



DRS  
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**Design Learning  
for Tomorrow**

Design Education from Kindergarten to PhD

*Proceedings from  
the 2nd International Conference  
for Design Education Researchers,  
14-17 May 2013, Oslo, Norway*

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Reds.: Janne Beate Reitan, Peter Lloyd,  
Erik Bohemia, Liv Merete Nielsen  
Ingvild Digranes and Eva Lutnæs

# Proceedings of the 2<sup>nd</sup> International Conference for Design Education Researchers

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14–17 May 2013, Oslo, Norway  
Volume 3

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# Introductions





## Design Learning for Tomorrow – Design Education from Kindergarten to PhD

Many thanks to the Design Research Society (DRS) and Cumulus for giving the Oslo and Akershus University College of Applied Sciences the confidence to chair and organise this 2<sup>nd</sup> international conference for design education researchers in Oslo May 14–17, 2013. Researchers from more than 74 universities have undertaken a rigorous double blind review process used to select papers for inclusion in these conference proceedings. We received 225 full papers and of these 165 were selected and included in the conference proceedings and presented at the conference. Thanks to all, and a special thank to professor Peter Lloyd of the Open University, who served as chair of the scientific review committee and to dr. Janne Reitan of the Oslo and Akershus University College of Applied Sciences who chaired the committee with him.

The 2<sup>nd</sup> international conference for design education researchers in Oslo May 14–17, 2013 on the theme of ‘Design learning for tomorrow – Design education from Kindergarten to PhD’ received an overwhelming response. This is gratifying for us, the organisers, as we see design in a broad interdisciplinary perspective in support for a *better tomorrow*. For years we have promoted the idea that sustainable design solutions should include more than ‘professional’ designers; they should also include a general public as ‘conscious’ consumers and decision makers with responsibility for quality and longevity, as opposed to a “throw-away” society.

This is also the reason why we as the conference hosts have chosen to focus on design education from Kindergarten to PhD. This perspective was put forward as a contrast to most design education conferences where there is either a focus on design education for professionals or general education for children and non-designers. In the call the conference papers we have argued for a longitudinal perspective on design education where the education of professional designers is seen in *relation* to general education of a people. This is becoming increasingly relevant as more and more decisions are being made on the basis of visual representation. With this conference we have the ambition to see education at many different levels in securing a sustainable future for the design of everyday life solutions. For that we need qualified and reflective decision makers with a consciousness for quality of design and solutions.

Why are these issues of concern for Norwegian researchers in this field? The answer goes back to the 1960 National Curriculum for primary and lower secondary schools in Norway, when art and crafts were merged into one subject. Currently this subject includes art, architecture, design and visual communication. No other Nordic–or European–country seems to have developed a model similar to this and today we see

the benefit of this merger where design is at the core of the subject for youngsters – building upon the best from art and the best from craft to become creative problem solvers and critical consumers. I am looking forward to the day when UNESCO, or other organisations with responsibility for funding research, recognise that we need more research and knowledge on what impact design education from Kindergarten to PhD have on consumer habits and sustainable development at large. I hope that such projects are not far away. Politicians have far too long been told that advanced mathematics is the main way to stimulate youngsters to abstract thinking. The designerly way of solving problems can be even more suitable in training abstract thinking, and it will also include ethical aspects of sustainable development and ecology. A design literate general public would therefore be a step forward in supporting the statement of commitment by the members of Cumulus; the 'Kyoto Design Declaration 2008'.

For this DRS//cumulus Oslo 2013 conference we are happy to continue our international cooperation for design education research. In advance of the conference we have cooperated on editing the conference proceedings at level 1 in the Norwegian system. After the conference we will cooperate for special issues of the following academic journals; *Art, Design & Communication in Higher Education*, *TechneA, Design and Technology Education*, *Studies in Material Thinking* and *FORMakademisk*. The role of journals as an arena for design education research is essential for the advancement of knowledge production within the field. For the Nordic design and design education research field, *FORMakademisk* has played a crucial role in its five years of existence, as a digital open-access journal for both design and design education research. Its first editorial wrote that:

The aim of the journal is to provide a venue for research in design and design education, and thereby develop an interest and working community of scholars in the field. The editorial team perceives design as a generic term that includes creative and performing activities in the great span of the artefacts 'from the spoon to the city'. The editorial team relates to design education as a field that includes the dissemination of design in society and the teaching of design at all levels general education, vocational preparation, professional education and research education - from kindergarten to doctorate.(www.formakademisk.org)

The Norwegian design education community includes design education for professional designers and teacher training for design educators. The teacher training is mainly developed through two master programmes—one in Oslo (Institute of Art, Design and Drama, Faculty of Technology, Art and Design, Oslo and Akershus University College of Applied Sciences - HiOA) and one in Notodden (Department of Art Education, Telemark University College - HiT). Two PhD-programmes; Oslo School of Architecture and Design (AHO) and Cultural Studies at the Telemark University College, have a focus on both design and design education. The AHO programme was chaired by professor Halina Dunin-Woyseth, who has played a key role in developing research within the 'making disciplines'. From the AHO programme the research network *DesignDialog* was established in 2002 with research focus on three themes; 1) Studies of dialogues of design in context, 2) Studies of design education, and 3) Studies of public dialogues on design.

I see this conference as a further step to international collaboration in design education research. Thanks to all those at HiOA, Faculty of Technology, art and design, who have supported this conference; Dean Petter Øyan and institute leaders Åshild

Vethal – Institute of Art, Design and Drama, Gunnar H. Gundersen – Institute of Product Design, and Laurence Habib – Institute of Computer Science. Without their support this conference would not have been possible. Thanks are also due to the leaders of Oslo and Akershus University College of Applied Sciences, rector Kari Toverud Jensen and head of research Frode Eika Sandnes, for general support to the internationalisation of design education research at HiOA, including this conference.

It is an honour for us that the DRS-Cumulus partnership will be signed in Oslo by DRS chair professor Seymour Roworth-Stokes and Cumulus vice-president professor Luisa Collina. Professor Michael Tovey and co-chair of this conference Erik Bohemia have played a central role in preparing for this partnership and this 2<sup>nd</sup> conference for design education researchers.

Warm thanks to the Scientific review committee, the Scientific review panel, the Programme Committee, the Organising committee, and the rest of the Editorial team; Janne Beate Reitan, Peter Lloyd, Erik Bohemia, Ingvild Digranes and Eva Lutnæs. Thanks also to colleagues and students for valuable contributions.

We are also grateful to our supporters and sponsors; the National Museum, the Research Council of Norway, the musicians and designers Peter Opsvik and Svein Gusrud, the furniture companies SAVO, HÅG, STOKKE and Variér for generously providing display chairs for the exhibition, and all the other supporters and cooperation partners.

We hope, as the organizers, that the conference will promote design and design education as a field of practice and inquiry. We hope that it will create a fertile context for establishing new networks of future co-operation, nationally and internationally, and that design education research in its broad context will be recognized both inside and outside the design research community. The general public's interest for design and quality is developed from the kindergarten, through primary and secondary education and the public's attitude is central for professional activities and a broad democratic design participation.

Liv Merete NIELSEN  
Professor, designer  
Chair of the conference

## Design Pedagogy Special Interest Group of DRS

This is the second symposium organised jointly by the Design Research Society and CUMULUS. The two organizations complement each other. CUMULUS is the International Association of Universities and Colleges of Art, Design and Media. It is a non-profit organization consisting of 165 universities and colleges of art, design and media from 43 countries. Cumulus was founded in 1990 and since then has been acting as an umbrella for many purposes and numerous projects for education and research of art, design and media. The Design Research Society is a multi-disciplinary learned society for the design research community worldwide. The DRS was founded in 1966 and facilitates an international design research network in around 40 countries.

The Design Research Society has three main aims. It focuses on recognising design as a creative act, common to many disciplines. It has the intention of understanding research and its relationship with education and practice. Then there is the overall aim of advancing the theory and practice of design. The membership of DRS is international.

The Society's Special Interest Group in Design Pedagogy is one of five in the society. It aims to bring together design researchers, teachers and practitioners, and others responsible for the delivery of design education, and to clarify and develop the role of design research in providing the theoretical underpinning for design education. These aims are not directed simply at one type of design education, but are intended to include all ages. However as the current membership of DRS is predominantly from universities inevitably the conference stream has concentrated on design education at that level.

The first DRS/CUMULUS Symposium was held in Paris in 2011. Its overarching aim was to explore how innovation in education is informed by and is informing design research. The symposium focused on design education, innovation in general education through design, and on innovation in business and engineering education through design integration. There was a particular emphasis on developing research in the area of Design Pedagogy. It was successful and it marked the point at which the Design Pedagogy Special Interest Group became could be said to be established as an effective force in design research.

This was consolidated at the DRS Biennial Conference in July 2012 in Bangkok. Papers aligned with SIGs were streamed through the conference programme. The Design Pedagogy stream consisted of 24 papers which was a strong representation within the conference. They focused on teaching and assessment, education and learning, design methods and processes, design approaches, cognition and creativity, and design culture, with papers grouped accordingly. Attendance at the sessions was good with informed and lively discussion.

In recognition of the strength of the papers at the conference, 8 of them were selected to form the basis of a special issue of the Design and Technology Education Journal. It was edited by Erik Bohemia and Mike Tovey and it included a review of the conference and an editorial which related the developments in design pedagogy in

higher education which the papers focused upon, to the wider issues of design teaching at the school level.

This second DRS/CUMULUS conference builds on these developments and develops them into new areas. Its theme of design learning for tomorrow encompassing design education from kindergarten to PhD is large and ambitious. The conference is intended to be an international springboard for sharing ideas and concepts about contemporary design education research. It is open to different facets of contemporary approaches to such research in any aspect and discipline of design education.

The context for this is set well by the organizers who say:

‘Designed artefacts and solutions influence our lives and values, both from a personal and societal perspective. Designers, decision makers, investors and consumers hold different positions in the design process, but they all make choices that will influence our future visual and material culture. To promote sustainability and meet global challenges for the future, professional designers are dependent on critical consumers and a design literate general public. For this purpose design education is important for all. We propose that design education in general education represents both a foundation for professional design education and a vital requirement for developing the general public competence for informed decision making.’

This is a powerful and energising assertion for all of us involved in research in design pedagogy. It is possible that you could argue that this is what is needed, for despite a richness of activity, the number of journal papers on design pedagogy research could be higher. In a ranking of design research journals (Gemser et al, 2012) Design Studies was placed first. In the last year it has published only three papers on design pedagogy. This is better than the second placed journal, Design Issues, which has none, or another highly rated publication, The Design Journal which also has none. A challenge for scholars of research in design pedagogy is to achieve a greater impact amongst our journals.

Design research is not the same as research in some other disciplines. (Ref) In a fundamental science such as physics if research stops then effectively the discipline comes to a halt. If there is no physics research then there is no physics. Design is not like that. If design research were to stop then design would continue, more or less regardless. Designers would continue designing things, and probably the world would notice no difference. It would seem that design research is not central to design practice.

Design research is an activity which is directed to exploring and understanding the nature of design, its processes and methods. It has loftier academic aspirations than the data gathering part of the design process. It is usually undertaken by academics, and it is expected to conform to conventional standards of academic scholarship and rigour. Design research is clearly necessary for the academic respectability of the discipline.

One of the purposes of design education within schools is to equip students with the information and capabilities they need if they are to apply to study design at a university. It is an intention which probably applies to a minority of the students, but it is important nonetheless. In schools design education overall has to achieve much more and its broader reach is extremely important. It is important that research into design pedagogy should also have this wider relevance.

The recently published ‘Design and Designing: a Critical Introduction’ (editors S. Garner and C. Evans) is intended to provide an overview of design for those at school who are considering embarking on a university or college education in design. It

consists of a collection of essays from a large number of contributors each concerned with a different aspect of design. In the first chapter for example Tovey asserts that the purpose of design education at this level is to provide students with a passport to enter the community of practice of professional design (Tovey 2012). For a significant time this has been the intention of practice based design education. Many students have the ambition of achieving a level of capability to function as designers in the professional world. In order to reach this standard they need to demonstrate a level of professional 'polish' and presentation to match that of the practising designer. However Tovey also argues that the most fundamental quality they need is one of creativity. The key to their achieving this lies in their abilities to think in a solution focused way employing visuo-spatial intellectual abilities. The ability to engage in creative thinking, and more particularly the creative synthesising of ideas through design thinking, is the most important capability required to enter the community of professional practice.

These are capabilities which need development from an early age. Abilities such as tackling problems with a solution focus, and thinking visuo-spatially are not developed ab initio at university and college level. It has been argued that spatial ability is a fundamental form of intelligence along with others such as numerical and literary abilities. (Gardner, 1984) Cross has gone further in suggesting that designerly thinking might be a basic form of intelligence (Cross, 2006). Although the case for such a view is not proven, it is a productive stance to take as it helps to identify and clarify features of the nature of design ability and it offers a framework for understanding and developing it. What seems to be generally agreed is that these underlying capabilities are ones which need to be nurtured early and developed, not only as the basis for studying design but also to equip students with abilities needed across a range of occupations. As the organizers of this conference propose design education can make a vital contribution to the development of the general public competence for informed decision making. Thus design education can be seen to have a wide remit in both providing the next generation of designers, and developing competence in decision making more generally. If it is to meet these challenges then research into design pedagogy has a crucial role in supporting the development of innovative and effective design teaching.

Michael TOVEY

Convenor of the DSR Design Pedagogy Special Interest Group (PedSIG)

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## About the Design Research Society

Design Research Society (DRS) is commending time, effort and energy and having already been investing these over the past 40 years to give rise to the most astute and relevant research in design.

When asked on numerous occasions to comment on design and design research, I've always been very careful, if not harsh, with regards to certain research projects whose content and/or approach seemed to fall short on the front of the relevant things in design. My reaction hit even closer to home in France where design is absent from academic disciplines, and design research has yet to really take off. I have to admit, nonetheless, that the strides undertaken by several universities abroad and continued by DRS have swayed me into believing that there really is an area that craves further learning and discovery, and cultivates fresh, relevance-hungry skills and competencies. Conferences and DRS-published works reflect a tremendous proliferation of new ideas, new projects and new ways to breed knowledge.

In 2010, and after having sat in on a conference in Seoul organized by the International Association of Societies of Design Research, I wrote the following: "Taking advantage of design's coming out and its lack of visibility research-wise for the purposes of Sociology, Psychology, Education Science, or even hard science, and playing them off as "design research" can only prove beneficial to design in the end. Employing the design research notion loosely, when, in reality, its usage is clearly career-gearred, does not seem all that fitting to me either.

The scope of research needs to be clearly outlined in a category of its own, and based on a language that both captures and communicates the knowledge from all fields spanning social and hard science, not to mention the socio-economic challenges that riddle our everyday. Design is a language doubling as an interface that connects people, ideas and knowledge, and imagines them in a better tomorrow. We could come up with our own scientific version of it as long as we don't get carried away and throw everything together haphazardly merely because design is omnipresent, and it suffices to get the intellectual juices flowing every now and then."

Time may have elapsed since these thoughts first emerged, but the issue remains the same. This text reflected the questions that crossed my mind following the various presentations I had attended. One presentation, in particular, caught my attention. It was given by a doctoral student who claimed that the work he was doing on the design of a bicycle was research. Twenty years ago, designing a bike was considered design. Today, that same bicycle now aspires to fall under the category of "design research." Let's try and refrain from wanting to label any idea, even the most relevant, "research." Despite their efforts to make a hard science out of Marketing, business schools are



busy filling in the gaps left behind by research done in the Marketing field. Every business owner and retailer in the world will tell you that Marketing is not a science, and wanting it to be one is just as futile as deciphering the gender of angels.

Design research is alive and well, and several universities have incorporated it into their agendas. It means nurturing a different kind of knowledge and insight at a time when other research fields lack the necessary to go head-to-head with the problems facing Mankind. There within is the incredible opportunity to truly, once and for all, set the fields of social and hard science apart. Kudos to DRS for being vigilant in choosing projects that are apt to map out a new direction between the two.

Just as design, creation and innovation are being positioned as solutions to problems in a world whose paradigms are crumbling, it would be, without a doubt, counterproductive for design research to cut ties with design practice. From an academic standpoint, it would also be a shame for design research to appear more virtuous and prestigious than design itself. That said, the loss would be just as great to reduce design to nothing other than a technique or representation. What design can offer goes beyond practicality. Design research goes beyond the designer. Their interconnectedness does not impede their individuality.

Design research and design itself are complementary. While loyal to the fundamental principles specific to each, both strive to find common ground and engage in a healthy give-and-take relationship to ensure balance and difference. With Mankind and its uses at the center of these issues, design gives impetus to an ideal or a potential, and not only pushes the limits of creativity and optimism to new heights, but seeks to defy them. At a time when science and technology are encountering a wary public, and where wealth and welfare are hitting glass ceilings, design provides an alternative future, and enables us to imagine it through a new lens. One thing is sure: Design researchers have their work cut out for them!

Christian GUELLERIN

President of Cumulus, International Association of Universities and Schools of Design,  
Art and Media

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# A different approach on gaining practical experience by acting as an (open) innovator at Industrial Design Engineering

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*Abstract: At Industrial Design Engineering we aspire to provide contemporary education, both in the content of the program as well as the way in which we teach. We aim to facilitate our students to become responsible entrepreneurs of their own learning experience. At the start of the second year we challenge students to initiate, organise and execute individual, international research abroad for 3 months. Students have to choose a research topic, initiate contact with companies and set-up a project. This ambitious setup at first creates confusion and excitement among the students. However, facilitated by a step-by-step approach, students arrive to inspiring research projects driven by their personal interests. We conducted a case study research to evaluate the educational approach as being successful in stimulating student entrepreneurship. We studied both the preparation course and the student projects. Insights on this approach are retrieved through the collection of multiple data from multiple sources and qualitative analyses. Results indicate that the majority of students are capable of designing an individual research project in an international setting and the balance between freedom and structure resulted in constructive friction*

*Keywords: new teaching, new learning, innovation.*

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## Introduction

The world is rapidly transforming. Economic, ecological, and technological developments transcend existing boundaries and push us to rethink and redesign society. Whether or not to innovate is not the issue. The challenge is in the way we innovate; are we able to rethink, redesign and realise the solutions to transform our society? (Valkenburg, 2011; Brown, 2009)

In order to redesign our world design education has to change (Norman, 2010; Kolko, 2011). At The Hague University of Applied Sciences (THU) at the international programme Industrial Design Engineering (IDE) students from all over the world are educated to become (open) innovators, who can integrate research, design and testing skills in an international context. Students are supported to develop an entrepreneurial attitude, to start up innovation projects that explore new possibilities, reframe contexts and create value for people (Valkenburg and Sluijs, 2012; Valkenburg and Sluijs, 2013).

Young adults today have grown up in a digital world (Prensky, 2001). These are our students, with specific values and needs. As teachers we are aware of this transformation and look for new ways to teach, coach and challenge our students. One innovation in the way we teach is encouraging students to create their own learning experiences throughout the programme. This paper focusses on gaining practical experience where this is explicitly taught. Instead of protecting them from this changing world, as many parents and educators seem to do these days (Furedi, 2012) we challenge them to take risks and discover the world in their own way.



*Figure 1. Student projects in the program of IDE. Each module is 10 weeks of education and a school year has 4 modules.*

At the beginning of the second year students start to apply the skills and knowledge learned in a practical environment. Half way during the first year the students are challenged to design their own project (see figure 1). The aim is to set-up an international research project directed at finding a meaningful design challenge to be used in a design project executed back in the university. The topic is free, for we want students to identify their personal interests and drivers and transform these to societal relevance. Our approach aims to stimulate entrepreneurial skills and personal responsibility. We facilitate the underlying search process with structure and coaching. The mix of maximum personal freedom for the students and maximum level of structure provided by us should result in challenging research projects (figure 2).

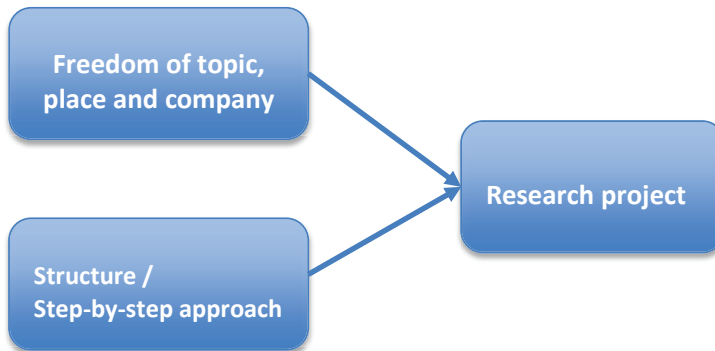


Figure 2. Freedom and structure as input for research project

We were curious how this ambitious educational approach can encourage design students in an early stage of their education to create their own projects. Stimulating students to make their own choices is risky. What are first year students capable of if you challenge them and give them the freedom to follow their own interests? In our opinion it is important to evaluate this new educational approach in order to learn from our experiment.

The main challenge we face in this ambitious educational approach is the balance between the freedom we offer students to find their own passion and help them in these insecure steps with a step-by-step approach. We want their challenge to be as large as possible, yet not scare them off or demotivate them.

This paper is structured as follows. Section 2 provides a description of the theoretical framework used to evaluate the educational approach. Section 3 describes the approach at IDE in more detail. In section 4 the research method is described. The results are presented in section 5. In section 6 conclusions are made on the value of contemporary education and the challenges faced in future education.

## Theoretical framework

In order to evaluate the balance between freedom of learning and teacher guidance we use the model of Vermunt and Verloop (1999). This model integrates two types of theories to bridge the gap between learning and teaching theories. The model addresses the relation between students' freedom to control their own learning and the control a teacher can exert on the learning process.

First it is important to make a clear distinction between learning activities and teaching strategies. In table 1 learning activities are categorised in cognitive, affective and regulative learning activities. Cognitive activities are related to processing subject matter and changing student's knowledge base. Affective activities are employed to cope with emotions during learning. Regulative activities refer to exerting control over student's own cognitive and affective processing.

**Table 1. A categorisation of Learning Activities. Source: Vermunt and Verloop (1999)**

Cognitive	Affective	Regulative
Relating/structuring	Motivating/planning	Orienting/planning
Analysing	Concentrating/exerting effort	Monitoring/testing/diagnosing
Concretising/applying	Attributing/judging oneself	Adjusting
Memorising	Appraising	Evaluating/reflecting
Critical processing	Dealing with emotions	
Selecting		

There are different types of teaching strategies. Strong teacher control is a learning situation where the teacher takes over the cognitive, affective and regulative learning activities of the student. Loose teacher control means that the responsibility for all learning activities is handed over to the student. Shared control stands for shared responsibility for learning activities, students are continually activated by the teacher to carry out learning activities.

The learning model by Vermunt and Verloop (1999) shown in table 2 integrates degree of student regulated learning – similar to the freedom we offer our students – with the degree of teacher regulated learning – comparable with the structure we provide. There is a tight balance between student and teacher regulation of learning that can either result in congruent learning, constructive friction resulting in challenging learning or even destructive friction not resulting in any learning.

**Table 2. Learning and teaching model. Source: Vermunt and Verloop (1999)**

Degree of student regulation of learning	Degree of teacher regulation of learning		
	Strong	Shared	Loose
High	Destructive friction	Destructive friction	Congruence
Intermediate	Destructive friction	Congruence	Constructive friction
Low	Congruence	Constructive friction	Destructive friction

Student activities and teaching strategies can either match and result in congruent learning or they do not match and result in friction. Two types of friction may be discerned: constructive friction where students are challenged to improve their skill in learning and thinking activities, and destructive friction that may cause a decrease in learning or thinking skills.

In our approach on gaining practical experience we used a shared control in the preparation course and a more loose approach in the research project. In order to identify the effect and evaluate the value we conducted a case study research. The main research question is: Does the balance between freedom – student regulated learning - and structure – teacher regulated learning – result in constructive friction?

## Description of the educational approach

At the beginning of the second year students execute a research project that should result in a design challenge to be used in the design project following after (see figure 1). Our aim is to give students the opportunity to research a topic that lies in their own field of interest. By addressing the students' intrinsic motivation we expect them to live up to the challenge. The project's main criteria are that it has to be abroad and the topic should be related to the theme Social Cities.

Example project: End of Mining, end of Society?

During a three month project, research was carried out on the impact of closing mines on a small community. These effects were investigated during a research trip to the mining influenced Island of Marinduque in the Philippines and in cooperation with the German company DMT GmbH & Co. KG who has a subsidiary in Jakarta, Indonesia.

Through interviews with stakeholders, such as local government and entrepreneurs, and observations of spaces and villages, diverse socio-economic aspects were found. Additional results of previous investigations were used to analyse effects mining can have on the society and.

The main findings show the strong effects of the closing of mines on the economic prosperity. Villages in the neighbourhood of the mines were cut off of basic supplies like water and electricity. These effects can lead to resettling and ghost towns.

(Bandelow, 2012)

The result of the research project will be user insights, based upon societal challenges. These insights are translated in a design challenge which is the starting point for product design. We carefully designed a preparation course (Plan the Project) that prepares first year students in a step-by-step approach to set-up a research project (International Insights Research) to be executed in the second year.

### *‘Plan the project’*

The course Plan the Project is designed to guide students step-by-step to set up their own research. The course contains four assignments. Assignment 1 and 2 lead to a project proposal on which students receive a go or no go from their coach. After students receive a go, they are encouraged to arrange their stay abroad and collaboration with an organisation in assignment 3, workshops and coaching sessions. Assignment 4 focuses on the detailed research plan. In the final project plan the student has everything detailed from research plan to financial overview. Additionally students have to show proof of their arrangements.

### *‘International Insights Research’*

For International Insights Research students will execute their plans submitted in Plan the Project. Students are only allowed to execute their plans if they have successfully completed Plan the Project. During their stay abroad students are supported by a coach. Students can also attend an online classroom where the students can discuss general issues with peers and the co-ordinating lecturer. These online classrooms are offered twice a week to address different time zones. Every fortnight students have to hand in a reflection assignment related to the different stages of the project.

## Research method

The educational project is perhaps too new for rigorous evaluation. As the approach is new, it is difficult to determine criteria for success. However, we want to gain insights into the teaching effects and evaluate the ability of students to deal with this amount of freedom and insecurity. We choose a qualitative research approach to leave space for insecurity in definition of the criteria and for surprises in findings. In a case study research (Eisenhardt, 1989) we collected many and diverse data from different resources.

### *Data gathering*

We gathered data during different stages of Plan the Project and International Insights Research (see table 3).

**Table 3. The data gathered in different stages**

Phase	Step	Data
Prepare project proposal (Feb – April)	Kick-off	
	Defining itch <sup>1</sup>	Student work
	Exploring	Student work
	Project proposal	Student data (grades, topics, etc.)
Prepare final project plan (April – June)	Approaching companies	Start logbook kept by course coordinator Student work
	Detailing research design	Student work Reflection interview coach
	What if things go wrong?	
	Final project plan	Questionnaire 1 (#16) Interview with education advisor Student data (grades, topics, etc.)
International Insights Research (July – November)	Executing plan	Student work
	Return	Student work Student data (grades, topics, etc.) Questionnaire 2 (#23) Evaluation meeting coaches

Different types of data were retrieved from multiple stakeholders. The course coordinator kept a logbook to evaluate the course on the go. Semi-structured interviews were conducted with a coach and an educational advisor. Student work was examined, such as assignments, reflections and reports. Students were also invited to fill in two questionnaires in order to determine their perception on both courses. In the first questionnaire students were asked to grade specific course steps of Plan the Project and learning activities. They were also asked to explain why they gave the grade. A second questionnaire was used to check their statements made in the first questionnaire, to grade learning activities of International Insights Research and to investigate what learning objectives students think contribute to becoming an (open) innovator.

<sup>1</sup> Itch is 'a hunch' that there is something going on. These undefined feeling can indicate a good starting point for change (Valkenburg and Sluijs, 2012)



## Data analysis

Firstly, statements – both positive and negative – were retrieved from the questionnaires. Then the collected data were clustered into the three categories of learning activities: cognitive, affective and regulative activities. Cross referencing was used to check for the coverage of multiple participants and multiple sources.

The student reflections, the logbook and the interviews were analysed qualitatively. Assignments, proposals and final reports were studied in order to retrieve key issues and insights. Each step of the structure provided by the teacher was analysed resulting in a list of effects illustrated by typical examples.

## Results

The results section is divided into three parts. The first part analyses students' perspective on learning activities in order to find out how well they regulated their learning. The second part studies the effect of teacher regulation on learning. The last parts examines where congruence and friction in learning occurred.

### Students perception on learning activities

This paragraph shows the results of the collected questionnaires. For each category of learning activity, cognitive, affective and regulative (see table 1) the results are presented and analysed. These results are illustrated with the data of three students as example (see table 4). The students differ in their approach to the project and their perception on the learning activities.

**Table 4. General characteristics of the students**

	Student 1	Student 2	Student 3
Originates from	Indonesia – Dutch father	Nigeria – lives in Netherlands for 10 years	China – grew up in Curacao
Place of research	Indonesia	Nigeria	China – Hong Kong (first visit)
Involvement of relatives	Worked with company of parent	Travelled with parents Co-operated with companies of family members	Worked independently
Details of planning	Switched topic before handing in proposal	Nominal	Started halfway plan the project
Grade PtP	9.2 <sup>2</sup>	7.5	8.7
Grade IIR	8	4.5 (retake: 6)	4 (retake: 6)

#### COGNITIVE PROCESSING ACTIVITIES

These are the activities that directly lead to learning outcomes, for example structuring, analysing and applying. In the first year students followed courses on setting up and conducting research in order to find insights and formulate design challenges. This was mainly done in teams. For this project students needed to apply these skills independently.

In the first questionnaire we asked students which skills they have applied in planning the project. The response to this question was low and these results are not

<sup>2</sup> All grades in this article are based on a 10-point scale

included in this research. In the second questionnaire we changed the question and asked students how the learning objectives contributed to become an (open) innovator (see table 5). Some students, like student 1, answered the question on abstract level resulting in high grades and general arguments. Others, similar to student 1, reflected on their own experience resulting in more diverse grades and reflective arguments.

**Table 5. Students' perception on learning goals**

Learning objectives	Student 1	Student 2	Student 3
Doing research	6: it would have been better if there was someone to do the research with	5: I had to find my own way with my research	10: knowledge is power
Work independently	8: learnt to be self-reliant	8: -	5: you have to inspire each other
Doing a project abroad	8: experience abroad makes us more open and we can grow as a person	6: it might not have the same impact when I went home	5: too expensive, why do something so far away with a legit purpose
Working with a company	6: you learn to function professionally in a professional environment	7: it helps to set a standard and improve communication	N/A
Finding insights	7: interviews and observation lets you grow as a person	8: it involves everything you know and more	N/A
Formulate design challenge	6: it was a small task but it was good experience for future research	7: it is still not perfected	6: easy to go many ways, easy to sway off

In general students agreed that these learning goals contribute in becoming an (open) innovator. Interesting results are:

- Doing research is a useful skill, however a few prefer to do research in a team or that someone else does the research. They believe that an (open) innovator should be working in a team.
- The majority was enthusiastic about executing the project abroad. Some say it is important to submerge yourself in other cultures referring to it in general or more specific to their own project. However, if they experienced many difficulties, like student 3, they are negative about being abroad and they complain about the expenses made.
- Working with a company was one of the learning goals that was often left blank as did student 3. This does not necessarily mean that this learning activity does not contribute to becoming an (open) innovator. For many students it was difficult to set-up good relationships with a company.

#### AFFECTIVE LEARNING ACTIVITIES

Affective learning activities are employed by students to deal with emotions that arise during learning, for example motivation and judging oneself. In the student work and questionnaires students made remarks related to such emotions that arose during learning (see table 6).

**Table 6. Examples of remarks related to emotions**

Negative	Positive
"Beginning was definitely hard." "At the beginning no idea about planning this project and I was anxious about what could I do and how to do it well." "At the beginning very confused." "Assignment 1 & 2 were helpful but quite confusing at the beginning."	"During planning things became clear." "For all done work I feel satisfaction and calmness." "I am really satisfied with the first stage of the research and I am looking forward of executing the research..."

In the beginning most students experienced negative feelings. Along the way more students became more positive with a small dip after the proposal. This was the step where they actually had to arrange their plans by calling organisations for cooperating with them in the project. In the end most students were positive.

**Table 7. Choosing own research topic**

	Student 1	Student 2	Student 3
Process of choosing own topic	Changed topic halfway first phase. Theme did not help specify itch	Knew straight away and stayed in own comfort zone	Straight forward. Went out of own comfort zone
Was it valuable to choose your own topic?	yes because it kept me interested and motivated	yes, I could choose something I was already interested in.	yes definitely because this way you feel more responsible for it. as nobody knows about this/your subject as good as you do

Analysing the affective learning activities gave the following insights:

- Choosing their own topic kept most students motivated. However choosing your own topic is difficult. Some students asked their parents for help. Others switched topic a couple of times. One student preferred an assigned topic.
- In the beginning confusion arose because students did not know what learning or thinking skills to apply and how to interpret the assignment given. However by giving students feedback, they started to understand better what was expected of them. By the time they handed in the project proposal most understood and the confusion was gone.
- Insecurity is an emotion that arises when students do not oversee the task ahead and do not believe that they can control the challenge. They felt insecure when trying to find an itch, setting up the research and making contact with a company for an internship or other form of collaboration.
- Students who worked independently without regular help of a company, experienced more difficulties along the way. The fact they had no one to rely on resulted in feelings of frustration and insecurity.

REGULATIVE LEARNING ACTIVITIES

These learning activities are about the ability of students to plan their learning and monitor, adjust or evaluate along the way.

**Table 8. Students' perception on structure**

	Student 1	Student 2	Student 3
Start PtP	9: helpful assignments	5: unnatural, did not help in the process	8: clear assignments
Proposal	4: changed topic completely	6: looked more in depth	5: changed formulation of itch
Approaching companies	4: whole responsibility finding a company	4: stayed in comfort zone	2: no, but give advice on approach
Start IIR	Lot of work and meeting new people. Expected to gain a new view of everything	N/A	Going to make an awesome project on my own. Had no idea but I'll enjoy while doing it

In general students were capable to control their own learning. Analysing the regulative learning activities gave the following insights:

- Students were happy with the structure of assignments. Like student 2, some students found it an unnecessary structure as they perceive themselves as good planners.
- Almost all students that filled in the questionnaires were positive on the tutoring in both Plan the Project and International Insights Research. One student stated that the coach was more helpful than the course Plan the Project.
- Some students were capable to independently adjust their learning plan, goals or activities when necessary. They did experience friction because of that. Nonetheless, comparable to student 1 they were motivated to proceed in the new direction.
- A few students asked for help outside our programme, for example from parents and other family members, especially on finding a company to work with.
- Most students felt negative about the fact they received no list of companies to work with or prearranged internship positions. They wanted more support on finding companies and research topics.

### *Effect of teacher regulation*

The course Plan the Project was designed to provide a learning environment with a shared control on learning between teachers and students. Students were continually activated with various learning activities to adequately prepare them for the research project. In the course International Insights Research students were expected to be more responsible for their own learning. The level of teacher control loosened along the way. In this paragraph the effect of each learning activity is examined.

**Table 9. Phase 1: prepare project proposal**

Step	Effect	Example
<p><i>Kick-off:</i> In February 2012 students heard for the first time that they had to design their own international research project.</p>	<p>Many worried feelings amongst the students and parents, because they had no idea how to make such a project happen.</p>	<p>We received an e-mail from a parent in which she expressed their concerns on our aim sending students abroad for practical experience at such an early stage of the programme.</p>
<p><i>Defining itch:</i> For assignment 1 students had to identify own itch. Students were challenged to find an itch based upon their personal drive and motivation.</p>	<p>Students identified their own itch. However difficult, this led to surprising results.</p>	<p>A student who has lived in the German Ruhr area where her dad worked at a mining cooperation. She experienced herself the impact of mining and the closing of mines on the local society. She was curious if in other places of the world mining would have similar impact.</p>
<p><i>Exploring context:</i> In assignment 2 students had to conduct background research on the context, the target group and the possible locations of their research by using the “WWWWWH” technique (why, what, who, when, where and how).</p>	<p>Some students showed a clear direction for their research project and even formulated preliminary research questions. Others were more struggling to get the right focus on their work.</p>	<p>One student wanted to go to a place where he could execute his research and hobby surfing at the same time. He looked into Maldives and Australia. Finally a friend showed him a picture of Bali where he saw a littered beach. He finally decided to go Bali and research why there is so much litter.</p>
<p><i>Project proposal:</i> The proposal is a report combining the information gathered in the assignments 1 &amp; 2. The aim of the report was to convince their coach that their project is feasible and adding value to society.</p>	<p>Almost all students were able to convince us of the feasibility of the project.</p>	<p>Four students had to do a revision of the proposal and received a GO after that. The students that received a No Go either did not hand in a proposal or needed to do a retake of a first year course parallel to the project.</p>

Insights:

- Launching an ambitious project with a loose teacher regulation generates a lot of uncertainty.
- Giving students the opportunity to explore their own itch results in interesting and unexpected projects.
- Two types of student regulation occurred: students who easily knew what they wanted to do and students who struggled to find the right topic and location.

**Table 10. Phase 2: prepare final project plan**

Step	Effect	Example
<i>Approaching companies:</i> The students have to arrange a context for their research project, by involving a stakeholder on the scene. We offered help in form of an assignment, an acquisition workshop and personal guidance	Students complained that the help was not enough and they needed more help on finding a company. In the end more than half of the students were able to find a company with help from their own network.	One student was rejected many times by different organisations in Germany resulting in doing everything by herself in her home town in Romania. Another student used her personal network to arrange collaboration with a fish farm in Indonesia.
<i>Detailing research design &amp; final project plan:</i> In assignment 4 the students detailed their research activities.	The last assignment was clear to most students and they appreciated the fact that it helped them writing the final project plan.	A group of students proposed a whole different research project a week before the deadline. This group had the idea to start-up their own company and wanted to combine it with their research project. We decided to let the students change their topic if they managed to come up with a good plan. It was one of the best plans handed in and the students were graded a 9.

Insights:

- Finding a company was the hardest part of all. Instructions on acquisition were given, but not sufficient to establish new relations
- Students that were not able to use their personal network struggled the most finding a company.
- Finding a topic is an iterative process that can take a lot of time. However, when they find a topic they like they can work hard and deliver good results in a short time.

**Table 11. Phase 3: International Insights Research**

Step	Effect	Example
<i>Executing plan:</i> Students executed their research plan guided by a tutor and sometimes a company mentor.	Students were excited about executing their own plan. Almost all experienced difficulties and frustrations at some point of their research. Most of them were capable of dealing with it.	One student experienced blackmailing by a local scooter rental company. He felt unsafe as he had no company mentor to rely on. He decided to cut short his stay and finish his research in the Netherlands.
<i>Return:</i> A special day was organised to welcome students back in school and share stories.	After being apart for a couple of months students were excited to return to school.	A student went to New York with great excitement. After a couple of weeks working independently on his research he was looking forward to be back in school again.

Insights:

- In the third phase the students were mainly in control of their own learning. In case the students encountered difficulties and frustrations most were capable of using advice from coaches and parents to independently solve their problems.
- Students missed working in teams and getting inspiration from others.

### *Friction in learning*

In order to determine whether congruence, constructive friction or destructive friction took place it is important to analyse how successful students were in Plan the Project and International Insights Research and what caused them to be successful or unsuccessful.

The teaching strategy of used in Plan the Project is a shared approach. The learning was regulated by teachers with assignments, workshops and coaching. The focus of teaching is on guiding the process. The content, the choice of topic and how to plan the research project is regulated by the student. In some cases students were perfectly capable of applying the right activities and needed little guidance indicating a high degree of student regulation. However, 10 students received a no go for their project proposal and stopped with the course (see table 12).

**Table 12. Student results in Plan the Project and International Insights Research**

	#	Remarks
Participants PtP	50	
No Go PtP	9	7 failed assignments 1 & 2 2 did not meet entry requirements of 18 ECTS
Quit PTP	6	students left IDE
Satisfying grade PtP	35	2 students left IDE

In case of shared teacher regulation, students with a low regulation of their learning are expected to enter the stage of constructive friction and students with intermediate regulation would be in a stage of congruence (see table 13). Tutors have noticed that most students needed guidance to understand how to apply appropriate learning activities. These students probably experienced constructive friction.

**Table 13. Regulation in Plan the Project**

Degree of student regulation of learning	Degree of teacher regulation of learning		
	Strong	Shared	Loose
High	Destructive friction	Destructive friction	Congruence
Intermediate <b>(few)</b>	Destructive friction	Congruence <b>(high grades)</b>	Constructive friction
Low <b>(majority)</b>	Congruence	Constructive friction <b>(satisfying)</b>	Destructive friction

Seven students were not able to successfully complete the first two assignments. This might indicate that destructive friction did take place. Could this be caused by students employing a high degree regulation? These students indicated they were not able come up with an itch or wanted to wait another year. A possible explanation can

be that teacher control in Plan the Project was more loose than the teachers intended and students with a low degree of regulation experienced destructive friction.

**Table 14. Student results in International Insights Research**

Participants IIR	33	1 student left IDE
High grade IIR	5	≥ 8.5
Satisfying grade IIR	11	5.5 < x > 8.5
Satisfying retake IIR	5	Not all students were able to write a good research report at the first attempt
Not yet complete	3	Extended deadline
Dropout IIR	2	1 student left IDE
Failed	7	1 student left IDE

In International Insight Research the teaching regulation was more loose. The learning was mainly regulated by coaching talks with teachers. Additionally reflection assignments and online lectures were provided to support the students. However, the main learning activities were planned and monitored by students themselves in a context outside of school. Sixteen students were capable of successfully finishing the course in the first attempt (see table 14). Students who executed their project during the summer holidays, when no coach was available, either dropped out or failed the course.

**Table 15. Regulation in International Insights Research**

Degree of student regulation of learning	Degree of teacher regulation of learning		
	Strong	Shared	Loose
High <b>(few: 5)</b>	Destructive friction	Destructive friction	Congruence <b>(high grades)</b>
Intermediate <b>(majority: 16)</b>	Destructive friction	Congruence	Constructive friction <b>(satisfying)</b>
Low <b>(few: 9)</b>	Congruence	Constructive friction	Destructive friction <b>(failed/dropped out)</b>

## Conclusion on contemporary education

At IDE we face the challenge of educating students an entrepreneurial attitude. We dealt with the dilemma of giving first year students freedom to create their own learning experiences and prevent destructive friction from happening. To learn from our experiment we evaluated the courses Plan the Project and International Insights Research. Does the balance between freedom – student regulated learning - and structure – teacher regulated learning – result in constructive friction?

First year students are often treated with strong teacher regulation. Our results show that the majority of students is capable of controlling their own learning. At the start they were uncertain and confused with the assignments we gave them, but towards the end they felt proud and satisfied with their accomplishments.

We applied a shared teaching strategy in Plan the Project to prepare them for the more loosely regulated International Insights Research. We controlled parts of the learning experience with assignments, workshops and coaching. Nevertheless, we gave students the freedom to choose their own research topic and design their own



research project. We can conclude that the teaching strategy we applied matches the learning strategy of most students and prevented destructive friction from happening in most cases.

For a couple of students destructive friction did occur. It might be that our teaching approach was too loose for these students. However, we observed in other courses that these students are having similar problems. Also a stronger regulation will not encourage them to become (open) innovators.

Finally, we can retrieve three recommendations from our findings on how to encourage design engineering students to create their own learning context and content :

- The majority of first year students are capable of creating their own learning activities when they are intrinsically motivated. A step-by-step approach can prevent destructive friction from happening.
- Teachers should help students dealing with emotions such as uncertainty, confusion and frustration, however without taking over the task of creating a learning environment.
- Finding research partners such as companies or research institutions is difficult and out of the comfort zone of students. Therefore teachers should continuously stimulate students to use networking skills and give support when necessary.

Based on these recommendations we will improve our approach. Future research will evaluate how these improvements affect the learning experience of design engineering students.

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*A different approach on gaining practical experience by acting as an (open) innovator at IDE*

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## Fostering deep learning in respect to the social aspects of sustainable product design

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*Abstract: This paper presents findings from a doctoral study, which investigated effective methods for teaching social sustainability within product design courses in British and Irish universities. Specifically exploring how appropriate methods can be used to foster deep learning in respect to the social aspects of sustainable product design. The importance of deep learning is reflected in both the sustainable design education (O'Rafferty et al., 2008, Griffith and Bamford, 2007) and education for sustainability literature (Warburton, 2003). Three 'Rethinking Design' workshops were designed and developed as part of the doctoral main study to introduce students to the wider social aspects of sustainability and were conducted in five universities in Britain and Ireland. The workshops were developed to foster principles that encourage students to adopt deep learning methods, including motivational factors such as relevance, appropriate teaching materials and opportunities for collaborative learning. The workshops were successful in fostering deep learning by facilitating learning through discovery, critical reflection, peer learning and creativity leading to an exploration of design thinking solutions.*

*Keywords: Deep Learning, Sustainable Product Design, Net-Generation learners.*

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## **Introduction**

This paper presents findings from a doctoral study, which explored effective methods for the teaching of the social aspects of sustainability in sustainable product design (SPD) (Watkins Forthcoming). Specifically describing how deep learning approaches were fostered through the careful design of learning materials in the 'Rethinking Design' workshops, which were conducted at 5 universities within the UK and Ireland.

The paper begins with the understanding that in order for students to fully grasp the complex, interdisciplinary and holistic nature of sustainability they need to adopt a deeper understanding of the subject (Warburton 2003).

A multidisciplinary literature review was conducted into deep learning with the key recommendations for fostering a deep learning approach relating to motivational factors including the student's perceived relevance of the teaching and the real world nature of the taught content, therefore the learning preferences of the current ('Net-Generation') learners are also considered. This paper then outlines how the findings relating to deep learning and the learning preferences of students informed the design of the 'Rethinking Design' workshops. The design and content of these workshops are then described and the findings from the study relating to deep learning including evidence of critical reflection and design thinking approaches are explored and conclusions drawn.

## **Deep Learning**

Warburton (2003) suggests that deep learning is particularly relevant to education for sustainability, because of the interdisciplinary nature and holistic insight, but warns that the effectiveness of deep learning can be inhibited if the backgrounds of the students have a strong disciplinary focus. *"Deep learning involves paying attention to underlying meaning. It is associated with the use of analytical skills, cross-referencing, imaginative reconstruction and independent thinking (Warburton 2003)"*

The search to understand and extract meaning is recognised as a definitive trait of deep learning (Hounsell 1997; Entwistle 2000; Warburton 2003; McMahon 2006), whilst a passive memorisation and an intention to merely complete the task are described as characteristic of a surface learning approach (Hounsell 1997; Entwistle 2000; McMahon 2006; Vaughan 2006). McMahon (2006) notes, that deep learning is more effective than surface learning because it leads to mastery in understanding that is necessary in a real world application. Whilst students may have a natural tendency towards either deep or surface learning, most students' decisions regarding their learning approach depend on external factors such as their experience in the classroom (Ramsden 1997; McMahon 2006) and their expectations of how the assessment (Marton and Säljö 1997) will reward them (McMahon 2006).

Deep learning is dependent on how much a student engages with the topic (Marton and Säljö 1997; McMahon 2006) and deep approaches to learning are likely to arise from both good teaching and greater student autonomy to choose both the content and ways of learning (Marton and Säljö 1997; McMahon 2006; Vaughan 2006). Deep learning is found where students are motivated and engaged with the subject matter

(Fransson 1977; Hounsell 1997; Marton and Säljö 1997), it is recognised that such students will tend to read beyond the course requirements (McMahon 2006).

Fransson (1977) found that students who exhibited a strong interest, combined with low levels of anxiety, demonstrated a deeper approach to learning and were able to recall facts from a studied text well. Whilst students that lacked interest and felt threatened by the prospect of testing (McMahon 2006), exhibited high anxiety and were likely to adopt approaches that demonstrated only surface levels of learning (Fransson 1977). Describing approaches to assessment that could foster deep learning responses, McMahon (2006) suggests giving students greater ownership and choice (McMahon 2006; Vaughan 2006) over how and when they are assessed as well as ensuring that the assessment is designed to reward higher order critical thinking (McMahon 2006). Describing such an approach McMahon notes the use of reflective diaries and short pieces of writing that can be peer assessed, fostering the development of critical reflection through practise and feedback (McMahon 2006).

### *Motivational Factors*

Deep learning can be associated with an internal motivation (Warburton 2003; Vaughan 2006), whilst surface learning can be associated with an external requirement (Entwistle 2000; McMahon 2006; Vaughan 2006) such as an examination. It is remarked however in the literature that this motivation isn't created by an individual but is instead found (Fransson 1977; McMahon 2006), so links between the learning material and what the students are interested in need to be made to ensure relevance. This view is supported by Ramsden (1997) who asserts that course materials or assessment methods alone are not enough to ensure that students will think deeply about the subject matter and that it is necessary to consider the students' perspective. Furthermore noting Fransson's study Marton and Säljö (1997) state a deep approach to learning is best fostered in students by considering the students' own interests, whilst seeking to eliminate factors which cause students to adopt a surface approach; irrelevance, threat and anxiety (Marton and Säljö 1997). *"A deep approach, in the context of everyday studying, primarily refers to the realisation of the fact that the studies one is engaged in deal with some aspect of the "real world" and thus by studying, one is trying to improve one's understanding of it."* (Marton and Säljö 1997)

Active (McMahon 2006) and collaborative learning (Entwistle 2000) can lead to deep learning by encouraging critical reflection (Entwistle 2000; McMahon 2006; Vaughan 2006). A peer to peer and group based learning environment is additionally recognised with the education for sustainability literature as advantageous.

It is necessary to ensure that the students are motivated in order to foster a greater likelihood of deep learning (Fransson 1977; Hounsell 1997; Marton and Säljö 1997) and Warburton (2003) notes the following considerations, which can affect motivation:

<b>Learning Environment</b>	<b>Course Content</b>	<b>Individual Factors</b>
Scope for discovery and problem solving	Key concepts and themes	Metacognition
Choice of study materials	Range/variety	Prior knowledge
Teaching style	Personal relevance	Experience
Social context and cooperative learning		Personality
		Morale
		Workload

*Table 1: Factors that affect motivation in respect to deep learning*

However the majority of the individual factors with the exception of experience and workload relate to aspects that are typically out of the scope of an educator’s control. Therefore the focus of the research study considered only how the taught course content and learning environment could be best optimised to deliver the most relevant and stimulating teaching of the social aspects of SPD.

## **‘Net-Generation’ Learners**

In order to increase relevance the students learning styles both as designers and ‘Net-Generation’ learners was considered.

Authors use multiple terms to describe the current generation of students, including the Net-Generation. Oblinger and Oblinger (2005a) define the ‘Net Generation’ as individuals born from 1982 onwards (Howe and Strauss 2003; Oblinger and Oblinger 2005). This generation would have all typically been using computers before they were 16 to 18 years old (Oblinger and Oblinger 2005). However Oblinger and Oblinger (2005) note that the differentiating factor for the ‘Net Generation’ may be their technological experience rather than just their age. Whilst (Tapscott 1998) defines the ‘Net Generation as those born after 1977, the generation born after 1982 are also referred to in the literature as the ‘Millennials’ (Howe and Strauss 2003; Holliday and Li 2004) and ‘Digital Natives’ (Palfrey and Gasser 2008). The Net Generation would typically apply to the vast majority if not all of the students involved in undergraduate and postgraduate study in the UK during the period of the study (2010-2011) and therefore all those students subject to this research study. Allowing for mature students, as an individual born in 1982 would be 28 years old at the start of the main study trials, whilst traditional undergraduate students would be aged between 18 and 22 years.

The Net Generation have differing learning styles and preferences to the generation that preceded them (Barnes, Marateo et al. 2007) typically known as ‘Generation X’. This is partly due to the influence of computer technology, the internet and the social media upon their lives and also partly subject to the social climate (Tapscott 2009) in which they are raised and their response to the attitudes of the previous generations (Howe and Strauss 2003).

### *Autonomous*

‘Net Generation’ learners in Higher Education prefer to be autonomous learners with a preference for experiential (Barnes, Marateo et al. 2007), learning by doing

(McNeely 2005). Such students place a greater emphasis on exploratory learning by discovery, whether individually or collaboratively with their peers, to the traditional lecture format where information is given to them (Oblinger and Oblinger 2005; Tapscott 2009). Tapscott (1998) notes that this exploratory style improves students' retention of information and allows for more creative and meaningful use of knowledge (Tapscott 1998).

Oblinger and Oblinger (2005b) note that the Net generation are very achievement oriented and have a preference for structure, seeking parameters, rules, priorities, and procedures; they are keen to know what it will take to achieve a particular goal.

### *Socially Orientated*

Net generation students are attracted to activities that promote and reinforce social interaction including interactive learning (Barnes, Marateo et al. 2007; Tapscott 2009), peer to peer learning (Oblinger and Oblinger 2005) and teamwork activities (Howe and Strauss 2003; Oblinger and Oblinger 2005; Barnes, Marateo et al. 2007; Tapscott 2009). This social nature of the Net generation means that they typically dislike online learning environments or distance learning, (McNeely 2005) despite the technological focus because distance learning lacks the social interaction that a traditional learning environment offers. Tapscott (2009) notes benefits of this social approach describing how students start to internalise their learning when they start to discuss it amongst themselves (Tapscott 2009). Oblinger and Oblinger (2005b) note that a peer-to-peer approach, where students help each other is seen by Net generation students as more credible than a teacher led approach.

Of particular interest to sustainability, it is noted that the Net generation are keen to engage in community activities, preferring to work on things that matter, such as addressing an environmental concern or a community problem (Oblinger and Oblinger 2005). Howe and Strauss (2003) similarly note that there is more emphasis on academic programs that serve public rather than individual interests (Howe and Strauss 2003).

### *Visual learners*

Net generation students are visual learners (Holliday and Li 2004), with enhanced visuo-spatial skills (Oblinger and Oblinger 2005; Tapscott 2009), who are more comfortable in image-rich environments than with text (Oblinger and Oblinger 2005; Windham 2005; Tapscott 2009). Net generation students retain on average 30% of what they see but only 10% of what they read and prefer to have graphics before text rather than graphics following text (Oblinger and Oblinger 2005). Oblinger and Oblinger (2005b) note that Net generation learners have a highly developed visual literacy, with the ability to read images and instinctively communicate through visual methods. They are also capable of combining images, text and sound seamlessly (Oblinger and Oblinger 2005) and this is demonstrated by the prevalence of amateur You Tube content.

### *Multitasking learners*

Net generation learners seek and handle information differently to previous generations. They multitask (Holliday and Li 2004; Barnes, Marateo et al. 2007), quickly shifting their attention from one task to another and can work on two tasks

simultaneously (Oblinger and Oblinger 2005) and deal with information in nonlinear ways (Oblinger and Oblinger 2005). Net generation learners respond more quickly than previous generations and expect rapid responses in return (Oblinger and Oblinger 2005). However it is suggested that this rapid pace may be detrimental to the student's ability to reflect and adopt critical thinking skills, which is cited as a weakness of the Net generation (Holliday and Li 2004; Oblinger and Oblinger 2005).

## **Design of workshop Activities**

Three 'Rethinking Design' workshops were developed to introduce students to a range of social aspects of SPD, these workshop were conducted at 5 universities 4 in the UK and an Irish university and were conducted with approximately 150 students in total. Each workshop consisted of two elements, a 3-5 minute audio visual (AV) introduction and a 45 minute group based workshop session in response to the AV introduction.

The choice of these particular elements was supported by the literature, which suggested that the audio visual and group based approach taken with the workshop should be beneficial to the students' learning in a number of ways, such as:

- Increased relevance through the visual methods used (Oblinger and Oblinger 2005; Windham 2005; Tapscott 2009) and team work (Howe and Strauss 2003; Oblinger and Oblinger 2005; Barnes, Marateo et al. 2007; Tapscott 2009).
- Encouraging students to personalise aspects of sustainability through indirect experiences (Murray 2011) by using carefully selected photographs.
- Group work that builds opportunities for discussion, debate and critical reflection as well as engagement (McNerney and Davis 1996; Huckle and Sterling 1997).

The A/V presentations were designed to be contemporary in style using photographs and music to capture the students' attention, deliberately mimicking internet based media content such as You Tube, where images or silent video are overlaid by a piece of popular music. This style was adopted so that the A/V material was more readily relevant to the 'Net Generation' audience, who are able to weave text, images and sound in a natural way (Oblinger and Oblinger, 2005). Ensuring that the A/V introductions were relevant and contemporary in nature was an important consideration, as the introductions sought to foster deep learning by motivating students, as recognised in the literature through the use of culturally relevant learning materials that related to real world issues (Fransson 1977; Ramsden 1997) (Marton and Säljö 1997). The photographs used were intentionally selected to portray a number of different aspects echoing the well-known Chinese proverb, "one picture is worth ten thousand words", so that each A/V introduction could introduce a much larger range of social issues than a traditional lecture format could accommodate, if only at superficial level. The use of photographs was also chosen as the literature findings suggest that the use of images can elicit an indirect experience that can foster personalisation of sustainability (Murray 2011). Furthermore, Griffith (2007) cites the use of introductory audio visual presentations as a means of promoting interest in responsible design amongst students, as well as supporting lecture content and stimulating discussion and activities in tutorials.



The group based aspect of the workshops was developed to further adopt approaches that intended to meet the learning preferences of the students. Including:

- Contextually relevant content in each of the workshops to suit the modules being undertaken at each university.
- Opportunities for collaborative group work to enhance peer learning and critical reflection.
- The use of questioning to elicit reflection amongst learners.
- Fostering deep learning through critical reflection.
- Enabling learning by discovery a learning preference of students.
- Fostering a holistic approach to enable systems thinking.

## Methodology

The 'Rethinking Design' workshops were conducted at 4 universities in the UK and an Irish University amongst undergraduate and postgraduate product design students. The total sample size was approximately 150 students and the workshops were conducted within modules which considered sustainable design. Data was collected via a mixture of methods including two student questionnaires which were completed prior to students commencing the workshops and immediately after completion to measure differences in individual students understanding and attitudes. Audio recordings and photography was used to record the students interactions during the workshops and the audio recordings were transcribed and analysed alongside the images using coding and clustering techniques. Student reflective diaries were additionally evaluated from the in-depth case study institution and were also analysed using coding and clustering techniques. Coding and clustering was used to analyse the qualitative data because this approach enables data to be reviewed and dissected in a meaningful way whilst still keeping the relationships between the data intact (Miles and Huberman 1994).

## Workshop Findings

The literature review demonstrated a link between deep learning, collaboration and critical reflection (McMahon, 2006) therefore the findings considered how these attitudes featured in the analysis of the student workshop experience, alongside the consideration of a design thinking approach amongst the students.

The group based discussion and workshop exercise demonstrated detailed consideration of the material with students exploring the A/V introductions at a deeper level, with a number of observations consistent with deep learning. Students engaged with the content of the A/V introductions at a personal level as well as engaging collaboratively in critical reflection, discussing issues such as the designer's responsibilities and the complexity of child labour in developing nations as well as suggesting approaches which foster design thinking principles.

### *Group work*

Students demonstrated group discussion and debate within the workshops and some even reflected upon this collaborative aspect later in their diaries. Suggesting that the group work and group discussion within the workshops encouraged them to consider different opinions and viewpoints. One student in particular noted that the

group work element of the workshop was particularly beneficial to his learning by offering a peer-peer learning environment.

“I felt that the group discussion was an excellent approach to the learning outcomes. It is in my opinion that students learn more from each other if they carry out projects in groups.”

Students additionally reflected on the conflicting views that arose within the group discussion, recognising that there were often two viewpoints or arguments to a particular issue, as a result of this. For example when considering the exploitative labour in developing countries through the ‘exploitation’ workshop, students recognised that whilst inequality of low wages, long working hours and child labour was wrong, it still provided the workers with much needed employment. Similarly, when considering the detrimental environmental and social impacts of globalisation and the more sustainable opportunities offered by localisation, the students recognised that a localisation approach would still have a negative effect for workers in countries such as China, that rely on the current global market model. Such examples demonstrate how the students grasped the complexity of sustainability through critical reflection.

The students’ learning however, continued beyond the group based workshop exercises, with students demonstrating even greater amounts of reflection and critical reflection, and a grasp of design thinking in their individual reflective diaries. Additionally students also recognised the reflective benefits of the data collection methods.

### *Questionnaire Reflection*

In their reflective diaries students noted that the questionnaires that were conducted at the start and end of the workshops had elicited reflection, initially upon the questions identifying aspects that they didn’t understand and also on the purpose of the questionnaires. *“The purpose of the survey was to determine how much every student understood about design. In my opinion, this was a good start to the workshop. It helped me to determine what I needed to know after finishing the workshop.”*

These students later reflected on how their thoughts, perceptions and knowledge had changed through the course of the workshops, comparing their responses in the final questionnaire with those in the initial questionnaire.

*“After the workshop we were then asked to fill in the same survey as we did before the workshop. This was interesting because my thoughts and knowledge of the aspects had changed or broadened. The videos and subsequent discussions had broadened my thoughts on the power of designing, that as well as functionality, aesthetics and a message, a design can have social benefits and bring people closer together to help make people’s lives better.”*

The students also typically found that the questionnaires were beneficial to them because of the ability to reflect upon what they had learnt, which was an unexpected outcome as the questionnaire was initially intended solely as a data collection and measurement tool. *“After watching the video and discussing the topics, we all had to complete a second survey individually..... I believe that this was an excellent way to end the workshop. It showed how much we learned from the presentation and the difference from what we knew at the start.”*

## Reflection

The time taken between students completing the workshop sessions and writing up their diaries enabled them to reflect further and combine their thoughts on all three workshops into a personal account of their experiences and reflections upon the activity. The student's reflective diaries noted how the workshops, caused them to reflect upon the decisions that they make as consumers as well as designers, with students reflecting upon what they saw, personalising aspects of sustainability by contextualising what they saw in terms of their own lifestyle or experience. An example of this was students recognising how they would feel an affinity to something they have made relating to example given for localisation.

Students reflected upon and unravelled issues that underlined some of the topics explored within the workshops, beginning to question macro themes such as globalisation and mass production. *"So maybe it is fair to ask if there is a need to mass produce items on such a large scale with such negative outcomes."* (A student's concluding diary remark)

Students also reflected on more specific micro issues such as the effect of technology growth upon communities such as the elderly. *"Technology is getting more and more sophisticated with every day that goes by but as we improve technology are we complicating things for different people in society."*

From a particular image used in an A/V introduction of a teenager in front of a boarded up house, students reflected upon social issues relating to a lack of community, family and broken homes. Such responses were framed entirely from the student's collaborative reflection and consideration of the short A/V introduction given in each workshop without any external input from lecturing staff, by allowing students the space and tools to explore concepts fully.

Furthermore the workshops encouraged students to consider the role of design and question the place of design in respect to numerous social aspects of sustainability, considering and discussing numerous issues such as design for need, noting how design for all isn't always possible and identifying cultural differences relating to age, ability or ethnic origin. Within this students also differentiated between the need to design for 'true needs' or 'needs and not wants'. In particular students reflected upon the conflict between the developed and developing world and how workers producing luxury goods for developed markets can often not afford their own basic needs.

In their diaries students also reflected upon how their own preconceptions of what design was, had changed. *"I thought about how a simple design or idea can have a big impact. Not on a consumer of an item, but on a community or a way of life. It made me really think about the power of design, as well as the responsibilities of designers to stay relevant and that as well as being fashionable or popular, that design has an important message, or in this case an important cause."*

The students also considered whether design was responsible for the issues portrayed, what the responsibilities were or should be upon designers and whether designers can be expected to be responsible for the effects of their products past the design stage, particularly in manufacture and at the end of life. *"It showed me that as a designer I have an obligation to use the talent and career that I have been given to help others"*.

Expanding on these issues of responsibility students highlighted the need for and potential approaches to address consumers' awareness of societal attitudes and values that are wasteful and harmful to the environment and society as a whole. Considering the prevalence of waste students noted social implications such as increasing consumer

awareness with students relating it to examples they are aware of such as the Remarkable pencil cases and suggested the consumer considers the need of a product at purchase in relation to wellbeing. *"You should think about it when you're buying it. You should think to yourself oh what effect is this product going to have on my life."*

Students also recognised the importance of the social implications of localisation concerning job creation and reflecting on the importance of maintaining cultural identity. *"But they were like making chairs to like give them money, yeah like the people. That makes sense and cos they can sell it can't they. Makes shipping pointless. So it provides opportunities. If they all started working for us they might lose their sense of cultural identity."*

### *Design Thinking*

Evidence from both the student's reflective diaries and workshop recordings demonstrated design thinking had taken place, with students using their creativity and knowledge to resolve issues outside of the remit of the traditional designer. Students questioned how they could address the issue of exploitation arising from globalised production, suggesting solutions that raised consumer awareness including labelling on products that would enable consumers to trace the product in a similar way that meat in Ireland can be traced. *"We first looked at the Irish beef market where you can trace meat from farm to fork and thought the same process could be employed in the manufacturing industry each material and component could be traced back to a country and company of origin making every link visible in the chain."*

Students also discussed corporate transparency, which would require manufacturing outsourcing in the developing world to become a public procedure promoting transparency and good practise. *"Doing business in this public theatre would hopefully guide companies to a higher moral ground in fear of being shunned by consumers."*

Both examples were suggestive of a service based approach to problem solving, which is an important recognition in the shift to a sustainable mind-set, from products to service based solutions (Morelli 2003). In addition to students adopting design thinking skills, students also began to consider and discuss the need for a redesign at a systems level approach to address the issues covered in the workshops. Demonstrating a grasp of the complexity of sustainability and the requirement for a systems approach to thinking as noted in the education for sustainability literature (McNerney and Davis 1996; Huckle and Sterling 1997; Wals and Jickling 2002; Cortese 2003; Warburton 2003; Li and Williams 2006; Henry-Stone 2010).

## **Conclusions**

Students demonstrated design thinking in both the workshops and diaries, using their creativity and knowledge to resolve issues outside of the remit of the traditional designer. Therefore despite Warburton's (2001) assertions that a strong discipline-specific focus can harm the potential for deep learning, students from a single discipline background managed to recognise the interdisciplinary nature of sustainability and consider solutions outside of their discipline focus. The success of the 'Rethinking Design Series' workshops in fostering design thinking agrees with literature, which notes that brainstorming and reflection are key components to enabling design thinking (Seidel and Fixson Forthcoming).

The 'Rethinking Design' workshops went beyond the traditional transmissive learning model, where students evidence surface learning, to a transformational learning experience with evidence of students demonstrating deep learning. The workshops were successful in enabling students to relate to the workshop content personally fostering deep learning through personalisation and critical thinking, which led students to adopting new approaches in relation to the material.

The audio visual method used within the workshops was described as relevant, effective and even enjoyable by the students, suggesting that the approaches adopted led to a relevant teaching style meeting a key requirement of deep learning as noted in the literature. Furthermore the A/V introductions in conjunction with the accompanying workshop questions encouraged student reflection, whilst the group based elements encouraged students to examine their own interpretations and those of their peers critically by fostering discussion and debate in response to each A/V introduction. This collaborative element led to a consideration of different perspectives and fostered critical thinking through the recognition of multiple perspectives.

- The workshop methods fostered a relevant approach which encouraged students to adopt deep learning responses to sustainability, despite the strong discipline specific environment, negating the concerns of Warburton (2001).
- The workshop format encouraged students to explore social SPD holistically, fostering design thinking approaches.
- The design of the workshops encouraged students to personalise sustainability and change their attitudes in respect to their outlook, both as designers and individual consumers.
- The workshops represent a container for the key elements needed to create a learning atmosphere where students can creatively explore the social aspects of SPD holistically through reflection, personalisation and collaboration. Rather than representing a one size fits all approach to the fostering of a holistic understanding of the social aspects of SPD.

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# **Multidisciplinary design education**

## A case study on action research: Barri Gòtic Barcelona

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**Abstract:** *The Design Degree program at Elisava Escuela Superior de Diseño e Ingeniería de Barcelona includes tools and mechanisms to focus students on the users, the social context and communication. The idea behind this is that greater density should be sought in the projects and a fabric of relationships should be generated in a social and geographical environment ranging from the most local to the most global. As part of its "Products, context and user" subject, Elisava planned action research during the 2010-11 academic year between a group of graphic design students and the members of the 'Asociación de vecinos del barri Gòtic' (AVVBG or Gothic Quarter Community Association), the Gothic Quarter being the district of Barcelona where the School is situated. As the AVVBG has few members, it considered the need to develop new communicative strategies. The teachers provided the students with the traditional social science methods (documentary sources, participant observation, in-depth interviews) with two goals: the first, that they might become deeply aware of the district's social reality, its relationship with the rest of the city and the true needs of the AVVBG (diagnosis); and the second, to establish bonds with the members of the AVVBG that would lead to starting spaces for reflection, joint creation and joint participation in designing the association's new communication strategies. The changes between the students' first proposal made with the typical conventional project methodology, and the following, after the action research and the users, students and tutors' reply, give a good account of the values and challenges of this methodology and enable design discipline self reflection.*

*Keywords: Research-action, critical social science, Barcelona.*

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## Introduction

In ELISAVA, students experience processes of awareness-raising and reflection on their own perspective as designers in a certain situation based on a commission. At the same time, as teacher-tutors we reflect and research on this educational process with the students themselves. However, time availability, the nature of the project and the involvement of the students and teachers rarely allow processes to develop beyond the initial premises and to expand the students, teachers and users' knowledge and experience.

Here we start to reflect on education in the design area. We therefore start with a specific experience carried out by third-year ELISAVA design undergraduates. During this experience, we decided to explore the possibilities of critical theory<sup>1</sup> and action research<sup>2</sup>, in a design-focused educational process. Firstly, we will study what a design must be like when it is focused from critical theory. Then, to investigate a new educational model for design, we will discover, explain and assess the specific experience from this critical focus. Finally, we will give conclusions to open up new lines of work for the future of design teaching.

## Critical theory and design projects

Historically, design school educational methodology has always had a general tendency to contemplate practical problems as theoretical matters. This dominant tendency is based on the positivist thought inherited from natural sciences. This has certain implications and consequences on design projects. According to J. Habermas (1982), positivism is characterised above all by its technical interest. The knowledge of any discipline guided by positivist thought therefore focuses above all on the accumulation of technical knowledge which, if suitably applied, solves problems. When applied to the traditional training process seen in many design schools, it consists of students acquiring knowledge to give them technical control over the problems that they will face in their future profession.

This technical interest in the design discipline and in many other disciplines and sciences is essential and accounts for a large part of the developments in the history of design. However, this is not the only type of legitimate knowledge. Under the influence

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1 The critical theory was developed by philosophers from the Frankfurt School, such as T. Adorno, M. Horkheimer and H. Marcuse, in the mid-20th-century, concern for the growing power of influence of the positivist focus of science as an ideology on 20th century Society. Later this was extended and consolidated by the approaches of critical social science made by J. Habermas in several works, such as *Conocimiento e interés* (1982), *Teoría y praxis* (1997), *Teoría de la acción comunicativa* (1987). Generally, critical theory, as W. Carr and S. Kemmis (1988: 146) say, tends to "express a focus of theory that proposes the central mission of emancipating people from the domination of positivist thought through their own understandings and acts".

2 W. Carr and S. Kemmis (1988) or J. Elliot (1990), amongst others, have taken critical social science to the field of education through the methodological focus they have called research-action. In general lines, this focus says that in order to produce emancipating or education-transforming knowledge, it is necessary not to separate research in the field of education from the educational praxis itself, and that it is essential to include the participation and collaboration of all agents involved in education (teachers, students, parents, institutions) in the research-action process.

of the hermeneutic tradition of social sciences in line with the ideas of J. Habermas (Habermas 1982), the design field has also incorporated a practical interest capable of producing knowledge following the interpretative understanding of the phenomena or problems approached. This interest applies to all design projects that, before proposing technical knowledge, have focused on understanding the problem they are intended to face, recognising the interaction there is between the product, the context and the users, and reflecting on it.

Transferred to the design project, this focus considers the need to make research that helps the problem to be understood before dealing with it from a technical point of view. Therefore, the results of research under this perspective can be taken as practical knowledge which completes and directs technical knowledge. The educational programs of the second period of the Bauhaus and above all the Ulm School project already included the concern for society and the deep knowledge of its present or future needs through the social sciences (Margolin 1991). However, according to critical theory, the practical knowledge this focus produces in social sciences is somewhat limited if we consider the social, cultural and political conditions that have configured the researcher's view (understanding). In other words, as J. Habermas (Habermas 1982) argues, the different types of knowledge are configured by the particular human interest they serve. Therefore, the knowledge depends on the subject's social position, their discourse and interest within a certain field of which they form a part (design, engineering, sport, etc.). According to critical theory, these conditioners must be revealed by self-reflection throughout the investigation to emancipate knowledge from such conditions. In design, this is akin to saying that designers must not base their theory only on the interpretations they make of the problems their trade poses for them. A self-reflection process is worthwhile to free oneself of these constraints on one's viewpoint. In social sciences, recognition of the subjectivity promoted by hermeneutics or the phenomenology during the investigation processes is an open path towards this reflexive focus in so far as it usually involves a transformation of awareness (cosmivision or the form of seeing the world). However, it does not necessarily produce a change in practice and can often lead to relativism. Therefore, self-reflection does not seem sufficient to overcome the gap between the interpretative focus and its practical and emancipating scope..

Under the hermeneutic focus, even though researchers might interpret and report, they are limited in transforming practice. Therefore J. Habermas's critical social science suggests offering individuals a means not only to become aware of how their objectives and purposes might have been distorted by the social, cultural and political conditioners, but also to transform the social reality in which they are involved (Habermas 1982 and 1997). In social sciences this is possible provided the subjects that form part of the situation or problem take part and collaborate in the research process. According to W. Carr & S. Kemmis, a critical social science must be (Carr; Kemmis 1988):

“a social process that combines collaboration in criticism with the political will of acting to overcome the contradictions of the social action and social institutions regarding their rationality and justice”.

According to these principles of critical social science, by including the subjects of the problem in the research team itself, they experience their own awareness-raising process (self-reflection) that necessarily leads to a will to transform reality. At the same time the researcher, previously a spectator, also experiences a process of self-reflection on their own role as a researcher and their own trade by mixing their interpretations with those of the agents involved and by sharing the decision-taking with respect to

methodologies and actions aimed at transformation, giving rise to a transforming will of the discipline itself.

In the field of design, which always has a practical orientation (a will to transform), in addition to the process of self-reflection on the part of the designer-researcher it would be a question of involving the subjects or users both in the process of investigating the problem and in developing its solution. In fact there are techniques already widely applied such as joint creation, discussion groups and feedback interviews during the processes of investigating and developing projects which are guided by this emancipating focus (Casacuberta, 2003; Jullier, 2010; Osterwalder; Pigneur 2010; Guersenzvaig, 2010).

However, this eminently creative and productive character specific to the design discipline adds a degree of complexity. Theoreticians such as A. Findelli defend creativity as a fundamental element both in the project and in research in the design field (Findelli 1999). Therefore, every research process in the field of design must not be limited by the epistemological premises of its focus, but must incorporate a transforming interest as practical knowledge. Design poses practical problems about what has to be done, therefore the solution lies in doing something.

Lécho Hirt (2010) quotes E. During in the sense that design research must be structured around methodological and operational elements in a heuristic process of balance between research and creation. By coining this term “research-creation”, the suggestion is to pay attention to the produced object, to the “tangible” result of creativity in any phase of the research. The results of the research-creation process must not be understood as proof or demonstration of the epistemological focus, but rather as possibilities that constantly transform the research field. Creativity and practice are therefore essential elements of the process on the same level as knowledge or research rigour.

Finally, we must understand that these types of processes do not reject other kinds of knowledge, but rather suggest integrating technical (positivist) knowledge and practical (interpretative) knowledge from an emancipating or transforming focus. At the same time, explaining a phenomenon (positivist approach) or understanding a phenomenon (interpretative approach) are but moments in the transformation process and not actual purposes of the science (Carr; Kemmis 1988).

In the next chapter, our experience shows the participation of the different focuses in different stages of an educational process focused on design as a means of transforming a problem.

## **Research-action with graphic design students and residents of Barcelona’s “Barri Gòtic”**

Having defined and explored the different theoretical perspectives in the design field, in order to confront different problems and realities we suggest reflecting on an educational experience that we had the chance to have as teachers during the 2010-11 academic year on the 3rd year of the ELISAVA design degree. Seeing the different situations that occurred throughout the experience, we proposed the application of the focus considered by critical social science. We therefore followed the postulates of W. Carr & S. Kemmis (1988) and J. Elliot (1990) for education, in our case: the design field.

In this context, W. Carr & S. Kemmis explain critical educational science as an action research process which consists of (Carr; Kemmis 1988, 168):

“/.../ a form of investigation carried out by those who participate in social situations to improve the rationality and justice of: a) their own education social practices; b) their understanding of them and; c) the situations and institutions in which these practices are carried out”.

This initial definition allows us to understand that, in our context, students and teachers must co-operate during the research process, which is aimed at developing new educational models in the design field, and students must include the collaboration and participation of the subjects involved in the problem they were facing in their research and design projects. Only in this way will we start the transformation process both of the educational model suggested by the teachers and the social problem dealt with by the students. This means that the educational processes must be processes of research into educational practice and processes of practice of the discipline at the same time. The teachers must play a double role as teachers and researchers, whereas the students must play a triple role as student, design professional and researcher.

We had the chance to start up this educational research-action when a representative of the *Asociación de Vecinos del Barri Gòtic de Barcelona (AVVBG)*, in the district where the design school is located, presented us with their proposal for collaborating on an educational project. We had a definite client. The member of the AVVBG suggested creating a group of graphic design students to make suggestions for the informative leaflet of the association and its corporate image. The tutors redefined the commission in the form of a suggestion for the AVVBG communication campaign so that the students would not be accepting a professional commission but would rather be dealing with a question that would give them broad pedagogical development. The AVVBG agreed and so we had a definite commission for the students. The school formed a team of volunteer students under the supervision of two teachers to develop a graphic design project for the residents' association. The students coming into the project were very excited and motivated as this was one of the first professional-type commissions led by the school.

In this stage, the traditional positivist focus procedure for commissions of this kind was applied. A meeting was held between students, teachers and a residents' representative to define the commission. After the meeting, the students were left free to try out all the technical skills and knowledge that they had acquired in their training. The tutors assigned to the project only made sporadic suggestions in order to maintain the quality of the project. In this phase, the tutors expected to work as intermediaries between the AVVBG and the students, trusting that the precision of the briefing and the students' capacity would ensure the conventional development of the project.

After a couple of weeks, the students already had a final proposal, so a presentation was organised for the AVVBG delegate at the school. The application of creative techniques and the use of new technologies brought forth a bold, groundbreaking proposal aimed at an aggressive, powerful communication to accompany the vindictive nature of the AVVBG, as we had been told by its representative.



Figure 1. Logo and informative leaflet in student's first proposal. Source: Pol Trias; Dani Llugany.

The representative was very impressed and grateful. Both the informative leaflet and the logo they had designed for the corporate identity upheld and modernised the association's image. However, when the delegate presented the results to the rest of the members of the association, there was strong criticism of the corporate image. It was generally argued that the design would give the association an excessively enterprising identity. They were not a company, but rather an association of residents. However, the representative argued in favour of the project and his opinion finally overrode with the support of one sector of the association.

The students then remained in contact with the AVVBG representative and worked on designing different issues of the informative leaflet. The meetings created a bond between the students most involved and the association's representative. At the same time, the students started the second term with a subject called Product, context and user, based on an anthropological-hermeneutic approach. The teachers of this subject called upon the students to make a guided study focused on the use of the qualitative research techniques typical of social science methods. One of the teachers' conditions was that the students should forget about researching to create or design prototypes and should only focus on trying to understand. Some of the students who were still in contact with the residents' association suggested to the teachers that they might research into the Gothic quarter and the association. The research started with four of

the students who had taken part in the previous phase. The aim was to understand the district and its relationship with the residents' association in greater depth and with a hermeneutic focus. The questions made of the group of researchers were therefore:

- What are the meanings and functions of the Gothic quarter?
- What are the social problems in the Gothic quarter? Causes of the problems?
- What problems are put forward by the residents' associations? Causes of the problems?
- What relationship is there between the residents' associations and the territory?

The field work was carried out using some of the traditional qualitative techniques: documentary sources (literature on the district, magazines, press, documentaries, etc.), distant observation (prospecting), and participant observation, making use of the bonds that had been sown with the residents' association in the work done on the informative leaflet, and in-depth interviews. The fieldwork helped to strengthen the bonds with the already known members of the residents' association and relationships were also started with other associates and residents. The students became involved in some of the activities carried out by the Association: the district assemblies and the organic food co-operative.



*Figure 2. District's residents street assembly. Source: Pol Trias; Dani Llugany.*

The results of the research presented in a report and a series of interviews showed an interpretive understanding on the part of the students of the experience that they had had in their three months interacting with the district and the association. Amongst other conclusions, the students revealed that the district's history explained many of its problems today. In the early 20th century, a policy was started to turn the ancient cathedral district into the Gothic quarter in order to turn the area towards tourist activity. To do this, a number of architectural works were undertaken to simulate the inheritance of a mediaeval past (Cócola 2011). Today, the city's governmental policy

has enhanced and extended the district's tourist activity, largely thanks to the development of global tourism, the new information technologies and transport, but also thanks to the city's situation in the global economy. The cultural diversity of the present residents (many of whom are foreign) and the presence of mass tourism have broken the traditional relations in the district associated with a more culturally standard group of residents. The residents' association is suffering some consequences of this. It seems that the members of the association no longer represent its great diversity, although it was possible to distinguish two profiles of members, corresponding to two different generations. The residents' association had lost influence in the district and had fewer and fewer members. It seemed that the district's heterogeneity had made them invisible. However, they made a great effort to offer the residents services, activities and to give advice. They also organised to call for solutions to district's problems: the uncontrolled growth of tourist apartments and the rise in delinquency.

The efforts made in the research process made some of the students drop out. Furthermore, the presentation of the results of the research, long awaited by some of the members of the association, failed to come up to expectations. The members of the association who saw the results said they already knew and that no new conclusions had been drawn. However, the knowledge acquired by the students gave them a new focus to be able to propose a creation project to improve the one before.

At this time, the school formed an interdisciplinary team of professors (communication, anthropology) to produce a workshop for students suggesting continuing with the experience. Therefore, in the second term, the members of the association and the group of students set out on a very intense collaboration and participation process. Meetings were held both at the school and in the association between residents, students and professors. The first meetings were used to discuss the commission, the proposals and the problems of the association. The typical tensions of perspectives, interpretations and experiences sometimes appeared at the meeting and some students and residents dropped out as a result. However, the goodwill of those most involved enabled the confusions and disagreements of a joint creation process to be overcome. Some design techniques applied as games with the residents, such as mindmaps or el brainstorming, helped to promote agreement and understanding. Then the students isolated themselves from the tutors and the AVVBG for weeks to leave a distance between them and develop creative processes that gave rise to new proposals. These were then discussed with the tutors and residents. Finally, the students worked independently again in order to adjust their proposals.



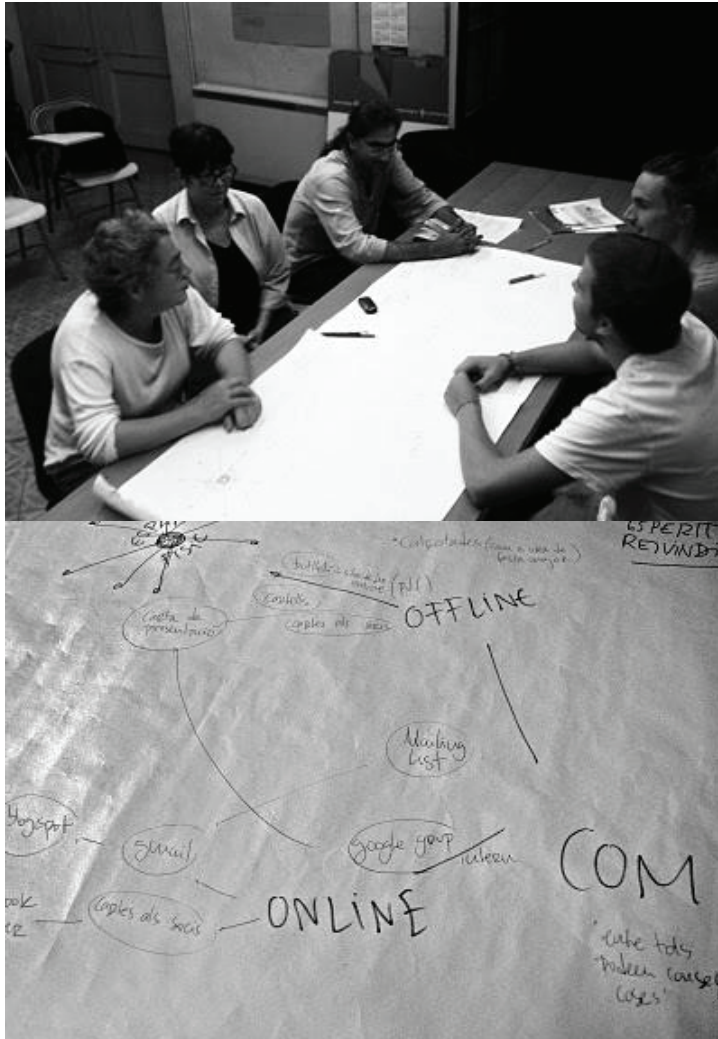


Figure 3. Briefing and mindmap previous to second proposal. Source: Pol Trias; Dani Llugany.

In the final results, the whole of the graphic campaign was developed in a warmer tone closer to the users of the AVVBG. The simplicity and visual clarity, as well as the warmth and relaxation in the formalisation, showed that the association was an inclusive, permeable place prepared to listen to the opinions of all of the district's residents. Furthermore, the proposal adapted to the means and resources of the association and enabled application in all kinds of formats, from the most conventional to the latest technologies. Signs, informative leaflets, corporate stationery, website and even a variant of the corporate image applicable to the district food cooperative were revealed.





Figure 4. Corporate identity and stationery of students' second proposal, including low-tech applications . Source: Pol Trias; Dani Llugany.



Figure 5. “El bròquil” food cooperative corporate identity. Source: Pol Trias; Dani Llugany.

The students also presented a campaign in which all of the claims and problems of the district were brought forth. The proposal was intended to cause awareness-raising

in the district itself and reported the negative consequences of the policies that the local government was carrying out in the area. At the same time, the association was to be more visible and be given a new image of inclusion to bring in more members.

This reporting campaign was never carried out, although its presentation caused an internal debate of self-reflection in the association and regarding its relationship with the City Hall and the area.

In this last phase, the students' (Pol Trias and Dani Llugany) work, their capacity to understand the context and strike a balance between their creativity and their will to produce useful objects for the association was fundamental. It was their will to learn and understand which drove the traditional educational model towards the emancipated and critical focus. Far from being frightened of the complexity of the commission, which had caused moments of tension and disappointment among all of those involved, and far from being intransigent as designers, the students' work was an example of how to balance the capacities of any discipline with its adaptation to the context. The final presentation to the ELISAVA tutors and the members of the AVVBG was a perfect staging of the excellent results of the process. The final results that were presented to the association were widely accepted by the members and are still being used and transformed into new uses and functions.



*Figure 6. Final presentation, with all the participants (residents, students and teachers), in AVVBG's head office. Source: Pol Trias; Dani Llugany.*

## Conclusions

This case suggests that design as a discipline based on praxis incorporates its capacity to transform the surroundings in all processes. The concept of action research

turned into creation research is almost intrinsic to design education. The described project shows how partial results become milestones of the process with a creative and formal power that force constant transformation in the model and the questioning of the initial premises. Both the students and the teachers, and particularly the users, reply actively and almost emotionally to these partial results that allow them to redefine their approach and, at the same time, to extend their field of knowledge. The creativity of the result becomes the true driving force of the emancipating learning process in all of the participants of the project.

A crisis is therefore revealed in the dominant positivist focus in design educational programs. If we understand design as a discipline aimed at solving practical problems, it is paradoxical that we insist on limiting its educational origin to technical (explanatory) knowledge or hermeneutic (interpretative) knowledge. If the solution to the problems posed by design lies in doing something, in the will to transform them, we will necessarily conclude that taking an emancipating approach in the educational processes seems to be far more coherent with their nature. As we have already mentioned in the conclusion of the second section, this does not mean that the emancipating focus rejects or ignores previous forms of knowledge, but rather suggests integrating them in the transformation process, just as this educational experience in the Barri Gòtic of Barcelona has shown.

However, there are two factors that cause problems in the process. On the one hand, we have already seen how this methodology causes a constant crisis in the process itself. Therefore, the agents involved (in our case the teaching staff, students, residents, the educational institution and the residents' association) were reformulated several times, causing changes in people, infrastructures and resources. The combination of these derivatives comes up against the rigidity of organisation and the University academic management. Furthermore, there is doubt as to whether the clarity with which the goodwill of this methodology in relation to the social aspects of design is seen in this case would be repeated in other areas, such as the scientific-technical or entrepreneurial.

Finally, we must stress the importance of these kinds of experiences for the relationship that the design school has and wishes to maintain with the area and its context. The practical theoretical focus deployed here promotes the institution's desire not to exist outside of what is happening in the district. The educational experience with the residents of the Gothic quarter shows the possibilities of ELISAVA's involvement, participation and influence in the transformation processes experienced by the social reality of the area where it is situated.

This all represents a challenge to further in the transformation and improvement of the educational models in the design field.

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## Multidisciplinary Design Education

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**Abstract:** *Since 1994, the Interdisciplinary Laboratory of Design/Education (LIDE) has been cataloguing works that report experiences, graduation projects and postgraduate researches focusing on the teaching of Design and Design in Education. This paper gathers a collection of the main projects developed in LIDE since its creation and that integrate the research directory of the National Council for Scientific and Technological Development –CNPq, with the aim to make available to academia and society a vision about researches dealing with Education in Design and Design on Education. Those are broad research fields; still few explored and, incidentally, that have been objects of research from various perspectives. It can be said that with each new experiment performed, the field of Design is widened and, consequently, the work possibilities for the designer are broadened. This move of permanent expansion of barriers, limits, is positioning Design as a multidisciplinary area. In this paper are presented abstracts of research projects that will make part of the content of this book, entitled “Things Written about Design Pedagogy: 20 years of research in the Interdisciplinary Laboratory of Design/Education”. The collection brings together articles that have as their base themes addressed on PhD theses developed in the Postgraduate Program in Design.*

**Keywords:** *Design, Education, Multidisciplinary.*

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## Introduction

Since 1994, the Interdisciplinary Laboratory of Design/Education (LIDE) has been cataloguing works that report experiences, graduation projects and postgraduate researches focusing on the teaching of Design and Design in Education. This paper gathers a collection of the main projects developed in LIDE since its creation and that integrate the research directory of the National Council for Scientific and Technological Development - CNPq<sup>1</sup>, with the aim to make available to both, academia and society, a vision of researches dealing with Education in Design and Design on Education. Those are broad research fields; still few explored and, incidentally, that have been objects of research from various perspectives. It can be said that with each new experiment performed, the field of Design is widened and, consequently, the work possibilities for the designer are broadened. This move of permanent expansion of barriers, limits, is positioning Design as a multidisciplinary area.

Present in this paper are a book and abstracts of research projects that will make part of the content of this book, entitled "Things Written about Design Pedagogy: 20 years of research in the Interdisciplinary Laboratory of Design/Education". The collection brings together articles that have as their base themes addressed on PhD theses developed in the Postgraduate Program in Design from PUC-Rio, oriented by Prof. PhD. Rita Maria de Souza Couto in the Interdisciplinary Laboratory of Design/Education (LIDE/DAD/PUC-Rio). In addition to the book content, there are abstracts of the main projects developed in LIDE since its creation<sup>2</sup> and that integrate the research directory of CNPq<sup>3</sup>, seven resumes of PhD theses and twenty-seven resumes of Master Dissertations published in the web page of the PUC-Rio Main Library, besides eighteen titles of Undergraduate Research.

The publication title was inspired by the book of Pierre Bourdieu<sup>4</sup> entitled "In Other Words", where are gathered transcriptions of several of his talks with ethnologists, economists and sociologists, in which he addressed particularities of his works and the philosophical assumptions of his researches.

The book, object of this article, represents a natural unfolding of the investigation called "Things Written about Pedagogy in Design on Brazil", finished in 2012, that used printed texts as a source.

Aiming to break with the immediacy and resistance in learning with past experiences, this investigation rescued, at least in part, the memory of Design teaching in Brazil<sup>5</sup>.

Couto (2012) was led to undergo this investigation, having as a guiding thread the Pedagogy of Design, by the realization that this is a field still to be explored, little investigated and with sparse information coming from periodicals, conference proceedings and a few books about the theme published by Brazilian authors.

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<sup>1</sup>Research Group in Design Pedagogy - <http://dgp.cnpq.br/buscaoperacional/detalhegrupo.jsp?grupo=0111612CJDIPP5>

<sup>2</sup>Initially the laboratory, created in 1997, had the name of LPD, Laboratory of Design Pedagogy. However due to the increase of the research themes, this name was replaced by LIDE, Interdisciplinary Laboratory of Design/Education

<sup>3</sup>Research Group in Design Pedagogy - <http://dgp.cnpq.br/buscaoperacional/detalhegrupo.jsp?grupo=0111612CJDIPP5>

<sup>4</sup>Bourdieu, Pierre. *Coisas Ditas*. São Paulo: Brasiliense, 1990.

<sup>5</sup>The author of this research published in 2008 a book called 'Escritos sobre Ensino de Design no Brasil' (1. ed. Rio de Janeiro: Rio Book's, 2008. v. 1. 96 p).



The research conducted had as its main data source papers published in the journal “Estudos em Design” (Design Studies), in the period from 1993 to 2007. This journal was created in 1993 and is a biannual publication with the goal to spread the academic and scientific production of teachers and researchers involved with the Design area and the like.

In the Interdisciplinary Laboratory of Design/Education (LIDE/DAD/PUC-Rio) it can be said that with each new experience performed, the field of Design is widened and, consequently, the possibilities for action of the designer are broadened. This permanent movement of expanding barriers, limits, is positioning Design as an interdisciplinary area.

The interdisciplinarity is nothing else than the intention to investigate reality, in all its relations and interconnections by an integral method of investigation and joint study, where knowledge is born interactively, generated on a qualitatively different level from the one existing in each individual discipline. The concept of interdisciplinary in the book “Things Written” about Design Pedagogy is related to one study that puts together Design and Education in a broader way, including the intention to research reality under several nuances (COUTO, 1997).

This finding is an important point with relation to the context defined in the project of the book, which proposes an alliance between two areas, in works developed in the scope of the research line entitled Design in Situations of Teaching-Learning, since:

The interdisciplinary is not only a fashion. It is a way to overcome the division between the domain of theoretical thinking and informed action. It should be noted that problems concerning the confrontation, approach and possible integration of multiple domains of human activity, are not only in the knowledge or theorization levels, but also, and maybe, especially, in the domain of action or effective intervention in the field of social and human reality. (COUTO, 1997).

In contemporary trends of design teaching, the finalities of education go beyond the development of creativity, of aesthetic perception, of reading, of formal reading. In the contemporary pedagogical trends in arts, that include Design, the finalities of teaching became wider and more complex, in line with the goals of the whole school education. The idea of curriculum as a hypertextual network guides the contemporary education.

The need to adopt an interdisciplinary posture for contemporary education finds echo in the writings of the book “Things Written about Design Pedagogy: 20 years of research in the Interdisciplinary Laboratory of Design/Education”, that illustrates the comprehensiveness of design as a social phenomena and presents effective ways to insert Design in Education, because we can no longer ignore the importance of experiences that wide this field of research and project development.

Given the above, this publication constitutes an academic space directed to deepening reflections, discussions and practices of the conceptual and projectual activities of Design, aiming the resignification of its school uses and its social function.

## **Research Projects**

The research projects that were developed or are being developed in LIDE since its creation are shown below, with the aim to offer for the reader an outlook of themes and cuttings that compose the mosaic of investigations undertaken in this academic space.

The research project with entitled “Curriculum, Teaching Materials and Teacher Training” (“Currículo, Materiais Didáticos e Formação de Professores” in Portuguese) is



aimed to the Early Childhood Education and has as its foundation the Law of Guidelines for Education – Law 2/2003 and Curricular Benchmarks for Preschool Education in the Republic of Saint Thome and Prince. It comprehends the development of contents for Preschool Education of children; the detailing of the teaching methodology adequate to this segment; the elaboration of teaching materials and the development of teacher training specific for this segment. The project is being developed in partnership with DAD|LIDE|PUC-Rio – Ministry of Education of the Republic of Saint Tome and Prince – UNICEF – World Bank.

The research entitled “Design, Education and Technology: theoretical and aesthetic reflections about Hypermedia Design” (*Design, Educação e Tecnologia: reflexões teóricas e estéticas sobre Design de Hipermissão* in Portuguese) has as a starting point the investigation of Doctor Cristina Portugal, who is a fellow researcher of CNPq in Design, in the Interdisciplinary Laboratory of Design/Education (LIDE/DAD/PUC-Rio), supervised by Prof. PhD. Rita Maria de Souza Couto. The research project has the goal to develop studies about the several relationships of Design in Situations of Teaching-Learning, having as its focus the development of hypermedia systems that reinforce the interaction of its praxis with Education and the Society where it is inserted. Such studies hope to foster the exercise of reflection, debate and critic, providing the professional with a wide view of the Design area and its possible applications in hypermedia environments. (Support CNPq).

“Tri-dimensional puzzles: entertaining games in Geometry teaching” (*Puzzles tridimensionais: jogos de entretenimento no ensino de Geometria* in Portuguese) is a research that has as the main objective to identify, substantiate and discuss the bases for the configuration of tridimensional objects that make possible the work with geometric concepts by using puzzles. It will be developed as an applied research, under the qualitative approach, unfolding in a exploratory research. It will involve bibliographical and documentary research, analysis of similar objects and use cases that may amplify the comprehension of the problem. It will also have validation sessions of prototypes projected with young groups from high schools that are part of the public and private networks in the city of Rio de Janeiro, as well as academics from the Course of Design in PUC-Rio, Graduation in Design in EBA/UFRJ and from the Lato Sensu Specialization Course in Techniques of Graphic Representation in EBA/UFRJ. Besides the theoretical base to be conducted based on books, periodicals, dissertations and theses, as a research aiming to elaborate models and prototypes within the Laboratory of Modeling and 3D Simulation, it will be developed in parallel as a process of planning, project and development, anchored in methodology from the Design area.

The research “Things Written” about Design Pedagogy in Brazil had as its main data source, papers published in the journal *Studies in Design* (“*Estudos em Design*” in Portuguese), in the period between 1994 and 2007. It aimed to identify, substantiate and discuss the bases of Design Pedagogies as they have been practiced in Brazil, since this is a seldom investigated field that has disperse and non systematized information. It was developed as an exploratory research, using the technique of content analysis as the methodological option for exploration, characterization and interpretation of the collected data.

Having as its theme the literacy process of deaf children, on the context of kindergarten and elementary school, this research called “Multi-trails: a game to help the acquisition of a second language by deaf children” (*Multi-Trilhas: jogo para auxiliar a aquisição de segunda língua por crianças surdas* in Portuguese) had an interdisciplinary approach. Besides the theoretical horizon that substantiated questions

related with the current investigation, that included authors from the areas of Education, Bilingualism, Deaf literacy, Design of Information, Didactic Design and Interface Design, objects were developed that have new strategies to ease the acquisition of a second language (written Portuguese) by deaf children. This investigation was performed in the Laboratory of Design Pedagogy (LPD, previous name of LIDE), in PUC-Rio, in partnership with INES (National Institute of Deaf Education), in Rio de Janeiro. The investigation, already concluded, with the support of FAPERJ under the program “Cientistas de Nosso Estado (2005-2007)” had as a result a concrete game for table and floor and a multimedia game. The second phase of the project, with support from CNPq under the program “Produtividade em Pesquisa” was concluded in May, 2009, with the preparation of all pieces of the concrete game to free download from the project page: [www.multi-trilhas.com](http://www.multi-trilhas.com).

“Design as an Instrument of Expansion of Pedagogic Resources in pre-school and elementary school” was a research that had the goal to identify and catalog works developed by students from the disciplines of Planning, Project and Development in the Course of Design in PUC-Rio, that were developed in schools of Childhood Education, Elementary, High School and Higher Education. This research was developed based on the collection of the Center of Information from the Department of Arts and Design from PUC-Rio, where are stored the summary sheets of works developed by graduation students in all project disciplines offered by the course.

The research called “Potential Contribution of Theses and Dissertations for the development of Rio de Janeiro” (“Potencial Contribuição de Teses e Dissertações para o Desenvolvimento do Estado do Rio de Janeiro” in Portuguese) had the goal to map, organize and disclose for consultation, data about dissertations and theses developed by designers who diagnosed and proposed solutions for problems in the social, economical and cultural spheres in the state of Rio de Janeiro.

“Pedagogical Practices in Design Graduation Courses” (“Práticas Pedagógicas em Cursos de Graduação em Design” in Portuguese) allowed the record of pedagogical practices that take place in the disciplines “Basic Project I” and “Basic Project II” in the Design Course of PUC-Rio, defined as didactic resources that are used by teachers in the classroom with the goal to motivate their children, giving them a better relationship with the content of the disciplines they teach.

The investigation “Program of Initiation in Design and Design on Elementary School” (“Programa de Iniciação Universitária em Design e Design no Ensino Fundamental” in Portuguese) had the aim to identify, analyze, substantiate, experience and document means and procedures that would enable the introduction of Design concepts in the scope of Elementary and High School. By way of this project the Program of University Entry in Design of PUC-Rio-PIU | Design was implemented, having being created to divulge the Design Course of PUC-Rio in Elementary and High Schools, and that promoted several workshops between the years 1998 and 2003 (Support FAPERJ and CNPq).

“Graduation Works of Students from the Department of Arts of PUC-Rio” (“Trabalhos de Graduação de Alunos do Departamento de Artes da PUC-Rio” in Portuguese) aimed to identify, catalog and enable the consultation of graduation projects of Industrial Design students from the Department of Arts and Design of PUC-Rio, in the scope of the Center of Information and Reference about Design in the Department of Arts from PUC-Rio.

Finally, the research “Production of Brazilian Designers in Stricto-Sensu Postgraduate Courses” (“Produção de Designers Brasileiros em Cursos de Pós-

graduação Stricto-sensu” in Portuguese) aimed to identify, catalog and allow the consultation in the Central Library of PUC-Rio of dissertations and theses defended by Brazilian Designers. The work was bound to the Center of Reference about Design in the Department of Arts from PUC-Rio (Support FAPERJ and CNPq). It began in 1994 and was concluded in 1995.

## Abstracts Papers

The articles that are shown in full on the book gather reflections made by students of the Doctoral Program of Design in PUC-Rio, about their theses, all developed in the scope of the research area called “Design: Technology, Education and Society”<sup>6</sup>.

### *Design in Teaching and Learning Situations. an interdisciplinary dialogue*

The thesis authored by Cristina Portugal refers to the study, research and theoretical line of research Design in Situations of Teaching and Learning through an interdisciplinary dialogue between Design and Education. Through methods and techniques of design it was sought to identify how this area of knowledge can participate in the processes of teaching and learning at the setting of learning materials and enhance the process of acquiring knowledge. The study was guided by the Multi-Tracks, subject of this thesis, which is a game to help the acquisition of a second language by deaf children. This game was developed in the light of methods and techniques of Design, under the Interdisciplinary Laboratory for Design / Education - LIDE, Catholic University of Rio de Janeiro - PUC-Rio, in partnership with the National Institute of Education for the Deaf in Rio de Janeiro - INES / RJ. Through the articulation of ideas of authors who support this research we worked issues related to new technologies, visual culture, culture in general, image, language and meaning making, relevant aspects for the design field in general and to subsidize conceptualization of the line of research Design in Situations of Teaching and Learning, and studies were performed on research at the level of Mastership and Doctorate dealing with Design in Education, focusing among other things, issues of teaching and learning, games, language and visual pedagogic techniques. This research provides a proposal for a conceptual model of pedagogical action and a methodology for the implementation of projects under the line of research Design in Situations of Teaching and Learning. The research also aims to contribute to the planning of educational materials that consider the specific educational traits and their dialogue with the surrounding reality, aiming at developing methods of teaching and learning that are more productive and interactive<sup>7</sup>.]

### *Model of Teaching Method for Product Design*

The paper by Ana Veronica Pazmino brings some reflections made in her doctoral thesis that presents a teaching model for product design methods. It was developed in order to assist the teacher in subjects such as Project Methodology and product Design. The research aims to attend the necessity, during the product design process, in dealing

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<sup>6</sup>All theses were supervised by Doctor Rita Maria de Souza Couto.

<sup>7</sup>PORTUGAL, Cristina. Design em Situações de Ensino-aprendizagem. Um diálogo interdisciplinar, Rio de Janeiro, 2009. 206p. Tese (Doutorado em Design) – Departamento de Artes & Design, Pontifícia Universidade Católica do Rio de Janeiro.

with all kind of information to be considered not only during the abstract project phase, but also in the moment of the project achievement. During the study the author affirms that the teacher should be a facilitator in the learning process of the future designer, while showing thorough knowledge of the subject to be taught, in a way to emphasize its fundamental aspects and enlighten its practical applications. The theoretical contribution of this study shows that the scientific activity of design, which investigates methods and determines the logical and sequential processes, has demonstrated to be suitable to transform design into a reflective practice. Beyond abilities and competence, a designer should process creative capacities in order to propose innovative solutions, by mastering the process designing techniques, as well as mastering the different development steps of a project, namely: object definition, data collection, and data analysis techniques, generation and evaluation of alternatives, solution configuration and communication of the results. Those two abilities and competences are fundamental, and are required of a graduate student. Therefore, education in design methods should be learned by the future designer so he or she will be able to face its profession with confidence. This method neither guarantees the solution nor the project effectiveness and its achievement since it is related to the approximation of knowledge, being only a guarantee of the attainment of the project's aim. Thus, this study aims to propose a Teaching Model for Product Design Methods (TMM), based on the theory of meaningful learning. The method proposes that the teacher should use differentiated strategies to achieve meaningful learning, based on a guide, which redress on pedagogic knowledge by means of the methodologies of lighter education. This study proposes learning strategies, evaluation strategies and 40 product design methods as tools able to provide a more effective learning process. At last, this work presents the application of the method to the subject Project Methodology during a semester at the Univille University and from the analysis of the results, the effectiveness of the model is found, thus recommending its use by other teachers of the subjects Project Methodology and Project Design of Industrial Design courses<sup>8</sup>.

### *The teaching of geometry-based exploitation of games and challenges: an experiment with Design students.*

Daniel Wyllie Lacerda Rodrigues in his thesis proposes a unique strategy for the teaching of the fundamentals of geometry and mathematics for design students. It was possible to plan a series of activities in which puzzles, problem-solving strategies and geometrical concepts were to be related in a structurally integrated fashion. This structure, which was planned to allow the reconstruction of knowledge on geometry by design students, went through two stages of exploration and analysis. Initially, the challenges were interpreted according to the instructor's view point, hereby represented by the author. In this first stage, the author tried to answer the following questions: What thinking strategies are at play? In what way can the contents be explored? What are the solutions to the challenges and how can they be obtained? Secondly, the challenges were presented to the students, who interacted with the instructor in an individual manner. From then on, the students were able to discover new relationships. Their expectations, reactions and thinking strategies were observed

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<sup>8</sup> PAZMINO, Ana Veronica e COUTO, Rita Maria de Souza. Modelo de Ensino de Métodos de Design de Produtos. Rio de Janeiro, 2010. 450p. Tese de Doutorado – Departamento de Design, Pontifícia Universidade Católica do Rio de Janeiro.

by the author along five two-hour meetings and then analyzed. Three PUC-Rio design students took part in the research, which involved taping of their dialogues with the instructor while attempting to solve the problems presented to them. In terms of theoretical framework, one can say that the investigation was, at first, strongly influenced by van Hiele's model for the development of geometrical thinking. In this case, the first three of the five thinking levels proposed by van Hiele (visualization, analysis and informal education) were noticeable. As to the grouping and reorganization attempts, not only of the parts in the proposed exercise structures but also of the exercises themselves (considering these as parts of a bigger structure), they were mostly based on the gestalt structuralist viewpoint, having Max Wertheimer as the main theoretician. Another essential reference was George Polya, for having shown the importance of figure sketching, of the use of auxiliary problems as well as of the heuristic thinking involved in the process of problem resolution<sup>9</sup>.

### *Teaching Project Design in Undergraduate Design Courses in Brazil*

Isabel Maria de Oliveira had in his thesis as the central discussions on design courses focuses on teaching project design and the field of knowledge encompassing the project design processes required to configure visual information systems of items. Historically, the development of project design has been viewed as a point of convergences and networking for various levels of knowledge acquired during the course, under printing the conjugation of experiences, reflections, analysis with regard to the syllabus but more specifically in the educational and cognitive senses. However, the full functioning of project design teaching focused on the backbone of the course and the driver behind the foundation of specific design knowledge was hampered significantly during the time of the Minimum Syllabus, (introduced by the Federal Education Council in 1987), due to its somewhat rigid structure. With the establishment of the New National Syllabus Guidelines in 1996 through Law Nº 9.394, teaching institutions were endowed with greater autonomy and flexibility for defining educational proposals and syllabuses for their undergraduate courses. Within this context, it is imperative to reflection on the countless issues that still remain or arise within the project design teaching sphere. This thesis intends to outline an overview of the construction of the real situation of project design education in design courses as experienced in a variety of contexts in Brazil, based on the identification and analysis of important aspects of the discourse built up through the teaching practices of a group of project design lectures. It uses the discourse analysis method in order to disclose indicators reflecting questions, ideas, beliefs, conflicts and queries, among select group. The methodological detailing complies with some basic principles of the Underlying Discourse Unveiling Method developed by Nicolaci da Costa. The issues addressed are discussed from the standpoint of educational experience, perceiving it as a political territory, a social construct that is the outcome of a historical process. The key points

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<sup>9</sup> RODRIGUES, Daniel Wyllie de Lacerda e COUTO, Rita Maria de Souza. O ensino de geometria com base na exploração de jogos e desafios: um experimento com alunos de Design. 2008. p. Tese de Doutorado – Departamento de Design, Pontifícia Universidade Católica do Rio de Janeiro.

relate to the concepts of knowledge and education, in addition to vision and stance on teaching paradigms and models<sup>10</sup>.

### *Design of experiments and interactive environments.*

Luiza Novaes is in search of the possibilities for designers' performances in the field of telemedicine are the focus of this thesis. A pedagogic proposal for a Design Specialist Program in Telemedicine Projects is presented. The academic structure suggested for the program is based on a learning process model conceived for integrating education, research and development; stimulating, through a trainee program based on practical experiences, a reflexive attitude towards the field to which the model is applied. The first part of the research contains a review of literature relating to telemedicine. Concepts, definitions, educational issues, ethic concerns, technological resources, political health strategies and the advantages of using telemedicine in peripheral countries are addressed. An overview of Brazilian telemedicine state of the art is presented, based on initiatives conducted by Fiocruz - Oswaldo Cruz Foundation and by the University of Sao Paulo Medical School - FMUSP. Interactivity issues are discussed next, from the perspective of design, covering the convergence of media and the Media Ecology approach – the study of media environments as structure, content and its impact on people. The proposal of a Design Specialist Program in Telemedicine Projects emerges from a partnership between design and telemedicine. The pedagogic model proposed integrates two fields, intending to favor the birth of a distinct space, which aims excellence in the production, as well as construction and innovation in telemedicine. To conclude the study, considerations concerning collaborative design, participatory design and human-centered design are presented. Design opportunities in the field of telemedicine are suggested and possible directions for further research are raised<sup>11</sup>.

### *Proposed Method for Creating and Validating Tutorials – Learning graphics software*

Walter Dutra da Silveira Neto conducted a survey that aimed to assist people working with graphics software for teaching in educational institutions motivated the research, where we show the efficiency of the use of tutorials and testing of such methods for Distance Education Computer-Mediated. The overall objective of this thesis was to develop models of creation and validation of tutorials for teaching graphics software, We analyzed tools that enables the enrichment of this method, showing how it can be effective and may even say attractive to those involved in process of knowledge construction. By its nature, the survey characterized as applied, and qualitative. From the perspective of your goals, set up as an exploratory research and the technical procedures, developed as research literature and documents. From the general models for the creation and validation of tutorials, we developed a specific tutorial that offers, among others features content and graphics, text, sound, still image

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<sup>10</sup> OLIVEIRA Izabel Maria de e COUTO, Rita Maria de Souza. O ensino de projeto na graduação em design no Brasil: o discurso da prática pedagógica. 2009. 140p. Tese de Doutorado – Departamento de Design, Pontifícia Universidade Católica do Rio de Janeiro.

<sup>11</sup> NOVAES, Luiza e COUTO, Rita Maria de Souza. Design de experiências e ambientes interativos. Rio de Janeiro, 2007. 86 p. Tese de Doutorado Departamento de Artes & Design, Pontifícia Universidade Católica do Rio de Janeiro.

and video files into language virtual reality. The main steps followed to developed this thesis were beyond the study off literature related to the theme, the development of parameters to determine the effectiveness of a tutorial, the identification and analysis of systems that are designed to EDMC, aiming to use them as an environment for experimentation of this work, the identification and analysis software that involves the process of developing tutorials, in this case, a three-dimensional CAD software, an object of study for usability evaluation of tutorials in order to know the various terms and select an appropriate from of ergonomic analysis and HCI ( Human Computer Interaction), based on survey of thesis, verification and study of definitions and applications of hypermedia in Virtual Learning Environments (VLE). The development and validation of the tutorial with students and professionals have identified a number of requirements that are need for good design tutorials. The completion of the work presents a synthesis of data collected in the validation process of this tutorial, as well as recommendations for future studies<sup>12</sup>.

## Conclusions

Teaching demands research.

There is no teaching without research and research without teaching.

Teaching demands critical reflection about practice.

That is why, in the permanent formation of the teacher, the key moment is the critical reflection about the practice. It is by thinking critically the practice of today or yesterday that the next practice can be improved.

(Paulo Freire, 1997)

The university constitutes an adequate space for realization of interdisciplinary experiences, once on it professionals able to relativize their specialties coexist, and because it is an environment that promotes reflection and production about objects that would hardly be monopolized by a specific area of knowledge.

The interdisciplinary experiences propitiate the team work, removing the teacher and student from the habit of personal isolation. Demo (1994), when proposing a new paradigm for the Brazilian University, tells that it is the proper place of technical competence composition (scientific and technological domains) an of humanist commitment and, thus, should increasingly value the team work, because the larger problems cannot be embraced individually, but by the systematic and carefully crafted concourse of many competences. Considering that the challenges constitute a matrix of interlinked problems, the research must know how to treat them globally, articulating efforts and resources.

The discussion about interdisciplinarity in the university context also leads to the intra-institutional relationship among the graduation teaching with the post-graduation programs, as well as for the relationship, on interinstitutional level, promoted by exchange among the several courses and post-graduation programs existing in the Country.

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<sup>12</sup> SILVEIRA Neto, Walter Dutra; COUTO, Rita Maria de Souza; Rosa, Silvana Bernardes. Modelos de Criação e Validação de Tutoriais – Aprendizagem de software gráfico. Rio de Janeiro, 2010. 190p. Tese de Doutorado – Departamento de Design, Pontifícia Universidade Católica do Rio de Janeiro.

The interdisciplinarity would thus be a vehicle for the introduction of a dynamic epistemological principle in the knowledge organization. It would constitute itself in a mean of auto renewal and in a form of growing cooperation and coordination among disciplines, thus inaugurating a pedagogical discourse consistent with the advancement experimented in contemporaneity. However, the problem related with the interdisciplinary formation of the student and the transformation of teacher in agent of the interdisciplinary process is not an easy task to equate and that has immediate results.

The interdisciplinary work that has been developed in LIDE and to which the book "Things Written about Design Pedagogy: 20 years of research in the Interdisciplinary Laboratory of Design/Education" is about, presupposes the formation of competent professionals, capacitated in the disciplinary cannons, critical about their profession, so that they have the freedom to flex the boundaries in their area, when challenging requirements of knowledge demand it, as was the case in the brief sample presented in this article.

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## Spatial and Service Design meet up at *Coltivando* Convivial Garden at the Politecnico di Milano.

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**Abstract** *‘Coltivando’ is the community garden set up by the Politecnico di Milano, a collaborative project that calls for both Spatial and Product Service Design competences, developed by a team of three postgraduate students supervised by researchers and teachers from the same fields. This paper describes the process and the tools used to design this garden: from the first “design studio based” concept (November 2011), to the final solution deployment (October 2012). Both soft and hard components of the project were included in the process, starting with design for social innovation and including Participatory Action Research as a way to test and prototype the ongoing outputs. Different competences merged to address questions such as: how to shape the spatial layout; how the temporary urban solutions could create a scenario to be developed as a long-term project; how to design the service model; how to approach Community Centered Design to engage the neighbourhood and academic staff in co-design activities, in order to open the campus space to the city. It is an example of a multi-disciplinary team collaborating with civil society representatives to engage various stakeholders and to shape a democratic design process.*

**Keywords:** *Collaborative service, co-design, Spatial Design, Urban Agriculture, garden.*

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## **A university community garden as a design experiment in a hidden public space**

As Francesca Zajczyk states, the neighbourhood is a portion of urban area, both territorial and social, where we may find plenty of resources, factors and critical situations. It underlines the identification with the local side of the city, able to read the micro-social dynamics and to express the relationship among citizens/social groups and urban areas (Zajczyk, 2008).

Sometimes public space is not so obvious. When borders between private and public are blurred, new kinds of space are born which, although available to everyone, are not visually public. These are hidden public spaces (Fassi, Rogel, 2012), meaning that they are open to the public even though they are private property. This feature makes them hidden places, since city residents, tourists or just habitual walkers are unlikely to visit them unless deliberately directed there. In Milan some such places even constitute “a city within a city” yet still remain unknown, despite their location on the main urban paths. Others are really not visible because located in an urban “backstage”. They can be classified as cultural heritage (whether material or immaterial), or as having community potential to be explored and valued. Public university campuses are included in the latter category. Even though they are used by a specific kind of user (people who study or work there) and are perceived by other people as private (belonging to university) areas, in most cases campus space is to all intents and purposes public. This is the case of the Politecnico di Milano campuses in the Bovisa district, an ex-industrial area where *Coltivando* is growing.

In the second half of the twentieth century the Bovisa District underwent drastic change due to the removal of almost all the industries. The new life of the neighbourhood has led to an improvement in public transportation and the building of new residential complexes, but public spaces such as green areas or squares equipped for recreational use are still missing. The Milano Bovisa Durando campus, hosting the School of Design, was built at the end of the 90s on the grounds of “Ceretti & Tanfani”, a historical company producing cable railways and which made Bovisa a working class district. The place is part of the historical memory of the inhabitants. It is today a green space hosting places for sitting as well as a cafe. In spring and summer time many students sit outside or enjoy the sun doing outdoor activities. It is a hidden public space since no one besides the university community uses it as such. The campus remains an “island for students” and most of the people who once knew the place as an industrial area have not even had the chance to see how it has transformed. The two types of ‘users’ (university community and permanent city residents) have very few points of contact. The improvement potential that the campus could have offered is huge, but unfortunately has not been fulfilled. *Coltivando* is attempting to change this tendency by developing the first convivial urban garden in an Italian university campus. The world of community gardens in Italy has recently been re-discovered and explored. In cities like Milan, a kind of gardening in public spaces was popular until the 70s, where people used to share green interstices to grow their own food in single lots. This was still not exactly what we would call a community garden today, but it was a way to take care of hidden spaces and keep social affairs alive. *Coltivando* aims to renew the concept of community garden as it was known in Italy by introducing collaboration where people of different backgrounds share spaces, experience and knowledge.

## **Research framework and analysis**

Coltivando is a design experiment born in the framework of two research programs run by DIS (Design and Innovation for Sustainability) – a Service Design research group at the Politecnico di Milano, INDACO/Design department. The first is ‘Human Cities, reclaiming public spaces’ (2010-2012), which worked on the regeneration of public spaces for urban communities. The second is ‘Feeding Milan, energies for change’ (2010-ongoing), which aims to shorten up the food chain in the Milanese region. Coltivando is the perfect sum of the two projects: it is growing in the public university space of the Politecnico di Milano - Bovisa Campus enabling the community to discover a hidden public place, adding social and environmental value to the campus and local community. Then, obviously, its main objective is to provide zero-mile food to the urban community of the neighborhood, helping people to become more aware of the importance of a local fresh food diet. In such a framework, the research focus was oriented to make two different design areas working together on the same project. In fact, it was a didactical and a research experiment to combine Service Design and Spatial Design competences to understand how they can enhance, as well as constrain, each other both in terms of designer’s competences and design results.

Before starting the design phase, researchers needed to explore and understand the state of the art of university community gardens and Milanese context as well. Here below, we report some examples of successful gardens that researchers analysed as cases study.

a. University: Harvard Medical School Community Garden, USA  
<http://www.garden.harvard.edu/>

- There is a strong focus on the surrounding community being involved in the garden
- Education about sustainable food systems including curriculum in with the garden
- An interactive blog students have a blog
- Strong graphic communications
- A specific department champions the project and ties this in with their curriculum of health and sustainability
- Run events and have services

Membership:

- Residents of surrounding community, staff and students are welcome
- There is a director and coordinator who is paid and a board of directors

b. University: Business – Yale Food Project, USA  
<http://www.yale.edu/sustainablefood/>

- Food from the garden feeds the halls of residence
- Has a formal board of directors, so is set up like a business. They have reporting like a company. It is a social enterprise.
- Ties into research outcomes for the university
- The Market

Membership:

- Board of Directors

c. Urban Reforestation, Docklands Community Garden  
[www.urbanreforestation.com](http://www.urbanreforestation.com)

- Garden is a convivial model where volunteers take care of the garden without allotments
- A coordinator facilitates the garden activities
- Social events take place at the garden such as eco-markets, local food dinners, food box distribution
- Develops the community of the Docklands
- Enhances the social, economic and environmental value of the suburb

Membership:

- Board of directors
- Paid Coordinator
- Residents from surrounding community

d. Il Giardino degli Aromi - Milan

<http://www.olinda.org/giardinodegliaromi/giardino>

- Garden is driven by a community of volunteers who live in the neighbourhood and guided by a coordinator, who is in charge of setting the activities, moderate the community and raising fund to keep the garden running;
- It sets in the garden of a former psychiatric asylum as a therapeutic activity

Membership:

- Residents of surrounding community
- Some guests from the hospital
- The coordinator is paid by funds they raise by themselves.

## Building “Coltivando – The convivial garden at the Politecnico di Milano”

In future, community gardens will fulfil an important function as ‘nodes’ and ‘places’ for learning, training, socialising and disseminating knowledge in the community. Therefore the major function of the Politecnico di Milano garden will be as a “Convivial Garden” as it does not have allotments. It will focus strongly on co-op style governance, curriculum development, training and services such as an eco-market and food distribution box. The garden can also be a place to tie-in curricula from different faculties.

### *Purpose*

In the early decades of the XIX century, there was the first attempt to transfer assets from the countryside into the city of Milan. In 1915, in the outskirts of Milan, the “Institute of Social Housing” started a horticultural experiment cultivating small plots of land rented to tenants of their homes in the same neighbourhood or close to them. In this period committees of pro-garden workers also appeared and horticulture was strongly advocated both within the family economy and for the associated physical and social activities. It is in this spirit that *Coltivando* is today trying to mend the relationship between citizens and public spaces of the city through shared actions. Reclaiming public space, connecting communities, experimenting innovative

collaborative services and growing food are just some of the things that are behind the project. *Coltivando* is based on mutual understanding not only as a shared resource, but also as an essential component of being and working together for a common good. If nineteenth century industrial capitalism led to the separation of town and country, with the consequent division between manual and intellectual labour, current urban agriculture with its handbook, can help to overcome historical opposition. The phenomenon of urban agriculture, from a design and aesthetic point of view, could generate new approaches to reading urban and peri-urban landscape. It may also lead to different urban behaviors and lifestyles if it develops on a larger scale (Nicolin, 2012).

With that focus of conviviality in mind, one of the main aims is to create a 'place' which people who work and study at the university can enjoy and at the same time people who live nearby could come and enjoy it too. Thus *Coltivando* has three separate, but merging, aims:

- social: to enable two kinds of community to make contact (university and neighbourhood) so as to give an added value not only to the campus but to the district too. On one hand the university community will live its work space not only as a commuter does, only in working hours, but as part of a larger group intermingling with urban residents. On the other, people living in the Bovisa area could get to know the university life, people and places better, and be involved in activities that could improve their quality of life.
- spatial: dedicating some of the green areas on the Bovisa Campus to a gardening activity means giving a new function to a place and designing spatial solutions that come from the disciplines taught in the Politecnico di Milano (Design, Architecture and Engineering)
- productive: gardening means first and foremost producing food and, in this case, means trying to let the community of 25 people who will take care of *Coltivando* be self sufficient in terms of vegetables and fruit.

### *Where and for whom*

Bovisa Campus at the Politecnico di Milano is a group of buildings hosting services, offices and rooms for courses run by the School of Design and the School of Architecture. Some of the buildings are renewed form the original ones built in the late XIX century, others are completely new. It is the only university campus in Milan that has large green areas where students and university staff enjoy their spare time.

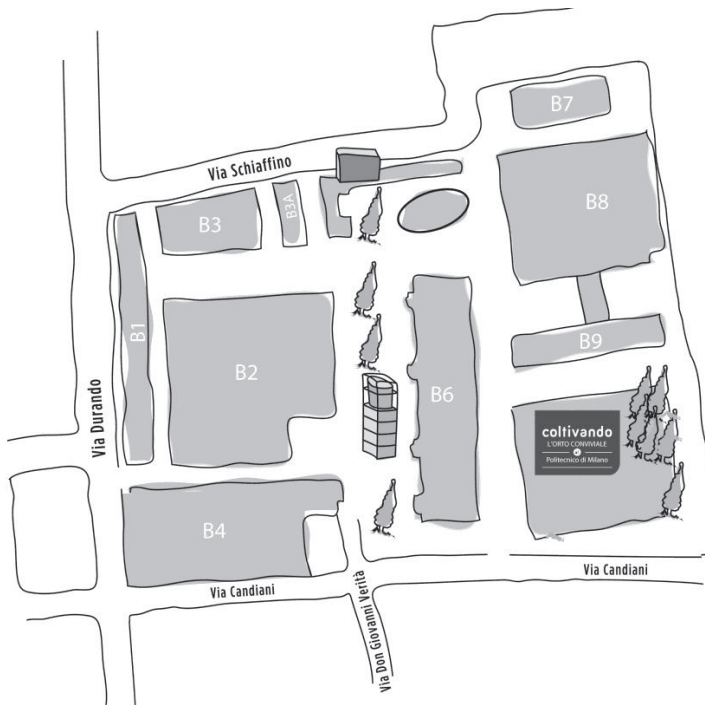


Figure 1 - Politecnico di Milano, Bovisa Campus: plan with COLTIVANDO location

A new, abandoned area has been included in the campus in the last few years. It faces Via Candiani where one of the main entrances to the campus is situated and where the surrounding wall allows people walking in the street to see inside. This area has been converted into green areas by just planting grass. *Coltivando* is dedicating 900 square meters of this space to the garden. This means a 90m x 10m area facing the street. According to the Milanese city council regulations, community gardens in public areas cannot use the soil but have to be designed in boxes laid on the ground. That's why the design solution has been a challenge from the spatial and technological point of view too.

### How

Moving on from the Urban Planners' definition of 'Neighbourhood Lab' (Calvaresi, Cognetti and Cossa, 2011), where such a *lab* is a place that hosts several activities to boost socialisation and communication among the people living in the surrounding area, and to enhance the relationship between dwellers and spaces, researchers believe that a community garden could be one possible configuration of a lab.

That is because, before being a vegetable garden, *Coltivando* aims to become a place belonging to the Bovisa community. Historically, from the '50s until the campus settled in the late '90s, local people used to grow their own food there. When the campus took over the space of the former factory, where people used to work, the local community felt completely detached from the new settlement and had to cope with huge changes in the social fabric, with the influx of students and immigrants, and in the urban planning as well, with the creation of new facilities for the university, and

new residences instead of the old factories. In such a context, researchers think that a garden could be an effective device to bring the local community back to their own neighbourhood and to integrate the new academic one with its place of work and study.

At the beginning of the design process, one of the biggest challenges was to share the project with both the local community and the academic one. According to Sanders and Steppers (2008, p.9), “co-creation practiced at the early front end of the design development process can have an impact with positive, long-race consequences.” For this purpose, designers organised three co-design sessions, so as to involve all the interested people and to start with them a democratic process of design. A Community Centred Design approach (Meroni, 2011) was used to engage various stakeholders in the university community as well as the local Bovisa community, and several tools were developed to enable many people to design their own garden. At the end of the three co-design workshops, designers could rely on the feedback from about 100 people (experts and beginners, academics and local residents) to adjust the first design proposal for the space and for the service model of the garden.

### *When spatial design meets service design*

#### SPATIAL DESIGN

The current focus on urban or peri-urban agriculture, implements particular aesthetic codes of behaviour in order to enhance or create neighbourly relations through the implementation of practical and tangible assets. The material practices embrace both the container, with a project for the spaces, and the content, through the sharing of agricultural knowledge among the agriculture lovers involved, allowing the recovery of old farming techniques and experimenting with new ones. The container plays a key role in the welcoming and interaction of people living *Coltivando* and in the redevelopment and re-functioning of the existing area. Before the project, the *Coltivando* area was just grass. It had been recovered as a public green area in the spring of 2011 by the Politecnico di Milano, on an abandoned area of wasteland.. The new green grass was little used by the internal community of the university because it was (wrongly) considered too far from the office buildings and rooms, and it was not used by the neighbourhood either, because it was considered inaccessible.

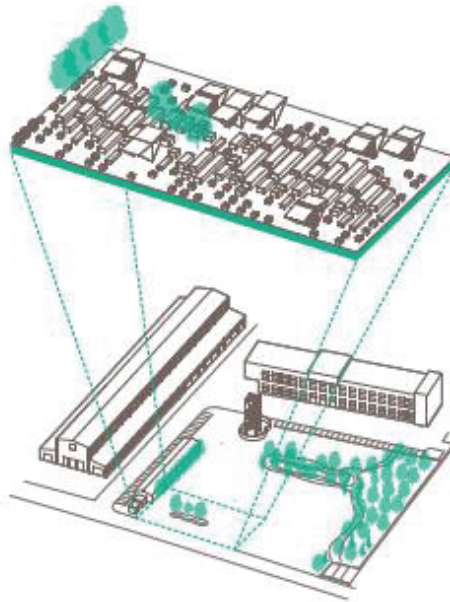
The project started with the idea of making this area into a meeting place by cultivating not only vegetables but also knowledge, relationships, friendships.

The friendly garden lot is rectangular and is located near via Candiani, a street of average inflows through Bovisa, with several private residences and some commercial activities (copy shops, bookstores, bars) mostly used by students. The gate that separates the roadway from the campus is a permeable border where it is possible to view inside, creating direct contact between the two public places. Starting from the input of Milanese legislation that requires urban community gardens to find solutions that do not use the existing soil, space design has created a three-dimensional network of devices using the ground only as support. The result is a place that includes:

- boxes for gardening and compost made of steel in the central part and tuff on the sides. They are designed to be assembled dry so as to be easily set up and dismantled/recycled (when needed)
- rest areas: multifunctional areas that in future could be used for cooking, didactic activities etc.
- sheds for gardening tools



The functional distribution is the result of the onsite co-design activities and mirrors people's needs as to the positioning and spatial dimension of the dedicated areas. From function to shape: the boxes are located in a grid, reminiscent of the Roman "cardo" and "decumanus", avoiding physical boundaries and allowing easy access to this area. The perpendicular path generates a serial space that could be repeated endlessly.



**Figure 2** COLTIVANDO: location and spatial solution (Alessandro Sachero, 2012)

#### SERVICE DESIGN

*Coltivando* has always been conceived as a collaborative service (Cottam and Leadbeater, 2004) experiment. So, at the early stage, its service model was inspired by American food coops where every member must work a minimum of time to get some benefits back. In accordance with such a model, *Coltivando* was based on work shifts, with squads of members and a democratically representative management board. After a series of co-design activities and local community meetings, designers decided to simplify such a structure in order to make it easy to prototype with the first *Coltivando* members. The designers scheduled a series of meetings every Saturday for the two months after opening, to better understand the actual commitment of potential members on one hand, and on the other to help them to understand what the garden would be like to work during the high season.

As a result, the new service model is still based on collaboration within the community and common allotment care, but it focuses more on working together and encouraging people to meet than on fulfilling a list of activities in working squads. The revised solution will be tested in the prototyping phase (October 2012 – April 2013): according to the monthly availability of the members, every week, the Coordinator will schedule the activities to be done in the days when most of the people will be in the

garden. This set up should benefit the sharing of experience and the meeting of members at the place. From the original solution, designers kept the rule that every member must spend at least one and a half hours per week in the garden, when the garden is open for convivial events, in order to receive the vegetable food box at the end of the week.

For people who want to stay or hang around in the garden, but are not members of *Coltivando*, the designers set up the “Visitor” position: anybody can access the garden on occasion when the working members are there and, if appropriate, help them in the gardening activities, but Visitors cannot receive any benefit at the end of the week for their voluntary work.

Every *Coltivando* member is part of the general board of management, which meet up once a year, while the coordinator has to call open meetings every three months to plan the general seasonal activities.

## Garden Design Process

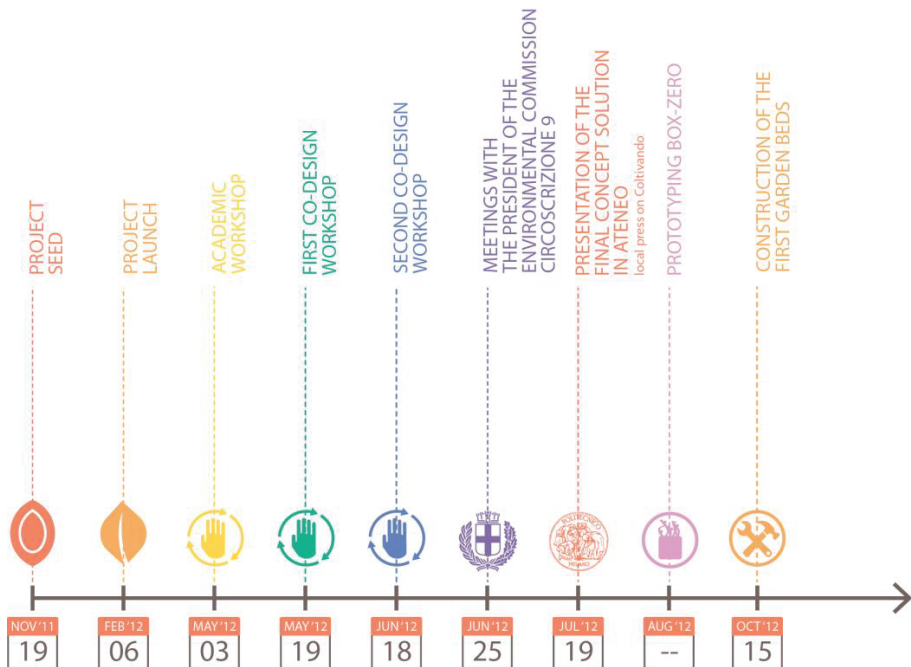


Figure 3 - COLTIVANDO, design process timeline

### October 2011: Project Seed, the first demonstration garden is designed

*Coltivando* took over 12 months to develop, thanks to a group of students and professors from the INDACO/Design Department of the Politecnico di Milano. The first indications of interest for a community focused vegetable garden began in Fall of 2011 when students created a test garden for the community to interact with. This demonstration experiment came out from a week-long workshop called “Temporary Urban Solutions”, provided by the MSC Product Service System Design at the School of

Design of the Politecnico di Milano. The workshop was held by prof. Davide Fassi within the framework of the European Research project “Human Cities” and aimed to generate solutions to open the public space of the campus to the city. These solutions were prototyped at the end of the workshop in a one day event called “C’è spazio per tutti – There’s room for one more”. Along with others, the solution of the community garden was a great success and many local people who work at the university and who live near the campus showed interest in being a member of the future community garden.

### *February 2012: Project Launch – Garden Team Created*

The next step for the garden was taken in early 2012 when the INDACO department brought together a multi-disciplinary team of students, staff with expertise in spatial design and service design and a community garden and development practitioner from an Australian social enterprise, called Urban Reforestation. They came together to design the first concept of the garden, based on a convivial model.

#### CONVIVIAL MODEL; COMMUNITY SPIRIT OF THE GARDEN

The model of the garden was an important question. Should there be allotments, or should it just be a ‘shared’ space? The main objective of the Politecnico di Milano was to engage their students, staff and surrounding community with the public space in the campus. Therefore the decision was made to begin with a ‘convivial model’, which means the cultivation and distribution of the garden’s vegetables will be shared. The volunteers who put time into the up keep of the garden will be the people who benefit from its “fruits”. The first design concept, with a masterplan, was presented to the Dean and other members of the Politecnico di Milano administration. The meeting was a success and the project was backed with support from the administration, which authorized the team to develop the garden project further and create a feasibility study, with hopes of constructing the garden in Spring 2013.

#### SOME FERTILIZER AT PAOLO PINI COMMUNITY GARDEN “IL GIARDINO DEGLI AROMI”

One of the first activities of the Design team was to visit the local Paolo Pini Community Garden, called “Il Giardino degli Aromi”<sup>1</sup>(cfr. par. 2.2). The manager showed the team the essence of what makes a community garden run; the importance of working with a diverse array of people, the art of gardening and showing how a community garden is a tool to engage communities and connect people to place.

### *May 2012 – June 2012: Academic workshop, First and Second co-design workshops. Stakeholder and community consultation, engagement and co-design.*

The design team developed workshops to co-design the community garden with its potential users. This is an important phase of the project because the users of the garden will be giving feedback to the designers on what they think it should look like.

Three community consultation sessions were run:

1) May, 3<sup>rd</sup>. An internal meeting with the students and staff of the university to engage them in the project. The aim of this workshop was twofold: on one hand, it aimed at informing the academic community about the garden and to collect their

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<sup>1</sup> “Il Giardino degli Aromi” is a community garden born in the historical park of a former asylum, that helps people from the neighborhood, from the schools and people with mental disease, to work together and benefit from the garden.

feedback according to their peculiar expertise; on the other, the hope was to involve more Design disciplines in the project, such as Communication, Fashion and Product.

2) May, 19<sup>th</sup>. A first external meeting with the local community to inform them about the project as well as co-design different elements of the garden with them. The co-design activities focused on the creation of groups of expert and beginner gardeners; they were asked to design the map of the garden, according to some given elements (such as: plants, benches, bushes, tools, convivial spaces...); then they were asked to discuss a draft of the basic membership rules.

3) June, 18<sup>th</sup>. As well as the first co-design workshop, after one month designers replicate it to engage more people from the neighbourhood. At the end of the two co-design sessions, more than 80 people from Bovisa were involved and some of them actively took part in the next steps of the process.

From the workshops, designers collected feedback to give a final shape to the garden space, as well as to the service model and the garden governance. They set the basis for the first community and the garden construction in October 2012.

### *June 2012: Paperwork and newspapers.*

While designers went back to the local District 9 Council to present the final project and get some tips for the bureaucratic paperwork required by Milan City Council, the local and national press set their eyes on the first University community garden in Italy. At the same time, the team presented the project start-up budget to the University administration and got the funds.

### *August-September 2012: Prototyping the “Box Zero”.*

As a demonstration to people who took part in the co-design session, spatial designers built the prototype of “Box Zero”, the container for the plants designed for *Coltivando*, and put some tomatoes and basil plants in. It aimed to test the effectiveness of the box project, as well as to prove the actual interest of the local people who offered themselves as volunteers to take care of the box in the summertime.



**Figure 4 - COLTIVANDO: drawings of the final design solution and “Box Zero” prototype (Alessandro Sachero, 2012)**

## “Iniziamo COLTIVANDO”: the beginning of a green project

On October 13<sup>th</sup>, 2012 the second edition of the “Temporary Urban Solution” workshop ended with the second edition of “C’è spazio per tutti- There’s room for one more” event. The workshop involved 58 international students in 9 design solutions based on a Participatory Action Research process, one of which focused on the opening of *Coltivando*. It carried out a massive promotion campaign for the event through guerrilla actions in the local markets, the use of social networks (Facebook, twitter), a blog and dissemination of press releases. 500 people entered the campus on that day, most of them from the surrounding neighbourhood. 60 *Coltivando* membership modules were collected in one day when the area began to take shape. 10 students steered the action, coordinating active visitors (who began to build the tuff box) and welcoming those who need information on the initiative.

A heterogeneous target group consisting of families, young students and senior citizens worked together throughout the day. It was an opportunity to test the effectiveness of the spatial and service design, understanding the first limits, organizing the next steps.

*Coltivando* is continuing. Every Saturday until the end of December 2012, the meetings were open to everyone and have the objective of concluding the hardware construction phase, but also the group that will take care of it.

The first garden community is supposed to be made of 15 people coming from the neighbourhood, moving from the ones who took part to the co-design sessions plus 10 Polimi students/academic/technical staff.

During the start-up phase, designers, in the role of pro-tempore Coordinator are monitoring:

- the interaction dynamics between the hidden public space and its new users: this will allow us to understand whether the proposed target of opening up a public space to a wider group of people and to return it to the district has been reached



- the use of the built space by the new users: design solutions will indeed generate new use dynamics for the space, through a functional diversification of the areas (growing, resting, storing, recycling, etc.);
- the level of integration between the internal community at the Politecnico di Milano and the external one (Bovisa citizens): the aim of managing the garden in a shared and not private way will in fact allow comparison between people of different ages, geographical and social backgrounds generating an exchange of information and knowledge.



*Figure 5 - COLTIVANDO, first built spatial devices during the start-up phase.*

## **The design process as a multidisciplinary exercise**

### *The students' experience*

*The Coltivando* project was one of the first attempts in the Politecnico di Milano School of Design, to force the two different design perspectives, spatial and service design, to work together around the same subject. Such an approach gave to the students and teachers involved a rare chance to develop a more holistic solution. According to Gustavo Primavera (a graduate student who developed the service project) "the multidisciplinary group warranted the definition of the "design problem" outside normal boundaries, reaching an enabling solution based on a new understanding of the complexity... *Coltivando* developed as a whole natural system and not as a collection of different parts relating to different disciplines". In addition, the student training side was enriched by the cross-fertilisation of some design tools traditionally adopted by one or another perspective: Alessandro Sachero and Sonia Zanzi (graduate students who developed the spatial project): "working side by side with service design and developing part of the communication while designing the spaces, helped us to design a coherent and complete solution. The constraints that emerged working with other disciplines were a stimulus to go beyond our single perspective and

figure out a real and reliable solution... We had the unprecedented chance to meet another design field, with its methods and tools.”

The students also had the chance to play with a real project from the concept to the implementation phase: in their academic curricula, the business plan, community management and budget issues are usually given with the brief or are just a theoretic exercise. With *Coltivando*, they were pushed to talk to real stakeholders, go networking with our local gardens and local authorities, ask for providers and their quotes, building the first community of members... and, in some cases, to scratch and rethink the solution according to its feasibility.

### *Major challenges occurred*

Since the beginning, designers had to face different kind of challenges in building the garden. Some of them were very practical and ask them to find an agreement within the University Governance in terms of permissions, budgeting and logistics. Other, more exciting issues they had to tackle, concerned the design of the solution, such as:

- overcoming the “opening time” enthusiasm of the people to guarantee continuity to the experience, by organising weekly meetings with the first members;
- set up an “exit strategy” for designers as pro-tempore coordinators, in order to leave the service to the members’ management;
- balancing the internal and the external community of *Coltivando* in terms of number of participants. This concerns the cultural attitude of the internal community of people working in Politecnico di Milano: despite *Coltivando* has been elected among Poli-Social (the social responsibility program of Politecnico di Milano) most promising activities, most of the employees are still not able to consider the garden as a (social) benefit for their working life.

### *The role of the community in helping the multidisciplinary conversation*

The co-design approach helped designers to collect precious feedback from the potential community of users and, moreover, to know their “customers”. People who took part in the co-design sessions were not concerned about the space and service design perspective, they just wanted to give their contribution to figure out “their” garden. Such a neutral point of view fed the project with many inputs, from which service and spatial designers selected and put into the project those that were feasible. The issue of conviviality, inspire designers with the idea of doing things together: taking part to the decisions; being a fundamental part of the running system; taking care of a place for yourself and for the others, as they exactly do for you; sharing the fruits and the benefits of the work and so on. How designers boost the conviviality in the garden? They kept continuously involving the members in the decisional process: after the opening, they decide to prototype the service for few months under their supervision. They set up several co-design activities on specific topics (eg: placing the garden beds, sawing vegetables...) in order to harmonize the community members about the garden and about working together.

**Acknowledgements:** *This paper reports on collective work and is the result of collective reflection. Nevertheless, for the purpose of this publication, Davide Fassi wrote sections 1, 3.1, 3.2, 3.4.1, 4 (except 4.2) 5; Giulia Simeone sections 2, 3.3, 3.4.2, 4.2, 6. COLTIVANDO is a successful project*

*carried on by the effort of people that we warmly thank: Gustavo Primavera (Product service system designer), Alessandro Sachero and Sonia Zanzi (Interior Designers) for designing the garden and developing great master thesis; Anna Meroni and Luisa Collina from Politecnico di Milano, DESIGN dept.*

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# Design as a second language. Design as a multicultural-multidisciplinary space of integration: Challenges and advantages of introducing design to non-design students, in a second language, in a new cultural context

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**Abstract:** *Teaching design to design-illiterate students is usually a common case for every first year class instructor at any design program. In addition to this, a particular combination of extra challenges makes Design Fundamentals at the University of Alberta- a very special spot to learn and teach design. Most sections of this class are open to students from many other fields and levels, from psychology to engineering, and from first year students to senior students. Masters students, who usually come from various countries, are often appointed as teaching assistants as part of the graduate program experience. Some of them choose to stay and teach upon graduation. Diversity is even more distinct amongst undergraduate student. In 2010-2011 this university received about 5800 international students from more than 140 countries, three times larger than the figures of 2001, and increasing every year. The combination of multidisciplinary and cultural diversity from both sides, teachers and students, is a symbiotic and synergetic phenomenon that offers additional challenges and opportunities. This paper intends to describe the experience of teaching-learning design under this environment and ultimately depict the Design Fundamentals classes as a space of integration.*

**Keywords:** *Design education, Design Fundamentals, second language, multidisciplinary teaching, teaching non-designers.*

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## Introduction

The authors of this paper are graduates of the Masters program in Visual Communication Design (VCD) at the University of Alberta, Canada. As novice graduate students, our experience with Design Fundamentals primarily came from assisting professors, but as we became more familiar with the course, we were invited to teach as Principal Instructors.

Design Studies is a division of the Department of Art & Design at the University of Alberta. It was recognized as a key field of research innovation when the Province of Alberta decided to consolidate, develop, and expand this division in 2002 (Faculty of Arts, University of Alberta 2007).

Design Fundamentals is an introductory course to two- and three-dimensional design-related studies. For students applying to the design program, taking this course along with Art Fundamentals, the course that focuses on art basics, is a pre-requisite. Likewise, students already accepted in the program have to take Design Fundamentals in their first year of design education.

There are two types of Design Fundamentals courses at the University of Alberta: one open to any student enrolled in any program at the University, and the other one for students already accepted in the Design Studies Program. The first course is intended as a preparation course for students to proceed into the Design Studies, while the other one is a required course for students who have already been accepted to the program.

Design Fundamentals at the University of Alberta is a particular educational experience that prepares students to a deeper outlook of the design practice.

Professor Emeritus Jorge Frascara defined the nature of this course, when he taught it in the early years of the program,

*“This course marks a shift from the traditional foundations courses in art and design departments, in that it recognizes that in addition to visual issues, there are many other conceptual dimensions that concern design and the designer. The intention is to provide incoming students with a comprehensive panorama of what design entails. People have always been interested in the assessment of the territory they step in. Our intention is to facilitate the students’ understanding of the territory they are entering. This course is intended to outline the context and the purpose of design, as well as its conceptual tools and the manual and visual skills required.” (Frascara 2007, 1).*

In addition to the approach described by Jorge Frascara, other two distinct and unique characteristics that define the Design Fundamentals course at the University of Alberta are multiculturalism and multidisciplinary.

## Teaching design to non-design students. Advantages of applying Multidisciplinary, Interdisciplinarity, and Cross-disciplinarity in Design Fundamentals.

One remarkable aspect of teaching Design Fundamentals at this Design Studies program is the variety of backgrounds observed in new students taking the class. The design program uses a unique route system that allows second year students to follow orientations in engineering, business and marketing, computer science, printmaking and social sciences (Faculty of Arts, University of Alberta 2007), along a general route for either more traditional areas of design or more disciplinary combinations.

In the upper level-courses, it is also common to host graduate students from other disciplines like Humanities Computing (figure 1), English and Film Studies or other Social Sciences in the undergraduate design classes.

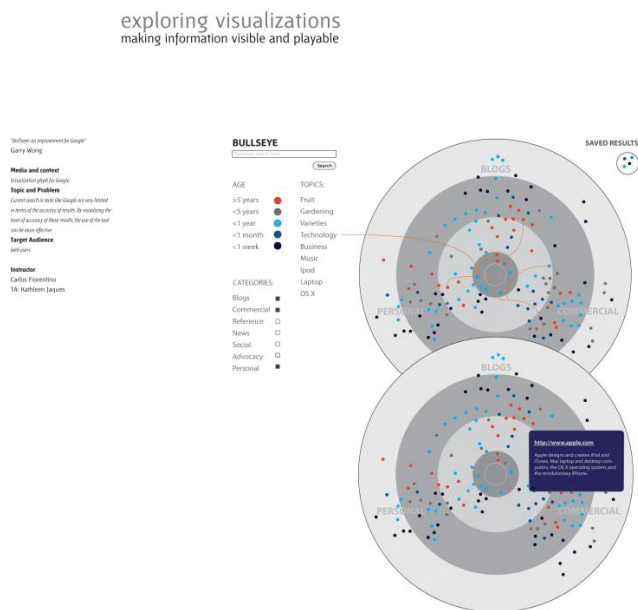


Figure 1. Information design project combining two fields: Visual Communication Design and Humanities Computing. (Image courtesy of Garry Wong, graduate student from Humanities Computing taking DES 493 Concepts and Systems in Visual Communication Design, 2008).

In Design Fundamentals, it is very usual to have students from other disciplines, or holding minors and majors, or already graduated from other areas. Only considering the courses the authors of this paper have taught in the past, the list includes students in the fields of Psychology, Education, Drama, Chemistry, Engineering, Biology, Human Ecology, Physics, Physical Education, Health Sciences, Music, Anthropology, and Computing Sciences.

This remarkable mix of disciplines and knowledge is also a source of inspiration and in-class collaboration, as opposed to the tendency of traditional design schools where programs work in silos.

Some may argue that the lack of a unified disciplinary language, the highly varied approaches and backgrounds under the same classroom, would add not much more than cons to the desired teaching excellence. However advantages surpass the disadvantages, especially for students from other fields taking this class.

Students are introduced to design methods and processes, allowing them to explore different ways of thinking, visualization and problem-solving techniques. These techniques can eventually be translated into their fields, increasing the opportunities of solving any difficulties they might encounter. Furthermore, due to the studio-based nature of this class, students get familiarized with various design approaches, methods and techniques, including: visualization of ideas, the brain-hand connection, exploration of ideas through research, two-dimensional sketching, drafting and rendering, and three-dimensional models and prototypes. Many students are first introduced to these skills in class. Jorge Frascara explains,

“There is a primary learning, that is connected to the acquisition of information, and is conscious; and there is secondary learning, that relates to the development of the skills, and is an automatic and unconscious effect of primary learning.” (Frascara 2008, 42).

This phenomenon is reflected in the classroom, for example: one of the first projects in the course introduces the Gestalt principles applied to design, students learn about composition and figure-ground relationship, among other skills that can be easily recognized in their future projects.

Another advantage is the exposure to concepts such as critical thinking. Design Fundamentals students are expected to participate in in-class project critiques by visually and verbally communicating their design ideas. Project critiques are essential to the class; every student has the opportunity to present their ideas and comment on others' work, establishing critical and constructive dialogues between students and instructor.

Michael Scriven and Alec Fisher define critical thinking as a “skilled and active interpretation and evaluation of observations and communications, information and argumentation” (Fisher and Scriven 1997, 21).

Critical thinking, sometimes referred to as critical-creative thinking, takes in consideration the ability of being imaginative and creative when criticizing. It is not enough to see faults in others work, but to be good at evaluating arguments and ideas you must be creative about other possibilities, alternative considerations, different opinions and so on (Fisher, 2011, 14). This concept applies to the dynamic of project critiques due to the fundamental principles of this theory. In class critiques are meant to evaluate positives and negatives attributes of the students' work by verbally communicating them. To do so students need to be creative and mentally agile to point out what works and what does not when discussing each design assignment. This is achieved by giving explanations and solutions based on previous knowledge and theory learned in class.

### Multidisciplinarity, Interdisciplinarity, and Cross-disciplinarity in Design

#### Fundamentals.

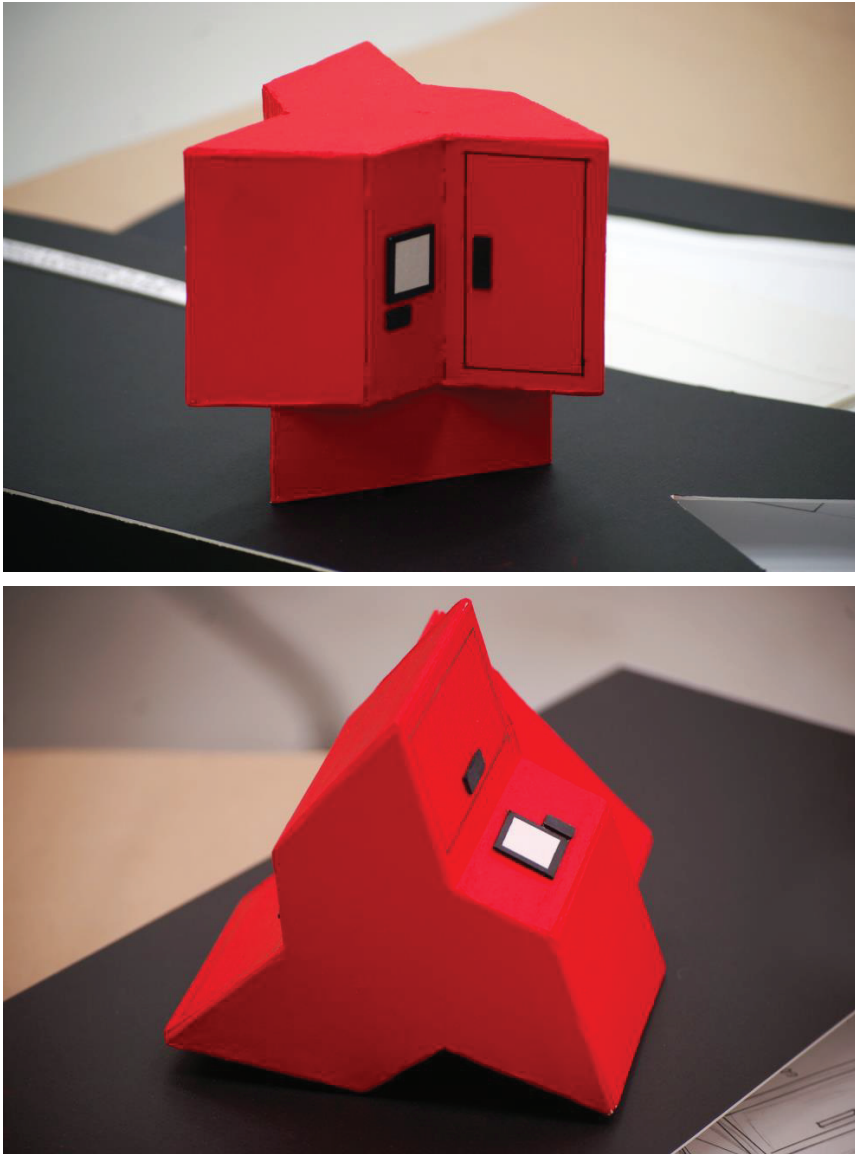
Design is very opportunistic in that it can integrate knowledge from many disciplines and make that knowledge effective, but only if properly understood and studied (Buchanan 1998, 66). Seeing the world through more than one lens is the main appeal of multidisciplinary, interdisciplinarity, and cross-disciplinarity. Integrating and combining multiple approaches into the Fundamentals curriculum gives students a wider perspective of the design field and establishes a strong foundation for further design studies.

In context of this paper, interdisciplinarity, multidisciplinary, and cross-disciplinarity are defined as separate methodologies used in Design Fundamentals courses. While the terms interdisciplinarity and multidisciplinary are often seen as synonyms, multidisciplinary involves “placing side by side of insights from two or more disciplines” (Repko 2008, 13), whereas interdisciplinarity is characterized as “centralizing and combining knowledge on a particular subject from various disciplines, knowledge which is taught during class and is unified under a common subject.” (Kampouroupoulou 2011, 60). For example, one of the projects in Design Fundamentals class focuses on Colour Theory and introduces students to colour foundations and basic painting techniques. To deliver the project objectives and make the learning experience more fulfilling, educators usually invite artists or painters to talk about their expertise which exposes students to multidisciplinary methods. In general all students introduce an interdisciplinary perspective into the classroom because they draw on their existing knowledge from their “home” disciplines to solve design problems. Lastly, a cross-disciplinary method, which is commonly defined as explaining aspects of one discipline in terms of another, is used in the Design Fundamentals course to explain new design concepts. For instance, the project on *Patterns and Modularity* is often delivered from the perspective of Natural Science by introducing students to patterns found in nature (Figure 2).



**Figure 2.** Patterns inspired by nature, as a part of Sequences & Modularity project from DES 135 Design Fundamentals, 2012.

While all three methods are present in the Design Fundamentals course, the most distinct one is interdisciplinarity since all students come from different academic backgrounds. There are many benefits to having students of various disciplines working on design problems. One of the most fundamental traits observed in students who partake in the course is a raised awareness of their own discipline. In successfully designed and planned Fundamentals projects students begin to filter the problems presented in their “home” discipline, i.e. design, through the mindset of an engineer, environmentalist, or social scientist. Students also gain an appreciation of perspectives other than their own, a tolerance of ambiguity, an increased sensitivity to ethical issues, and an ability to synthesize or integrate. Students enlarge their perspectives or horizons, become more creative through original or unconventional thinking, increase their humility and listening skills, and increase their sensitivity to disciplinary, political, and religious bias (Newell 1994, 35). Note that interdisciplinary learning does not claim that all students will become experts in multiple areas; rather, they become more aware of traits outside of their discipline. In other words, “designers do need to know more about science and engineering, but without becoming scientists or engineers.” (Norman 2010). In turn, some engineering students learn about design without eventually becoming designers. For example, in one of the projects asked students to investigate the issue of homelessness in the City of Edmonton and to provide three-dimensional solutions. This brought students of English, Music, Education, and other disciplines together to tackle a human-centered design issue (Figure 3).



**Figure 3.** Three-dimensional design solutions provided to the issue of homelessness by DES 135 Design Fundamentals students.

Interdisciplinary learning can be a great addition to a traditional studio-based Fundamentals course. The conscious implementation of an interdisciplinary approach demonstrates a number of benefits such as development of wider perspective of design as an interdisciplinary subject, betterment of skills that are transferable across disciplines, improvement of critical and conceptual thinking, deeper knowledge of the



industry, ability to become well-rounded designers, and demonstration of motivation and creativity in students. Learning to work creatively and in interdisciplinary teams is “a critical part of successful design education” (Norman 2011). However, an interdisciplinary approach does not advocate against studio-based curriculum; instead, it invites educators to explore new ways of teaching design.

Teaching design in a second language, learning design in a second culture.

The Design Fundamentals course presents challenges and advantages for teaching and learning, given by the multicultural diversity of educators and students alike.

Classes are very often taught by international graduate or recently graduated students from the Masters of Design program. Graduate students from many countries come to the design program every year to study, and they are also appointed for teaching assistants as part of their regular duties. Some of them remain teaching for long time after graduation. The University of Alberta currently employs many contract academics and tenure faculty that have immigrated from other countries to Canada.

The multicultural diversity is even more noticeable in the undergraduate studies. In 2010–2011 the university received about 5800 international students from 146 countries (University of Alberta 2011, p.161), three times larger than the figures of 2001, and increasing every year. Canada is currently inviting more international students as the driving force of economic future under Canada’s International Education Strategy. This strategy strives to double the number of full-time international students, from 239,131 in 2011 to more than 450,000 by 2022 (FAITC, 2012). Many of these countries are represented in the Design Fundamentals classroom, creating unique multicultural situations.

### *A Spanish-speaking instructor teaching a Chinese-speaking student: language barrier or communication design opportunity?*

A second language can sound like an additional barrier but also can be an opportunity for developing communication skills. Language educators sustain that learning a second language lays ground for individuals to acquire further languages with much less effort. This is particularly noticeable from early stages in bilingual education. In this sense, Professor of Linguistics Jim Cummins sustain that “bilingualism has positive effects on children’s linguistic and educational development”, adding to this:

“...When children continue to develop their abilities in two or more languages throughout their primary school years, they gain a deeper understanding of language and how to use it effectively. They have more practice in processing language, especially when they develop literacy in both, and they are able to compare and contrast the ways in which their two languages organize reality.” (Cummins, 2012).

Many research studies conducted during the past decades strongly suggest that bilingual students may also develop more flexibility in their thinking as a result of processing information through two different languages. Although this learning process takes a longer period in adults, the training dealing with additional languages seems also beneficial to design students.

Jorge Frascara also refers to “the language” as an important aspect of design learning process:

Design, one could say, is bilingual. There is the language of form, visual and three-dimensional, that one has to master. But there is also the need to verbally articulate the problem, the process to follow, and the solution. Designers normally work for people who are not designers themselves. When a client presents a problem, that problem is outlined in non-design terms. The task of the designer is to re-state the problem in design terms. When one develops a solution, it has to be articulated in ways the client can understand. It is therefore necessary to develop the skills required to verbally articulate one’s ideas clearly, simply and precisely. (Frascara 2007, 3).

In a way, every new student to Design Fundamentals, even those who only speak English, has to learn a second language: the design language. Those who are already dealing with two languages might find a third one easier to achieve under these particular circumstances.

### *Learning how to teach and teaching how to learn: a collection of experiences from the Design Fundamentals classroom*

As graduate students the process of learning how to teach was acquired by experiential learning. The graduate program of design is focused in building student’s capacities in instructional preparation, specifically by assisting design instructors with their courses. Assisting the Design Fundamentals course is highly recommended for any graduate design student who has interest in teaching.

Two of the three authors of this paper are international graduate students originally from South America, who through experiencing the instructors’ approach and teaching techniques, got familiarized with the Canadian cultural and teaching methodology. Placing ourselves in the classroom as teaching assistants, gave us the opportunity of capturing the procedures and methods of teaching from different perspectives, from different cultures, that resulted in a vast collection of acquired knowledge.

Canada is a country with a multicultural policy that embraces the mixture of ethnicities. Having a diverse society results in a combination of unique knowledge and participation in communities, this contrast and harmonious feature is also projected in the Design Fundamentals classroom. Canadian and international students working together, create a unique blend in design production, each one contributing with distinctive aesthetics, ideas, and specially form and visual languages.

The following experiences were —among others- collected with the idea of building possible techniques, methods and strategies, to address teaching design for international students learning in English as a second language (ESL) and interdisciplinary students in Design Fundamentals classes:

Emphasis in the design process and the sense of context.

Giving a large number of examples to students during lectures or working periods sometimes can be counter-productive. By looking at various examples of two- and three-dimensional design work, some students can become biased, limited, or only mimic what they see. This is usually different when approaching ESL students. Without

exceeding a proper number of examples, a collection of selected images can make a big difference for students in understanding the subject, and make it easier for instructors to ensure that students are on track. It is beneficial as well, to gather these students in groups or individually to share examples, discuss details and follow the steps written on the project sheets. In addition, showing a documentation of previous students' work such as photographs of sketching stages, process materials, and notes from the sketchbooks is an advantage. As instructors, documenting students' work process and final project material is an important part of successful teaching. Students are usually asked to submit sketchbooks, rationales, samples and design process along with their final projects, which makes the selection of examples for our documentation versatile and diverse.

#### Ensuring verbal understanding

Greig Rasmussen, a design instructor with a vast experience teaching Design Fundamentals at the University of Alberta, uses a very simple technique to establish effective communication with students, in particular at the time when assignments, tasks and important projects details have to be well understood. Rasmussen explains: "I deliberately spend more time explaining projects and my criticism to them, and after that I often have the student tell me (in their own words) what they think I am saying; I have found this method works quite well and it serves as a good check to make sure they have understood my remarks."

#### Customized written translations

It is very common in ESL students to misunderstand even written words —project sheets, handouts, reading materials, etc. We noticed that students coming from countries with written languages other than the western alphabet, have an extra challenge to the spoken language barrier. This is the case of written characters like Chinese, Japanese, Arabic, Cyrillic, etc. Quite by chance we also discovered that many students facing this situation find good and creative ways to cope with the challenge. In many cases students "translate" instructions given into their own language, adding notes right next to the original in English. This simple technique is proven to be very effective for them, and for the teacher. As a result, we encourage students to adopt this habit. We show them examples and give them some extra time to apply their "translations" to the materials given.



### Diminishing cultural barriers that prevent engagement

Another important aspect to an effective communication with ESL students is instructor's understanding of cultural differences. One of the curriculum requirements in Design Fundamentals course is students' participation and verbal contribution during in-class critiques and presentations. However, most Asian students would not participate, unless individually invited. According to one of the students who comes from the Northern China, the way teacher-student relationship work is that students are prohibited from speaking up, unless their teacher calls their name and talks to them directly. The same teacher-student relationship was observed in students from Mexico and Korea. As a result, it becomes the teacher's responsibility to engage students and create all-inclusive environment.

## Conclusion

Diversity of cultural backgrounds, multiplicity of spoken languages and mixture of disciplinary fields, provide Design Fundamentals at the University of Alberta with a unique set of qualities that enriches the learning experience. All these variables add a layer of complexity to the class, and could be seen as a disadvantage. However, we have recognized this complexity as a resemblance of factors that affect numerous current design work or design projects in the world, making this class learning experience a true reflection of the present design practice.

This combination also makes teaching an extraordinary opportunity to explore additional qualities: design as a second language and design as a tool for further learning.

Design Fundamentals also demonstrate a unique combination of multidisciplinary, interdisciplinary and cross-disciplinary approaches to learning. Instructors use multidisciplinary and cross-disciplinary knowledge to explain design concepts while students contribute their interdisciplinary expertise to Fundamentals studio classes. Most students come from non-design disciplines and bring their knowledge of these "home" disciplines to the table thereby creating unexpected design solutions.

In addition to this context, young educators and graduate students currently working for the Design Fundamentals program will incorporate more approaches to the basic design training by introducing new interdisciplinary subjects in the next years, such as *Design Fundamentals for Sustainability*, *Participatory Design*, *Design Activism* and *Design for Social Change*. This promising prospect could bring new projects and assignments, pilot courses for further development, and in the long run would open the opportunity to the inclusion of new routes of expertise to the main curriculum. New graduate students joining the program in the future will also help to expand the design boundaries, bringing new conceptual tools and more case-studies through research.

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# Integrating multidisciplinary collaboration in undergraduate design education: Too many cooks spoil the broth?

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**Abstract:** *Employability studies continue to highlight the fact that digital media design graduates may not be sufficiently prepared to bridge the gap between university and industry. In response, an alternative learning and teaching approach for digital media design education, the POOL Model framework, was developed and subsequently trialled at an Australian university. A broad underpinning strategy of the framework is to reflect industry practice through implementing workplace realities such as multidisciplinary teamwork. Introducing multidisciplinary collaborative practice into design education is identified as necessary; however, exactly how these collaborations can be managed at an undergraduate level is less well defined. This paper describes the design of a collaboration that engages undergraduate digital media design students in multidisciplinary teamwork with information technology students and subsequently multimedia journalism students as well. Can such multidisciplinary collaborations be beneficial for all participating students? Are there too many disciplines involved? Challenges that commonly occur when undergraduate design students engage in multidisciplinary collaborations with disciplines outside the creative arts were identified. These informed the development of strategies (pragmatic principles) which aim to facilitate the functioning of the POOL Model framework and the development of a sustainable solution. Findings from a three-year study are presented.*

**Keywords:** *multidisciplinary undergraduate design education, POOL Model framework, multidisciplinary collaboration.*

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## **Introduction**

Designers today and increasingly in the future need to be able to navigate within a shifting economic, social, cultural and technological landscape. Design and communication problems become increasingly complex, are often part of larger systems and have at times a global scale and audience. According to Barnes-Powell (2008), the “two momentum trends of this century are growing complexity and increasing rates of change” (p. 378). This situation is challenging for designers because in this “complex, changing professional environment...design involves more skills and knowledge than one designer can hope to provide, [in fact] most successful design solutions require several kinds of expertise” (Friedman 2000, p. 21). Consequently, work environments that are based around multidisciplinary, interdisciplinary or transdisciplinary models are seen as providing fruitful ground to respond to the increasing complexity. In fact, the digital media design industry (e.g. interactive media design, game design) is structured around multidisciplinary teamwork, with designers mostly working in collaborative environments (Kerlow 2001; Niederheman2001; Sommese 2007; Whyte and Bessant 2007). This reality, however, is rarely reflected in digital media design education. Bennett (2009) argues that “despite numerous isolated examples of innovative practical pedagogical projects taking place worldwide, there are still no proposed working models...that are specifically aimed at assisting visual practitioners to work collaboratively” (p. 5). A study undertaken in Australia revealed that only 27% of the 120 surveyed university design students (diverse levels and areas, e.g. multimedia design, industrial design) had the opportunity to work with students from other disciplines (Design Victoria 2009). While this research is Australia-specific and a small sample, it is alarming evidence and arguably indicative of many design degree programs worldwide (e.g. Szenasy 2004, Design Council and Creative & Cultural Skills 2007).

The current debate on the future of design education highlights the fact that changes are urgently needed (see i.e. Icoграда 2011, Visible Language 2012). In fact, some design educators and practitioners argue that design education is stuck in the past (e.g. Davis 2011, Norman 2011, Poggenpohl 2012), “out of date” (Dubberly 2011, p. 81) and seemingly incapable of meeting the demands of the changed scope of the profession and the marketplace (Canniffe 2011). Employability studies reinforce this argument, revealing that digital media design graduates may not be sufficiently prepared for the workplace (Design Council 2005, 2010; 60Sox 2009, 2010; ISIS 2011). In particular, a lack of teamwork skills are often identified in design graduates (Ball 2003; Design Council and Creative & Cultural Skills 2007; 60Sox 2010). Ball (2003) argues that most design students experience collaborative teamwork only with other design students, which leads to a “lack of critical team-working to mirror industry practice” (p.18). This is surprising because design educators seem to have a positive view on collaboration across other disciplines. Szenasy (2004) discovered when surveying 325 North American design educators that 71% “completely agree” and 24% “somewhat agree” that interdepartmental collaborations are an important part of the curriculum. A similar situation was found in Australia, where surveyed design educators were aware of some criticism and nearly half of the surveyed institutions intended to implement improvements by increasing opportunities for interdisciplinary collaboration for students (Design Victoria 2009).

Although progress appears to be slow, the process of re-thinking design education has begun. Davis (2011) acknowledges that a few programs “demonstrate foresight by



addressing the shifting landscape of design practice” (p. 73). Some examples include the d.schools, founded by Hasso Plattner Institute at Stanford University and in Potsdam, the Master in Multidisciplinary Design Innovation at Northumbria University and the Master of Fine Arts in Transdisciplinary Design introduced by Parsons The New School for Design. These programs have certain aspects in common: they are newly founded programs (rather than a re-design of an existing program); they are still relatively unique compared to the number of design schools in existence worldwide and they are all offered at postgraduate level. In fact, when over-viewing the latest efforts to base design education programs in part or completely on collaborative practice it becomes evident that even fewer approaches are introduced at undergraduate level. Although some examples exist, collaborations, particularly those with disciplines outside the creative arts, often appear to be sporadic if they occur at all.

This picture gives rise to several questions. Are undergraduate design students not ready to engage with disciplines outside the creative arts? Are multidisciplinary collaborations not considered beneficial at this level? Is it too difficult? Is it too expensive? Why is it that, on one hand, working collaboratively is identified as essential and fundamental to learning (Heller and Talarico 2011), and as a key skill required for the future (Hunt 2011), and on the other hand, particularly in the area of digital media design where the complexity of projects clearly requires different disciplinary input to produce an outcome, an approach that is reflective of such reality is still missing in undergraduate design education? Certainly, issues such as silo mentalities, university structures and time constraints are recognised as barriers to interdepartmental collaboration (e.g. Szenasy 2004, Design Council and Creative & Cultural Skills 2007, Canniffe 2011). But are there other reasons? In order to obtain a deeper understanding of this complex situation, investigations were made to determine whether common challenges could be identified and subsequently evaluated to establish whether these challenges could be effectively managed to facilitate the implementation of a sustainable approach to multidisciplinary design education at undergraduate level.

## **Multidisciplinary collaboration: The POOL Model framework**

In response to the identified shortfalls in design education and to better prepare undergraduate digital media design students for professional practice in the creative industries, an alternative learning and teaching approach was developed. The *POOL Model framework* consists of a teaching pool and a learning pool containing specialists from diverse but connected disciplines. In the *teaching pool*, educators work collaboratively to define a project or problem and create a learning environment for students to develop the project or respond to the problem in multidisciplinary teams. People external to the university are included in the teaching pool, such as industry professionals, and the community—arguably a pool in itself—in the capacity of clients, advisors, experts or sponsors. In an ideal environment, the input into the teaching pool can also occur inter-institutionally, depending on the project/problem definition and resources needed. This would have a significant impact on the sharing of key knowledge between institutions and would require a major shift in current thinking.

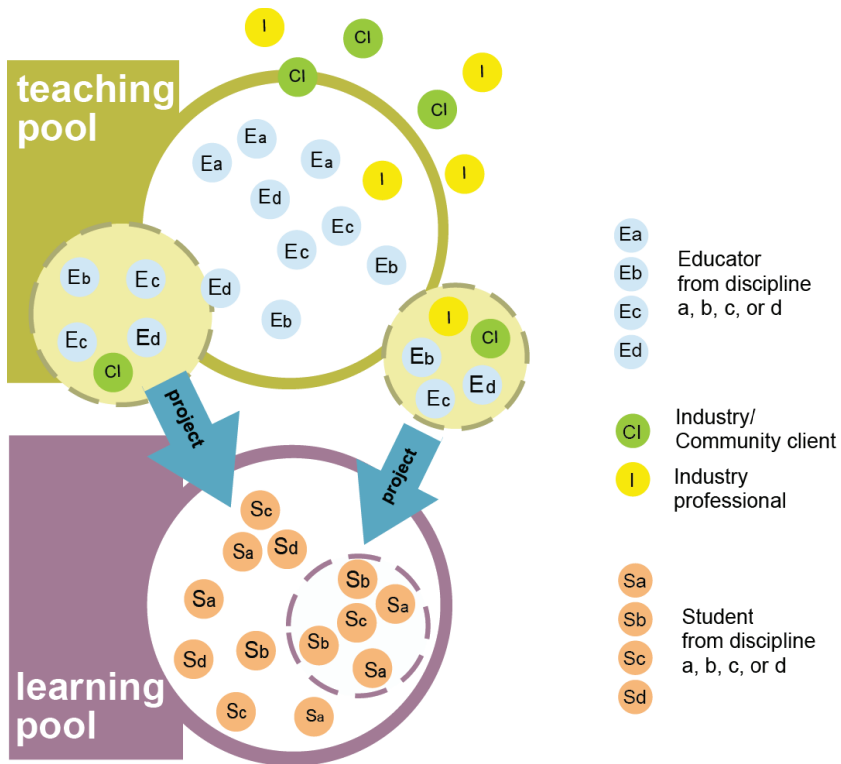


Figure 1. The POOL Model framework: an alternative learning and teaching approach for digital media design education.

In the *learning pool*, students from different disciplines form teams to solve a defined problem or produce a project collaboratively. The composition of the team will depend upon the presented problem/project. While working in these collaborative multidisciplinary teams, a student will be able to gain insights into, and develop an understanding of, other disciplines. Through the collaborative multidisciplinary team approach and the shared learning process, each student will have additional time to concentrate upon discipline-specific skill development and challenges within his/her multidisciplinary team while experiencing a more holistic and efficient way to approach complex projects or problems. Figure 1 provides a graphical illustration of the POOL Model framework.

The POOL Model framework was implemented in three subjects in the curriculum of the digital media design major in the Bachelor of New Media Arts degree. One of these subjects was Web Authoring 1 (School of Creative Arts), which was offered jointly with the subject Multimedia Web Design (School of Business, discipline IT) to facilitate industry-relevant collaborations between undergraduate digital media design and IT students. Both subjects were 2<sup>nd</sup> year introductory subjects on web design and web development, with Web Authoring 1 focusing on the design and basic development of websites and Multimedia Web Design on web development (backend). Both subjects had been taught separately up to this point. The collaboration between digital media

design and IT students was trialled in 2009 for the first time. A community client was involved in providing a real world project for students to work on, which was also the case in 2010 and 2011.

Due to the School of Creative Arts proactively looking for additional disciplines to participate in the collaboration, multimedia journalism students from the newly introduced Bachelor of Multimedia Journalism course joined the learning pool in 2010 (see Appendix A for numbers of participants in 2009-2011). While collaborative practice is identified as one way forward in the current debate on the future of design education, on the other hand, the exact way in which such collaborations are managed on the ground is less well defined, particularly in undergraduate design education.

## **Challenges to overcome**

Although recently the number of innovative approaches to design education has increased, it is notable that there is a lack of published data measuring their impact and efficiency (Design Council 2010). From the limited number of published examples from undergraduate design education, only a few have applied research methods such as surveying or interviewing students to evaluate the approach. Examples that aim to mirror industry practice with cross-disciplinary production teams being established when producing games or animations (Ebert and Bailey 2000; McDonald and Wolfe 2008) exist and were analysed. Due to the lack of relevant research relating to undergraduate digital media design education, examples from the area of industrial design (also known as product design) were also included. This is because some authors, for example; Viemeister (2001), Stone (2004) and Talbot (2007), make references to similarities between industrial design and digital media design in that both have a comparable product development and user testing process, and both have the need to deal with increasing complexities through new emerging digital technologies (Choi 2009) (see Appendix B for the list of examples analysed).

Table 1 overviews the challenges outlined by the authors and also displays details of the disciplines collaborating and student numbers, if available. All collaborations analysed were conducted in undergraduate degree programs in North American institutions.

**Table 1. Challenges identified by design educators when engaging undergraduate art and design students in multidisciplinary collaborations that reflect industry practice.**

	Disciplines No. of teams/size/no. of students / Duration	Challenges
1	<ul style="list-style-type: none"> <li>- art students, computer science</li> <li>- four to five students per team</li> <li>- 12 weeks</li> </ul>	<ul style="list-style-type: none"> <li>- it does require a significant amount of effort in teaching not only computer animation, but teaching successful teamwork and group dynamic techniques.</li> </ul>
2	<ul style="list-style-type: none"> <li>- computer science, fine arts, (music composition students were brought in during class)</li> <li>- four to five teams/ five to six students per team</li> </ul>	<ul style="list-style-type: none"> <li>- students were given a free choice of roles to perform (coding or design), which resulted in an environment that did not accurately mimic a commercial production environment;</li> <li>- some students undertook roles they were not adequately prepared for and that element was left incomplete or was implemented poorly;</li> <li>- the concept of critiques was not familiar to the computer science students.</li> </ul>
3	<ul style="list-style-type: none"> <li>- art, design, computer programming, business</li> <li>- three groups: programming, writing and art group; 27 students</li> <li>- 16 weeks</li> </ul>	<ul style="list-style-type: none"> <li>- ongoing tensions between these groups throughout the course;</li> <li>- differences in subject culture: design and computer science are very different from each other, not only in subject content, but in styles of discourse.</li> </ul>
4	<ul style="list-style-type: none"> <li>- industrial design, graphic design, business (marketing, finance)</li> <li>- three teams; 16 students</li> <li>- 16 weeks</li> </ul>	<ul style="list-style-type: none"> <li>- discomfort with the 'messiness' and ambiguity of the project development process, which intentionally was designed to reflect the real world;</li> <li>- different subject culture;</li> <li>- considerable time was spent in the teams explaining and clarifying basic terms and/or ideas;</li> <li>- business and design students possessed very different ideas about basic development methodologies;</li> <li>- majority of students had underestimated the huge time demands of cross-functional teamwork.</li> </ul>
5	<ul style="list-style-type: none"> <li>- industrial design, business, mechanical engineering</li> <li>- 11 teams (in two years)/six to seven students per team, two from each discipline; 34 students</li> </ul>	<ul style="list-style-type: none"> <li>- teamwork caused conflict, frictions among team members, <i>team dynamics do matter</i>;</li> <li>- individual team members did not deliver their agreed-upon deliverables on time, causing difficulty for the entire team.</li> </ul>
6	<ul style="list-style-type: none"> <li>- industrial design, business</li> <li>- two design students and four business students per team; 45 students</li> <li>- ten weeks</li> </ul>	<ul style="list-style-type: none"> <li>- uncomfortable ambiguity and team conflicts;</li> <li>- students felt pressure of tackling an open-ended and undefined problem with team-mates who did not share similar training, work styles, personal objectives, etc.;</li> <li>- workload conflict;</li> <li>- business students were completely unfamiliar with the ways in which design students work.</li> </ul>
7	<ul style="list-style-type: none"> <li>- product design, business, engineering</li> <li>- three to nine students per team</li> <li>- six to nine months</li> </ul>	<ul style="list-style-type: none"> <li>- teamwork is difficult, especially when different disciplines are involved;</li> <li>- alignment and realisation of individual and team goals;</li> <li>- subjects culturally different, e.g. discussing something openly is not common in engineering culture, or meeting in the lab three days a week for two hours of class time is common in design but not in engineering or business.</li> </ul>

Although Table 1 presents only a small number of examples, it is evident that similar challenges have been identified in all studies. A recurring theme is that difficulties in teamwork are caused by collaboration between students with different disciplinary cultures or subject cultures; hence, with a diverse “community of practice” (Wenger 2006). These disciplines have different work methods, different learning approaches and different ways of completing projects. Fry (2006) highlights the fact that “philosophies underlying their respective disciplines regarding modes of creativity are often at odds with one another. This encourages conflict and frustration”.

Findings from research conducted with design educators from eighteen Australian universities, reported elsewhere in detail (Fleischmann 2010), identified the following student collaboration challenges presented in Table 2:

**Table 2. Student collaboration challenges identified by Australian design educators in face-to-face interviews.**

Challenges	
Skills	- matching skill levels of the technical understanding and competence of students from different distinct academic areas.
Interpersonal skills	- common language missing; - communication in all forms; and - the notion of collaboration is little understood.
Assessment	- structural problems, especially with assessment – each discipline has specific requirements to ensure teaching and learning aims are met.

Findings presented in Table 1 and Table 2 indicate a range of challenges that appear to be common when design students engage in multidisciplinary collaborations. Key challenges appear on various levels; some are linked to different skill levels and difficulties arising through different discipline cultures and others relate to the management of teamwork and assessment procedures. What is interesting, however, is that the identified issues are essentially pragmatic, rather than reflecting fundamental curricular, or unsolvable pedagogic, challenges. Therefore, the attempt can be made to develop supporting strategies to help manage these challenges and ultimately prevent them from occurring.

## Enabling multidisciplinary collaboration

Based on the findings presented above, supporting strategies to manage multidisciplinary collaboration effectively and thereby support the functioning of the POOL Model framework were developed. This meant looking at what could be done to eliminate challenges. Table 3 outlines key areas in which challenges occur, the identified challenges (synthesised from Table 1 and Table 2) and implications (actions to be undertaken).

**Table 3. Managing challenges in multidisciplinary collaborations.**

What needs to be addressed at a pragmatic level?		
Key area of relevance	Challenges identified	Implications
<b>Skills and understanding of discipline</b>	<ul style="list-style-type: none"> <li>- different skill levels of participating students</li> <li>- a lack of understanding and/or appreciation of the other disciplines</li> </ul>	<ul style="list-style-type: none"> <li>- align learning outcomes of each participating discipline</li> <li>- build a shared learning environment that also allows the development of discipline-specific skills and their application to a collaborative outcome</li> <li>- specify joint and discipline-specific learning outcomes</li> <li>- educate students regarding the contribution of each participating discipline to the collaborative process in order to create an understanding of their value in the process</li> </ul>
<b>Work ethic/ Equal work load</b>	<ul style="list-style-type: none"> <li>- different work ethics amongst students regardless of discipline</li> <li>- different learning styles amongst students regardless of discipline</li> <li>- different levels of motivation amongst students regardless of discipline</li> </ul>	<ul style="list-style-type: none"> <li>- monitor and organise teamwork and collaborative interactions</li> <li>- formal teaching on teamwork, conflict resolution, etc. needs to be part of the learning environment</li> <li>- integrate teamwork exercises (e.g. ice breaker)/ communication exercises if disciplines have different discipline culture (e.g. IT and Design) and/or students are not known to each other</li> </ul>
<b>Communication/ Collaboration</b>	<ul style="list-style-type: none"> <li>- different disciplinary cultures lead to difficulties in communication</li> <li>- missing knowledge on effective collaboration amongst students regardless of disciplines</li> </ul>	
<b>Assessment</b>	<ul style="list-style-type: none"> <li>- assessment of different disciplines participating in collaboration</li> <li>- co-ordinate assessment between disciplines</li> <li>- fair assessment of individual performance in teamwork</li> </ul>	<ul style="list-style-type: none"> <li>- identify assessable joint and discipline-specific tasks (outcome) and teamwork related (process) assessment items</li> <li>- include peer and self assessment</li> </ul>

While the POOL Model framework presents a ‘big picture’ approach to digital media design education, more detailed pragmatics were developed to reflect the implications identified in Table 3, such as the integration of formal teaching regarding effective teamwork, the building of a shared understanding of the collaborative teamwork process, support for discipline-specific skill and knowledge development and assessment mechanisms to evidence and support learning. Figure 2 shows how learning and assessment are managed within the POOL Model framework (pragmatic principles), using two disciplines as an example of how this approach works in practice.

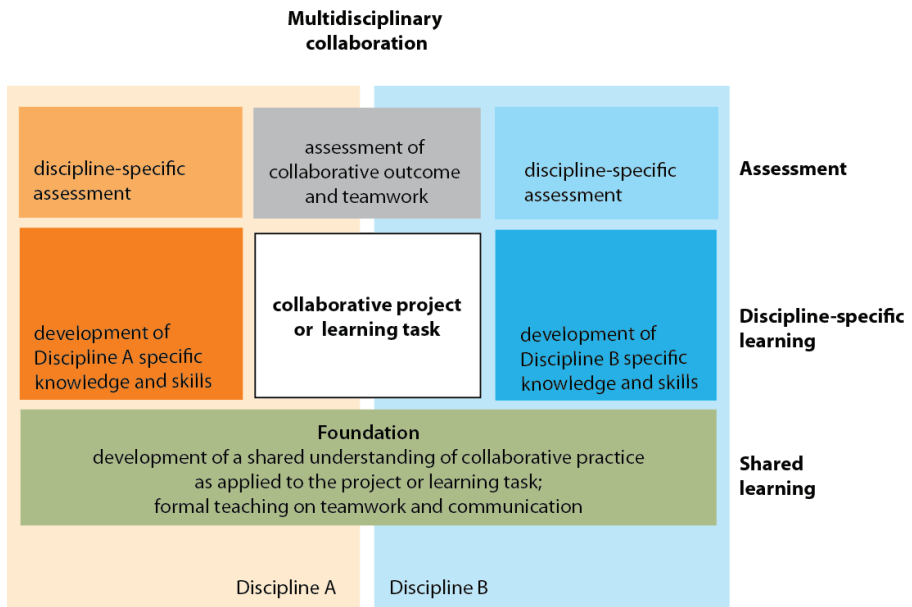


Figure 2. Pragmatic principles: managing multidisciplinary collaboration within the POOL Model framework.

These pragmatic principles were translated into a study plan for two disciplines initially (digital media design and IT), as shown in Table 4. The table overviews the specifics of the collaboration, showing details of the structure of the curriculum delivered and the activities that took place across the 13-week semester.

In order to expose students to realistic (authentic) challenges, students took on roles equivalent to those existing in the industry, as either IT developer or interface designer (2009-2010). To also integrate multimedia journalism students effectively into the multidisciplinary collaboration, the developed pragmatic principles needed to be expanded to include these students, starting in 2011. Therefore, the role of a multimedia journalist within a real world Web design team environment, for example, needed consideration. After seeking input from the Head of Journalism, an additional role within the multidisciplinary collaboration was created to cater for the workplace requirements of journalists. Discipline-specific lectures and workshops for multimedia journalism students were added and delivered by a journalism educator. This also included the assessment of this student group to be undertaken by the journalism educator. In order to build empathy and understanding across all disciplines, a lecture on Writing for the Web was delivered to all students. As a result, the project team had become an even more realistic reflection of industry practice.

**Table 4. Curriculum plan and structure for multidisciplinary collaboration between digital media design and IT students 2009-2010.**

Week	POOL Model framework core characteristics/pragmatic principles	Discipline Digital media design	Discipline IT	Learning outcomes shared	
1-5	Shared understanding  Web design industry professional as tutor to deliver up-to-date and industry relevant knowledge	<ul style="list-style-type: none"> <li>- lectures delivered by either IT or digital media design educator to both student groups to build common knowledge base and develop understanding for other discipline</li> <li>- team-taught lectures to expose students of both disciplines to interrelating disciplinary views on presented problem</li> <li>- learn how to design and develop a simple website, individual work</li> </ul>		<ul style="list-style-type: none"> <li>- elementary understanding of how to design and develop a basic website</li> <li>- produce a professional website</li> <li>- develop an understanding of how the two disciplines work together on website projects</li> <li>- understand and acknowledge each discipline's contribution to the project development process</li> <li>- document website development for further use/ extension (e.g. create production document, style guide)</li> </ul>	
6	Teamwork preparation	<ul style="list-style-type: none"> <li>- lecture on teamwork (team-taught)</li> <li>- practical icebreaker exercise (getting to know the other discipline)</li> <li>- team forming</li> </ul>		<ul style="list-style-type: none"> <li>- develop team working and communication skills</li> </ul>	
7-12	Discipline-specific knowledge/skills	Discipline-specific lectures delivered by design educator to digital media design students	Discipline-specific lectures delivered by IT educator to IT students	Learning outcomes for digital media design students:	Learning outcomes for IT students:
	Community client provides project  Teamwork	<ul style="list-style-type: none"> <li>- collaborative project; client briefing</li> <li>- weekly tutorial time is used to provide feedback from IT and design educators on project development process, indicating sources for self-directed learning, monitor teamwork, resolve teamwork issues and disputes</li> </ul>		<ul style="list-style-type: none"> <li>- create an information architecture and translate it into a functional user friendly navigation and interface design</li> </ul>	<ul style="list-style-type: none"> <li>- learn to use markup languages and style sheets and work with dynamic functionalities (PHP &amp; database) for creating a website</li> </ul>
	Web design industry professional as guest lecturer and advisor	<ul style="list-style-type: none"> <li>- presentation of prototype to web design industry professional, feedback</li> </ul>		<ul style="list-style-type: none"> <li>- produce images, graphics and animation according to</li> </ul>	<ul style="list-style-type: none"> <li>- become proficient in technical aspects of web</li> </ul>



13	Community client	<ul style="list-style-type: none"> <li>- presentation of project to client</li> <li>- feedback from client and educators provided</li> </ul>	technical requirements of the screen-based online environment	development, such as code validation, accessibility and usability issues
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## Methodology and research design

The presented study is part of a larger doctoral research project which is framed by a pragmatic approach. This allowed the researcher to choose methods that suit the real-world practice nature of the situation (Creswell 2003; Johnson and Onwuegbuzie 2004; Punch 2009). A parallel mixed methods research design was applied. Online questionnaires were used to collect quantitative and qualitative data from students in addition to focus group interviews (collecting qualitative data). This allowed for the triangulation of data obtained through different methods, providing corroborating evidence for the conclusions drawn, i.e. validation technique (Bazeley 2004; Johnson and Christensen 2008; Teddlie and Tashakkori 2009). Feedback was also obtained from educators involved, allowing further triangulation, of different data sources which would add depth and/or breadth to the study through “expression of different facets of knowledge or experience” (Bazeley 2004, p. 4). Although an in-depth qualitative data analysis was conducted on feedback received from students and educators, the scope of this paper requires a focus on quantitative findings primarily. Some qualitative feedback is used in this paper “to enrich the bare bones of statistical results” (Rossmann and Wilson 1985 p.636) and to illustrate the situation (Fielding 2012).

The following questions were explored to evaluate the effectiveness of the pragmatic principles supporting the multidisciplinary collaborative teamwork process:

- Was the multidisciplinary collaborative teamwork considered beneficial?
- Did students develop an understanding of the multidisciplinary collaborative teamwork process?
- Did each disciplinary group have the opportunity to concentrate on their own area of expertise while being part of a multidisciplinary team?

## Findings and discussion

Table 5 presents quantitative feedback from students in regard to the effectiveness of the POOL Model framework and its implemented pragmatic principles over a period of three years. Findings are presented for each participating discipline group per year and a 3-year average is presented in the last column.

The 3-year average gives an indication of the overall positive outcome across all disciplines. Looking specifically at disciplinary groups, a high percentage of students in each group believed the multidisciplinary collaboration to be beneficial. Only 19 from a total of 198 students (8%) across three years thought that this was not the case. The students’ reflection on their ability to develop an understanding of the multidisciplinary teamwork process was similarly positive, with only 18 of the 198 students (8%) stating that they were unable to develop such understanding. The feedback from students of all discipline groups has shown significant support for working in multidisciplinary teams.

**Table 5. Students' perspectives on multidisciplinary collaboration 2009-2011.**

		2009		2010			2011			3-year average
Discipline (2 <sup>nd</sup> year undergraduate)		IT	DM D	IT	DM D	MM J	IT	DM D	M MJ	
Did your project benefit from working in a multidisciplinary team?	Yes	100% (24)	95% (19)	86% (2)	88% (28)	100% (4)	79% (23)	91% (42)	100% (14)	92%
	No	0% (0)	5% (1)	14% (4)	12% (4)	0% (0)	21% (6)	9% (4)	0% (0)	8%
Do you think that you have developed a better understanding of how people from IT and Design can work together on such projects?	Yes	100% (24)	100% (20)	86% (2)	91% (29)	100% (4)	83% (24)	94% (43)	79% (11)	92%
	No	0% (0)	0% (0)	14% (4)	9% (3)	0% (0)	17% (5)	6% (3)	21% (3)	8%
Do you feel that you could explore and concentrate on your area of expertise while being part of the multidisciplinary team?	Yes	92% (22)	90% (18)	93% (2)	78% (25)	50% (2)	86% (25)	76% (35)	93% (13)	82%
	No	8% (2)	10% (2)	7% (2)	22% (7)	50% (2)	14% (4)	24% (11)	7% (1)	18%
Number of student participants		24	20	29	32	4	29	46	14	
IT = Information technology, DMD = Digital media design, MMJ = Multimedia journalism										

When looking at each discipline and their ability to continue to develop discipline-specific skills, Table 5 shows that some students had difficulties with this aspect in the multidisciplinary collaborations. Digital media design students reported more problems with this than the other discipline groups, with a 3-year average of 19% of digital media design students (10% in 2009; 22% in 2010; 24% in 2011) stating that they were not able to continue to develop discipline-specific skills. The number of digital media design students who were able to concentrate on their area of expertise (81% across three years) is still relatively high and considered a positive outcome, especially considering the fact that these students had engaged in such multidisciplinary collaborations for the first time during their course of study when undertaking *Web Authoring 1*. Nevertheless, challenges that had prohibited a more positive outcome needed to be further investigated.

When exploring why 19% of digital media design students (20) across three years were unable to concentrate on their area of expertise while being part of a multidisciplinary team, the following factors emerged:

- some digital media design students worked in a self-chosen non-design role, which required exploring other areas;

- team problems were raised relating to different work ethics resulting in unequal workloads and communication problems;
- team members were reported as not being skilled enough or not doing what they were supposed to do, and therefore a student had to take over another discipline's part; and
- students' design work was not valued and/or another designer's idea was selected within the team.

It is notable that identified challenges do not directly relate to the different disciplines working together; rather, they can be identified as issues arguably occurring in any kind of group or teamwork. In the case of communication problems, they clearly related to teamwork or work ethics problems caused by individual students, as the following comment shows:

There were a few communication issues, where some people would not respond or contact the team via the modes of contact they asked to use at the beginning of the project. This just made things difficult to plan. (Multimedia journalism student)

On the contrary, some students specifically mentioned the development of communication skills; one example from each discipline is presented in the following:

We had to communicate really well, because they might not understand why we've designed the page in a certain way. And we might not understand why we can't do certain things because it needs to work out from the IT side of things. (Digital media design student)

You get experience communicating with someone who isn't necessarily at the same level of knowledge as you are. So you've got to put things in a way that they can understand or figure out what they know before you just bombard them with information. (IT student)

You've got to have really good communication because some team members might not understand your point of view so much. (Multimedia journalism student)

It needs to be noted that although assessment strategies were developed and are considered important in supporting the functioning of multidisciplinary collaborations in undergraduate design education, given that students view assessment as a key element of the learning experience, their effectiveness was not explored within the scope of this study. However, when analysing qualitative feedback from students, comments on assessment being "fair" or "unfair" did not emerge.

The overall positive feedback from students of all disciplines indicates that the pragmatic principles were effective. The feedback from the group of multimedia journalism students in particular best shows how the pragmatic principles worked in practice. Adding discipline-specific content (lectures and workshops) in 2011 for multimedia journalism students as well as including a journalism educator for the delivery of content and assessment had a positive effect, with 93% of the multimedia journalism students stating that they could concentrate on their area of expertise while participating in the multidisciplinary collaboration. In the previous year (with pragmatic principles applied for digital media design and IT students), only 50% of multimedia design students stated the same. It is acknowledged that the feedback received in 2010 was from a very small number of students (4) and generalisations could not be drawn. Nevertheless, the feedback was an early indicator that adding disciplines without specifically defining joint and discipline-specific learning outcomes and means of

assessing the discipline may inhibit the achievement of beneficial outcomes for those additional discipline groups. Ultimately, this led to the decision to apply the pragmatic principles to effectively integrate multimedia journalism students into the multidisciplinary collaboration, which resulted in a very positive outcome with only one multimedia journalism student (7%) reporting an inability to concentrate on his/her area of expertise while being part of the multidisciplinary team.

When exploring educators' perspectives on the structured approach to multidisciplinary collaboration, all educators involved during the three-year period reflected positively on it. The following comments from an IT educator provide some insight into the integration of the three diverse disciplines:

We're doing quite well with design and IT together. We're seeing better results than we ever got in our separate disciplines. ...That is because students understand that it's not just here's my bit and here's your bit, but here's us working together on it.

My overall feeling is that we have more exceptional projects. I think our efforts in explaining how design, IT and journalism work together and how it is visible on a website paid off.

Some of the journalism students created good content, and there were some excellent homepages with good blurbs that were well written. ... I think they had that incentive of not being just thrown into a design subject, but put into a subject that has a relevant journalism aspect...

The effectiveness of formal activities, such as teaching on effective teamwork and communication, was explored with educators. They agreed that integrating these formal elements was valuable and, in fact, needed. One educator commented:

Teamwork doesn't happen on its own. There is leadership involved and team organisation and you can't just all sit and wait for it to happen... We actually got them to write down methods of communication, plans for communicating properly... we didn't just put them in a group and hope they would work together. ... In terms of communicating across, ...there didn't seem to be too many communication problems between design and IT.

The journalism educator also highlighted the benefits of multidisciplinary collaboration and its relevance for students' employability:

I see the skills offered in this subject as being highly beneficial for journalism students who are entering a changing media landscape where they may often be working in small teams... This subject engages students in team building and helps them realise how their journalism skills might be used. Some of our graduates end up working for small Web-based companies so this subject also helps them become more work ready. (Journalism educator)

In summary, the educators involved in this three-year trial considered multidisciplinary collaboration beneficial for students from each participating discipline. In fact, all educators would prefer this way of learning and teaching to continue in the future.

## Conclusion

While there is a saying that too many cooks spoil the broth, the contrary is true for designers and their education. Multiple and diverse disciplines are required to formulate responses collaboratively for a world of increasing complexity and change. Design education must enable students to participate in multidisciplinary collaborative processes in their future work environment. The POOL Model framework was developed to better prepare digital media design students for a work environment in which they will be required to create and innovate with people who have work methods and a style of communication different from their own. A highly structured approach was developed to manage multidisciplinary collaboration at undergraduate level. The developed pragmatic principles (e.g. integrate teaching of teamwork skills, offer discipline-specific and shared learning content for each participating discipline) supported the majority of digital media design students and students from other disciplines in interacting with each other and helped them manage the multidisciplinary teamwork process effectively. Challenges that were identified as commonly occurring in multidisciplinary collaborations, and in particular when undergraduate design students engage with students from disciplines beyond the creative arts, have, to a large extent, been absent.

Because the POOL Model framework presents an industry-reflective approach to design education, and is dependent upon the nature of the project or problem, the learning and teaching pool can be expanded to include more disciplines. While this study looked at collaborations across three diverse disciplines, more research is needed to explore the effectiveness of the pragmatic principles when even more disciplines are involved.

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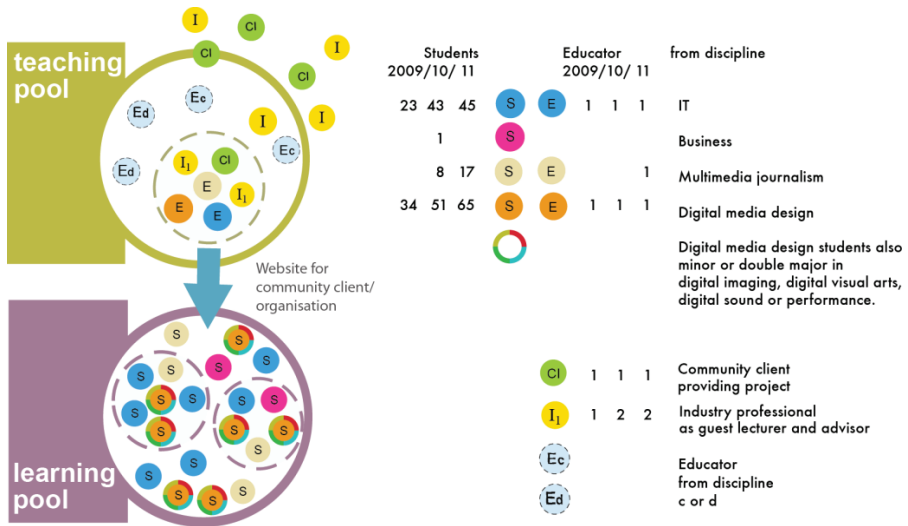
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## Appendices

### Appendix A

POOL Model framework and participants in the collaborative subject offering during 2009-2011.



### Appendix B

List of published examples from undergraduate design education analysed.

	Author
1	Ebert and Bailey 2000
2	Duesing and Hodgins 2004
3	Dickey 2010
4	Rothstein 2002a, 2002b
5	Melamed, Page and Scott 2004
6	Welsh, Murray and Privitera* 2005
7	Privitera and Zirger 2006

\* This conference paper was published with a spelling error in the name of the third author. The correct spelling should be: Welsh, Murray, and Privitera.

# Teaching the Design of Narrative Visualization: Using Metaphor for Financial Literacy and Decision Making

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**Abstract:** *The authors provide a scholarly definition for metaphor-rich, story-driven “narrative visualization,” and assert the importance of this methodology in contemporary design education. They propose “narrative visualization” as especially useful in promoting financial literacy: a context in which design can both facilitate understanding and possibly influence behavior. This emotionally-engaging means has the potential to affect the “System 1” intuitive decision-making processes that Kahneman and others have identified as the primary drivers of financial behavior. The case study here presents a recent design course that was customized to teach “narrative visualization” in a financial-literacy context. Student work from that course is examined through a newly-devised framework: the infoEmotion<sup>®</sup> matrix of visual and content elements. The infoEmotion<sup>®</sup> matrix is introduced here as a first step toward establishing best practices for teaching “narrative visualization” and for assessing animations, graphic novels, informational short films, and illustrations.*

**Keywords:** *Design education, Narrative visualization, Information design, Metaphorical visualization, Behavioral finance, Financial visualization, Financial illustration Financial literacy, Financial education, Financial capability*

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## Introduction

In this paper we assert the importance of narrative visualization methodologies as part of a contemporary design education, and argue that narrative visualization is especially important in any context in which design can both facilitate understanding and potentially influence behavior (e.g., public health, disaster management). Recent research in behavioral economics suggests that such narratively-driven approaches to information design (in particular, their reliance on metaphor), engage the cognitive dimensions of “System 1” thinking, and thus have a strong impact on decision-making. Narrative visualizations are thus a crucial tool in the growing field of financial literacy.

The 2008 recession prompted governments and non-profit organizations in the U.S. and other countries to step up their efforts to improve financial literacy among the public (c.f. the Financial Literacy Research Consortium, <http://www.ssa.gov/pressoffice/pr/flrc-pr.htm>). As with public health, disaster management, and other areas of public importance, one of the key research and funding priorities has been to develop more effective communication strategies and educational resources. Existing financial literacy materials—however thoroughly planned and assessed—often lack consistent, comprehensible design methodologies. (Please note that for policy-makers the word “design” usually connotes only the design of research instruments such as surveys or studies.) This lack of methodologies presents a significant opportunity for design educators and designers in the 21<sup>st</sup> Century. In the design classroom, financial literacy provides an excellent context within which to give students an understanding of how narrative visualizations function; financial literacy also provides opportunities for students to broaden their skills in information design to include a wider range of visualization strategies.

This paper is in two parts. In Part 1 the authors present our definition of “narrative visualization”: in particular, its reliance on visual metaphor. We then relate the emotional and cognitive impact of narrative visualizations to recent research in behavioral economics and to psychological studies regarding individuals’ interpretation of information and making of financial decisions. In Part 2 we apply these insights to a case study in which design educators and financial educators collaborate to approach financial literacy as a “design problem” for students in a design class. We develop a conceptual framework that we call an “infoEmotion® matrix” which defines the constituent factors of a typical narrative visualization, and we use it to analyze two examples of student work. Finally, we discuss how the infoEmotion® matrix may be used to develop assessment tools for educators, and we outline directions for future work.

### *Part I: Narrative Visualization and Behavioral Economics*

#### *Defining “narrative visualization”*

The authors define the term “narrative visualization” to refer to illustrations, animations, storyboards, and graphic novels that engage the viewer with metaphor and storytelling. This is very different from the use of the same term by researchers such as Edward Segel and Jeffrey Heer (Segel and Heer 2010) from the computer- and graphics-oriented Stanford VIS group (<http://vis.stanford.edu/>), who emphasize the storytelling aspects in visualizations of complex data sets and other schematics. In the financial literature, data-driven visualizations are intended to provide context, amplification, and cognitive assistance in interpreting data by highlighting, illuminating, suppressing, or

supplementing the financial information that is embedded in the data. This important data-driven work certainly has implications for the emerging field of “data journalism,” but the “Stanford” use of the term “narrative visualization” is very different from the “Parsons” use here.

In contrast, the authors’ (“Parsons”) definition of “narrative visualization” refers to the kinds of illustrations that are frequently used to explain financial concepts and elements in financial journalism and financial education materials (see Figure 1). Largely hand-drawn and pictorial—combining simple imagery with graphic elements—these visualizations use metaphors and implied relationships to imbue complex financial concepts with emotional or conceptual context. These narrative visualizations often depict emotional cues (pain, fear, joy) overtly through a character’s body language and facial expression when referencing issues that have emotional resonance for the viewer. This resonance allows viewers to engage with the concepts on an intuitive basis—one that relates to heuristic-based “System 1” thinking (Kahneman 2011). As we discuss in the section “Two systems thinking” below, the intuitive engagement that narrative visualizations engender may have a significant impact on financial decision-making and behavior.

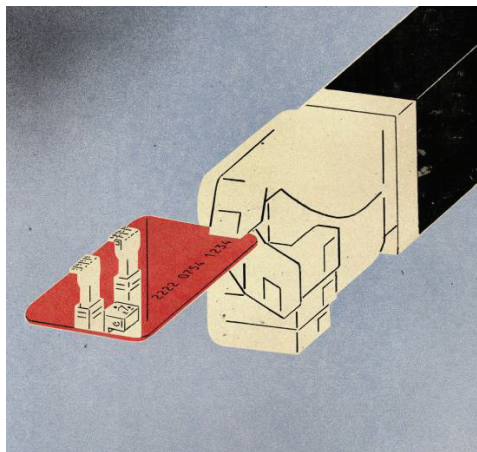


Figure 1. “Avoiding the Credit Card Trap,” David Plunkett, *Business Week*, Feb. 13, 2006

Comparison of the two examples highlights some differences between data-based and narrative-based visualizations. The visualization in Figure 2 lies somewhere along a continuum ranging from “pure” information/data-driven to “pure” pictorial/narrative, and integrates elements of both. Figure 2 illustrates the ways in which metaphors can be embedded deeply and implicitly in a visualization that would otherwise seem primarily schematic. This flow chart plots the evolution of the 2008 financial crisis through two narratives that develop over time. The narratives are composed of sequences of events that overlap chronologically: one fuels a speculative frenzy while the other results in financial crisis. Both sequences of events are framed by two overarching metaphorical associations: green = proceed/safe; red = stop/danger.



Figure 2. "A Visual Guide to the Financial Crisis," Mint.com, November 13, 2008

As the sequence of events and actions accelerates, the background shifts from neutral (or possibly clear) blue sky to green, and then from blue sky to red. Analysis of this image hints at the underlying tension between factual information (or data) and the subjectivity of the metaphorical frame through which it is encoded and communicated. Because the viewer reads this graphic top to bottom, the crisis is identified with a descent or downward orientation. The frame emerges as a form of master narrative that directs the complexity of the data in deterministic and, data purists may claim, reductive ways. "Hybrid" visualizations of this kind point to the fact that maps of any kind are metaphorical: the question is not whether metaphors are present, but how apparent they are to the reader.

Figure 1, in contrast, is rich in explicit metaphorical content. Illustrating a man hanging onto the edge of a credit card by his fingertips, it is a dramatic representation of the feeling of financial "abyss" that many experience in their relationships to credit and to the credit industry. As in Figure 2, the red color signifies danger. The card/abys is proffered by a disembodied hand, which represents the financial system as an impersonal, oppressive, and rigid machine. Rigidity and impersonality are further signaled by the geometric, mechanical rendering of the line that outlines the shapes and by the contrasting scale between the big man/big hand and small man/small hand. The article accompanying the illustration explains how banks arrange the order of debit card transactions at the end of the day to maximize the number of times that the customer can be charged overdraft fees.

The narrative suggested in Figure 1 does not lie in the depiction of a linear sequence of events; rather, it appeals in a visceral and emotionally-laden way to the viewer's anxieties surrounding excessive debt, bank practices, and financial insecurity. Its explicit use of metaphor is crucial to understanding how this image functions, because the associations arising from the metaphor frame the financial content in ways that affect the viewer's interpretation of the image and the way credit is subsequently viewed.

Besides asserting that the depiction of emotional content *is* information visualization (of a very different kind from data visualization), the authors also contend that the supportive role of metaphor in conveying emotional content—present in these kinds of information visualizations—has been insufficiently studied, primarily because analyses of metaphorical devices have focused historically on their written and oral forms. More recently, interest in the formal aspects of visual and other representations of metaphors has broadened to include multimodal forms (Forceville 2010). One key to understanding the impact of metaphors in narrative visualizations of the kind shown in Figure 1, however, is conceptual metaphor theory.

### *Conceptual metaphor theory*

Conceptual metaphor theory grew out of the seminal work by George Lakoff and Mark Johnson who asserted that metaphors are primarily a product of perceptions about the world rather than a product of language. In *Metaphors We Live By* (Lakoff and Johnson 1980), they argue that metaphors structure the way individuals think, and that many metaphors have their origin in physical experiences in the world. They analyze families of metaphorical associations around ideas such as “life is a journey” and “argument is war” to demonstrate how these metaphorical phrases both shape and are shaped by the way humans conceptualize different aspects of their lives. Of particular relevance to financial visualizations are the “orientation” metaphors that underlie ideas such as “up” is good and “down” is bad. As Lakoff and Johnson suggest, these associations may have arisen because of humans' physical stance in the world: facing the world from a vertical position, so lying down is associated with illness or weakness. Regardless of the origin, the association of up-as-increase pervades how individuals “read” information, and how they organize their visual schema. Quantities are graphed along a vertical axis in which up is associated with more and down with less; similarly, the phrase “GDP is up” connotes positive change. Conversely, the metaphorical phrase “falling into debt” denotes imminent peril (as reinforced visually by the dangerous position of the protagonist in Figure 1).

The metaphors used in narrative visualizations thus do more than provide convenient visual symbols for abstract concepts. They draw upon and reinforce existing conceptual frameworks. The use of the credit card to represent a potential financial/physical abyss in Figure 1 is made more powerful by the conceptual (and experiential) association of “falling” with “danger” and our likening the feeling of being in debt with that of insecurity. The strength of these associations encourages the viewer to “buy into” the framing implied by the visualization (“credit is dangerous”), and this ultimately influences both the way the viewer thinks about personal credit and the way he/she subsequently behaves. This last claim is supported by recent research in the field of behavioral economics, which examines how individuals form judgments and make decisions about financial and other aspects of their lives..

## *Behavioral economics*

The neoclassical model of economics assumes individuals have unlimited information, resources, time, and know-how, which they use rationally to determine optimal decisions. In contrast, behavioral economics draws on results from clinical experiments on decision-making: these experiments conclude that individuals tend to rely instead on a series of simple heuristics (or rules of thumb) that codify ingrained habits of thought and systematic biases. One factor critical to this less-rational decision-making is the way that choices are framed. In “The Framing of Decisions and the Psychology of Choice,” (Tversky and Kahneman 1981), Amos Tversky and Daniel Kahneman assert that reliance on frames to interpret information and to make decisions is both significant and empirically verifiable: when the frame shifts, so do decisions. “[B]ecause the value function is steeper for losses than for gains, a difference between options will loom larger when it is framed as a disadvantage of one option rather than as an advantage of the other option.” (Tversky and Kahneman 1981, p. 211).

The economist Richard Thaler describes this theory in the context of consumer behavior using the following example:

...credit card companies banned their affiliated stores from charging higher prices to credit card users. A bill to outlaw such agreements was presented to Congress. When it appeared likely that some kind of bill would pass, the credit card lobby turned its attention to form rather than substance. Specifically, it preferred that any difference between cash and credit card customers take the form of a cash discount rather than a credit card surcharge. This preference makes sense if consumers would view the cash discount as an opportunity cost of using the credit card but the surcharge as an out-of-pocket cost. (Thaler 1980, p.45).

Individuals’ reliance on the “frame” to make decisions is analogous to reliance on visual perspective to make judgments about relative size and position when navigating physical space. As Tversky and Kahneman note (1981: 457), “changes of perspective often reverse the relative apparent size of objects and the relative desirability of options.” Changes in the visual framing of situations can reverse an individual’s thinking about the relative merits of two positions.

Metaphors also create frames and encourage changes in perspective, articulating what Donald Schön and Martin Rein in “*Frame Reflection: Toward the Resolution of Intractable Policy Controversies*” (Schön and Rein 1994) refer to as “cognitive frames.” Consider the two narrative visualizations in Figures 3 and 4. These illustrations have a common subject—that of US taxpayers’ “rescue” of the federal mortgage associations, Fannie Mae and Freddie Mac—but the framing of each is quite different.



Figure 3. "Bailout," Joe Barbee, September 7, 2008



Figure 4. Bailout cartoon, Heng Kim Song, 2009

In Figure 3, Fannie and Freddie are depicted as the arms of a drowning man needing to be saved ("thrown a lifeline") by taxpayers. In this illustration, the taxpayer is rescuing the insolvent Freddie Mac and Fannie Mae. The text in the first, "we need a bigger boat," aligns with the neoclassical model of logical decision-making in that it makes an essentially rational appeal for more capitalization. In contrast, Figure 4 depicts the taxpayer not as empowered rescuer, but as hapless victim. The taxpayer (shown as a boat) is imminently threatened by Fannie Mae (overweight individual), while Freddie Mac, equally overweight, passively waits to be rescued from the roof of one of many "underwater" houses.

The significant frame shift between the two images is the ways in which these agencies are understood. In the first illustration the reference point for Freddie Mac and Fannie Mae is represented by hands of a vulnerable man in urgent need of rescue; in the second Freddie and Fannie are seen as perhaps equally in need of rescue, but undeserving of it, putting their own survival selfishly and recklessly ahead of that of both the underwater homeowners and the U.S. taxpayer. Put another way, in Figure 3 Fannie and Freddie are most at risk; in Figure 4 the U.S. taxpayers are most threatened.



Illustration’s historical importance as a medium for political persuasion is something of a testament to its capacity to shift frames (reference points, perspectives, and points of view) through extensive use of visual metaphor.

### *Two systems thinking*

The “two systems” approach to understanding cognition was postulated by psychologists Keith Stanovich and Richard West (Stanovich and West 2000), and later elaborated by others (c.f. Wim De Neys 2006). In *Thinking, Fast and Slow*, Daniel Kahneman (Kahneman 2011) outlines the differences between what he terms System 1 and System 2 thinking which the authors summarize in the following table:

System 1	System 2
<p><b>Intuitive</b> fast automatic effortless <i>without voluntary control</i></p>	<p><b>Analytical</b> slow careful effortful <i>requires high degree of voluntary control</i></p>
<p>System 1 is particularly good at comparing, averaging, identifying surprises from normal expectations, gauging intensity levels of attributes, and representing sets (of data) as prototypes and norms.</p>	<p>System 2 is particularly good at computational tasks: sums, correlations and statistical tasks. It catches inconsistencies and anomalies in System 1 thinking, but will only be deployed when System 1 thinking encounters a problem it thinks it can't solve.</p>

Table 1

System 2 thinking is analytical: it requires a careful consideration of details, and an ability to work through and rationally weigh all the options. System 1 thinking is based on heuristics and on intuitive understanding of situations. System 1 thinking is also lazy: as Kahneman notes, thinking rationally is hard work:

“(we) gravitate toward the least demanding course of action (because) in the economy of action, effort is a cost, and the acquisition of skill is driven by the balance of benefits and costs. Laziness is built deep into our nature” (Kahneman 2011, p.35)

When faced with new information, System 1 thinking creates a fast holistic picture of the situation, often relying on metaphors (whether verbal, conceptual or visual) to provide a rapid sizing up. It uses metaphorical framing to guide the individual’s interpretation of the situation and subsequent actions. When comparing narrative visualizations such as those in Figures 3 and 4, System 1 thinking supports metaphorical framing to guide the viewer to consider Freddie Mac/Fannie Mae in two very different ways.

### *Narrative visualization*

The authors assert that visual metaphor is central to the effectiveness of financial communication through narrative visualization for the following reasons:

i. By being visual, illustrative metaphors engage perceptual intuition. Color, texture, the angle of a gaze, the tilt of a head, all offer very subtle yet unmistakable cues that are understood at the very instant they are perceived. System 1 thinking is primordial: it will instantly detect a sharp look, a change in the environment, or a subtle variation in tone of voice. It does this extremely quickly (often in a fraction of a second), and is

therefore a cognitive function whose development is strongly related to survival reflexes.

ii. By being metaphorical, illustrations require little new skill acquisition and investment. Conceptual Metaphor Theory demonstrates that individuals already have an available storehouse of embodied understandings of the world (the learning completed since childhood) and additionally have an equally vast repository of the sociocultural understandings gleaned from thousands of hours of listening to others, playing, interacting socially, watching television, acquiring language, and being schooled. By activating associative memory, metaphors allow individuals to access what has already been learned (with considerable effort) and to bring together these elements more effortlessly in new configurations and contexts.

iii. Visual metaphors are effective in helping viewers to change a perspective or point of view. These metaphors do not only have the capacity to inform, but to influence; therefore, in combination with an increased capacity to process cognitively, they also have the capacity to alter attitudes and behaviors.

The next part of this paper presents two pedagogical examples from a design class in which narrative visualization principles were taught, and an evaluation of these examples using the infoEmotion<sup>®</sup> matrix: a prototype framework for the analysis of narrative visualization.

## **Part II: Narrative Visualization and Design Education**

### *Design 4: A case study*

#### PURPOSE

In the Design 4 course at Parsons, students acquire the basic communication-design skills for engaging and informing through visual means. A dedicated section of this course in Spring 2012 encouraged students to extend their inquiry toward using design and metaphor to influence behavior.

#### CONTEXT

Parsons the New School for Design offers a wide range of design programs, but also an undergraduate management program that awards a Bachelor of Business Administration degree. The Strategic Design + Management program teaches design-infused management skills to students interested in the application of design-oriented innovation to the operation of business.

In the first two years of the program, students take courses in economics, social theory, marketing, statistics, art history, and written communication, as well as a four-course sequence of design studies. This design studies sequence is intended to enable students to evidence a synthesis of design with management as they progress to the upper levels of their degree program. The final course in the design sequence—Design 4—is a continuation of “Design 3: Visual Organization and Information Design,” with an

emphasis on the latter. Students explore information design by examining and creating visual communication in the form of page layouts, diagrams, charts, pictograms, maps, and instructional materials. The class is studio-based and draws upon previously-acquired design and technology skills.

In Spring 2012, The Visualizing Finance Research Lab offered a topic-specific section of this course, called “Design 4: Visualizing Finance,” asking students to consider questions such as “How can information design be used to make sense of a complex world? How can we evaluate data, events, processes, and organizational systems visually? How can information design inform good (and bad) decisions? How can it be used to learn something new, tell stories, and build awareness about ourselves and the world we live in?”

“Design 4: Visualizing Finance” was a modified section of the Design 4 course, which was originally configured to teach information design conventionally: through the graphical representation of data. The explicit purpose of the Visualizing Finance modified course was to teach “narrative visualization.” This was an ambitious goal: first because a course based on conventional information design should ideally precede one based on narrative visualization, and second because narrative visualization demands a variety of complex interpretations and analyses, the totality of which are difficult to accomplish within fifteen three-hour weekly class meetings.

The course assigned three projects; the first two were intended to provide a quick foundation of basic principles. The first project was a “data self-portrait” to articulate and cross-reference quantitative (numerical and countable) factors within aspects of the student’s life (e.g., food consumption, utilization of time, budget). This required primary data gathering—such as accumulation of receipts and recording of events—as well as analysis, coding, and categorization into basic typologies of activity. Visualizations of these data were ideally encapsulated within metaphors that referred, more or less directly, to the student, although in practice this final requirement was seldom accomplished. The second project was a narrative consisting of “key frames” or single events, arranged sequentially to tell the stories of the students’ passage from awaking to their arrival in the class at midday. The purpose of this was to familiarize the student with the editing process of converting longer narrative chains into a succinct and selective sequence of key events, and to present these events in a visually and emotionally engaging manner.

The third and principal project was creation of a brief video or animation depicting a financial decision-making process and incorporating data and financial concepts. This represented The Visualizing Finance Research Lab’s first attempt at implementation of some of the design insights described in this paper, beginning to develop and test a methodology for creating narrative visualizations in both academic and professional contexts.

#### COLLABORATION

For this final project, the Design 4 class partnered with a class called “Personal and Consumer Finance,” which was taught at The City University of New York’s professional-development evening school for working adults. This CUNY course is designed to train community leaders to work as financial counselors with individuals in various underserved populations, especially with immigrants and the economically disadvantaged.

This partnership encouraged Design 4 students to a more user-centered design process by “spending time with users/citizens in their own environments, rather than

working on a project abstractly in another space” (Chick 2012, referencing Manzini, 2006; Thackera 2007; Pilloton 2009), and by recognizing the expertise that resides in those whose interests are affected by the problem and its proposed solution (Chick 2012).

The counselor-training partnership provided context and content for the design students in several ways:

- acquainted students with populations different from their own
- required students to recognize and incorporate cultural and socioeconomic factors outside their own experience
- gave students live/simulated dynamic representations of financial behaviors and decisions
- provided a story line based on financial counselors’ experience with target audiences

The CUNY course can also be seen as a consumer/client for the completed student work: materials that were intended to be responsive to user needs by being

- culturally relevant to the target populations
- richer and more emotionally engaging than existing informational materials
- available to individuals and for use in counseling, education, or training sessions

The partner’s expected field usage of these materials can in future provide opportunities for critique from trainers, practitioners, and end users; also opportunities for assessment of the materials’ effectiveness.

#### BACKGROUND OF PARTNER

The “Personal and Consumer Finance” course at The City University of New York was originated and developed over several years by Ms. Joyce Moy, an educator/activist/attorney who has extensive experience developing support structures for underserved populations. Ms. Moy has written a course-specific textbook that makes substantial use of practical examples, scripts, and role-plays drawn from the experiences of Ms. Moy and of financial counselors. In several class sessions, the CUNY students engage in a role-play that simulates a counseling session on a specific financial topic and on related behaviors. Each role-play is a complex and multifaceted encounter, organized in a narrative form to train the counselors across the multiple dimensions required of them in a professional context. These dimension include

- empathy and interpersonal communication (present in body language, tone of voice, and verbal choices for dialog)
- command of information and reference to available resources
- analysis of data, financial analysis, and planning
- decision-making ability
- ethical/legal integrity

The simulated session is then discussed by the instructor and remaining class members, assessing the counselor’s emotional intelligence and command of factual information, as well as the psychological and cultural factors involved in the clients’ problems, behaviors, and possible solutions.

#### METHODOLOGY

Selected students from the Design 4 class visited the CUNY “Personal and Consumer Finance” class on several occasions: first as observers, familiarizing themselves with the

target populations, some financial concepts, and the purpose of financial counseling. In a subsequent visit, the Design 4 students and instructor videotaped a simulated counseling session.



Figure 5. Video still from financial counseling role-play, “Fin 180, Personal and Consumer Finance” The City University of New York

The role-play scenario concerned a young couple who are visiting the financial counselor because they want to marry; however, the man’s father had accumulated credit card debts in the son’s name and the son’s credit score was badly compromised. This situation was affecting the couple’s decision to marry, and potentially affecting the couple’s plans for a family and home of their own.

Back in the Parsons Design 4 classroom, students were provided with a printed version of the role-play scenario and with uploaded versions of the video. The students formed groups of two or three to process the information in the role-play and to draft narrative and visual strategies for the interpretation of the material. The instructors from The Visualizing Finance Research Lab provided a brief explanation of the financial content and context of the role-play. Students were then asked to present financial concepts directly through explication (text, graphs, and dialog), and metaphorically through the creation of characters, settings, and a narrative story line. Specifically, students were required to create a narrative, time-based representation of the financial role-play, which identified and incorporated both content elements and visualization elements:

#### Content Elements

##### Financial factors:

- Data and information, such as numbers, budgets, facts
- Concepts: time value of money, negotiation, legal information such as policies, loan terms, etc.

##### Behavioral aspects:

- Consequences: financial and emotional
- Negotiation and decision processes: skills, strategies, and methods
- Ethics: the right/wrong thing to do
- Culture: norms, expectations, and understandings within a community
- Emotion: personal and subjective factors (relationships, loyalties, opinions)

##### Visualization Elements

- Graphs/maps
- Text: on-screen text/data
- Dialog: monologue, verbal explication, through characters or voiceover
- Setting: staging, including objects and props
- Character: including archetype(s)/metaphor(s)
- Body language, expressed by character(s)
- Facial expression, expressed by character(s)
- Tone of voice, expressed by voiceover and/or by character(s)

It has only been on reflection that the authors have been able to synthesize these elements, formulating them into a tool that we call the infoEmotion<sup>®</sup> matrix (Table 2). In this we have organized the Content Elements in descending order from generally more analytical (or System 2) to generally more intuitive (or System 1) elements. A similar ordering from left to right was used in the organization of the Visualization Elements. The matrix is a framework for analyzing and identifying the presence and intensity of the elements that constitute a narrative visualization of a financial concept. This intensity is visually represented in a range from absence of an element (indicated by blank space) to moderate presence (pale-gray filled circle) to high intensity (darker-gray filled circle). Table 2 also represents a range of elements typically seen in narrative visualizations in the media, in financial education materials, and in student work. The authors are currently using the matrix to identify the relative presence or absence of these elements, and Table 2 should be viewed as a rough approximation of a typical narrative visualization.

Content Element:		Visualization Element:									
		Graph/map	Text	Dialog	Object	Setting	Character	Body language	Facial expression	Tone of voice	
System 2 Analytical requires a high degree of voluntary control	Financial: data	●	●		●						
	Financial: information	●	●	●	●						
	Financial: concept	●	●	●	●	●	●				
	Behavioral: consequence	●	●	●	●	●	●	●	●	●	
	Behavioral: decision process	●	●	●	●	●	●	●	●	●	
	Behavioral: negotiation	●	●	●	●	●	●	●	●	●	
System 1 Intuitive without voluntary control	Behavioral: ethic		●	●	●	●	●	●	●	●	
	Behavioral: culture			●	●	●	●	●	●	●	
	Behavioral: emotion			●	●	●	●	●	●	●	

Table 2. Visualizing Finance Laboratory infoEmotion<sup>®</sup> matrix

Our matrix does not address genre or other external factors because it was developed only to identify content and visualization elements that drive a narrative visualization. Metaphor is implied throughout Table 2: it has the ability to fill the blank spaces in the matrix and to create bridges between the content and visualization elements in each axis. Metaphor can communicate a financial concept in the form of a character as in the example of Figure 4, in which the metaphor of a “bloated bureaucracy” is expressed visually in the character of Fannie Mae as an overweight woman.

Use of metaphor helped students to strike an appropriate balance between narrative aspects (dialog, situation, and emotional tenor) and the practicalities (financial data and choice options) in their time-based narratives. Students came to understand that “real-world” financial situations incorporate a complex layering of frames—behavioral/emotional and cultural/familial, as well as the more pragmatic or

information-based—and that these situations often arise from decisions that are intuitive rather than analytical/rational. Experienced financial counselors can attest that while each scenario may have certain similar elements (family expectations, distrust of financial institutions, avoidance of reality, overconfidence in ability to “deal with it” etc.), yet each scenario cascades into a plethora of (often unforeseen) financial consequences.

The Parsons students had to make decisions about how to condense a 12½-minute role-play into a 3½-minute clip. They reprioritized information, condensing some aspects while allowing time to elaborate on others. The design students also had to make decisions about the type of story they were crafting—the characters, settings, and props—and the way these were activated within a narrative arc. They found the development of characters to be a complex process, necessarily intertwined with the physical setting of the story.

In the analysis below, the authors have selected two student projects that engaged the infoEmotion® criteria for narrative visualization. By testing subjectively-held opinions about the projects (those to which the instructor had assigned grades in the A range) against the infoEmotion® matrix, we are able to assess the works’ success in fulfilling criteria for complete narrative visualizations with more precision.

#### OUTCOMES

Project 1 is a 3:12-minute key-frame partially-animated narrative with sound and voiceover. The visual style uses simple vector-based graphics (similar to those used in the television animation *South Park*) over photographic montages that range from the interior of a church to a collage of credit cards. Some personae are represented metaphorically in memorable ways: Tom as a frightening vampire and Tom’s father as a blood-sucking mosquito who drains (transforms) Tom’s credit score. Eventually the students’ efforts to resolve Tom’s credit problem lead to a “brick wall,” necessitating additional research.



Figure 6. Project 1: "Tom and Jen: A Credit Story," Brianna Morris and Elizabeth Shupe

Table 3 shows the infoEmotion® matrix that identifies the content and visualization elements present in Project 1; this assessment is elaborated in the text that follows.

Teaching the design of narrative visualization

Content Element:	Visualization Element:	Graphs/maps	Text	Dialog	Setting	Character	Body language	Facial expression	Tone of voice
Financial: <b>data</b>		●	●						
Financial: <b>information</b>		●	●	●					
Financial: <b>concepts</b>		●	●	●	●	●			
Behavioral: <b>consequences</b>		●	●	●	●	●	●	●	●
Behavioral: <b>decision processes</b>		●	●	●	●	●	●	●	●
Behavioral: <b>negotiation</b>		●	●	●	●	●	●	●	●
Behavioral: <b>ethics</b>			●	●	●	●	●	●	●
Behavioral: <b>culture</b>				●	●	●	●	●	●
Behavioral: <b>emotion</b>				●	●	●	●	●	●

Table 3. infoEmotion<sup>®</sup> matrix for "Tom and Jen: A Credit Story"

Project 1 scored quite high on the Visualization Elements relating to System 1. Behavioral aspects are clearly communicated through the characters (the disappearing groom, the predatory father), their facial expressions, and their tones of voice. The visualization engages with financial concepts and behavioral consequences to a limited degree, but is slight to nonexistent on imparting financial information and data. The viewer never learns, for example, how a credit score is calculated, what credit-score numbers mean, and what the consequences of having a low credit score are. Stronger aspects in this project were the (metaphorical) personification of Tom's father as a mosquito, and the very ethnically and culturally relevant characterizations and setting of the story line. However, the lack of props and other design elements that would indicate more specificity in the setting (further underscoring cultural factors) were a missed opportunity, as was the lack of articulation of the character's bodies thereby limiting their expressive ability. Other deficits were the lack of financial data and lack of detail in the financial information.

Project 2 is a 3:32-minute key-frame partially-animated narrative with sound and voiceover. The visual style combines the same vector-drawn characters as Project 1, but adds marker-pen lines (reminiscent of the "whiteboard" graphic style of RSA Animate) on a background of graph paper.



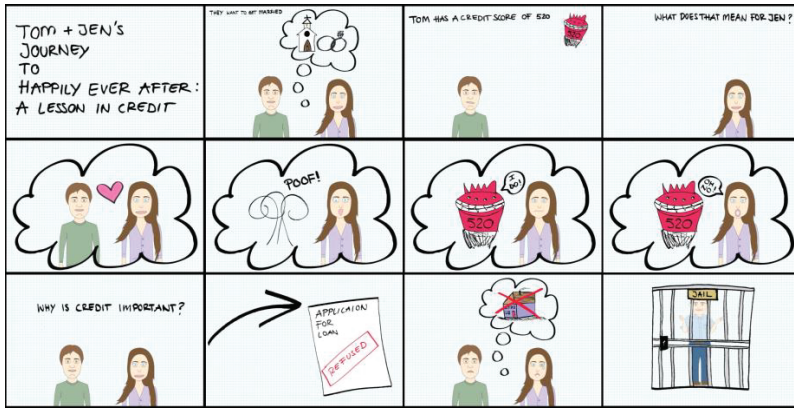


Figure 7. Project 2: "Tom and Jen's Journey to Happily Ever After," Caitlin McDonough and Prisca Bommeli-Kasser

Table 3 below and the following text analyze the content and visualization elements present in Project 2.

Visualization Element:	Graphs/maps	Text	Dialog	Setting	Character	Body language	Facial expression	Tone of voice
Content Element:								
Financial: <b>data</b>	●	●						
Financial: <b>information</b>	●	●	●					
Financial: <b>concepts</b>	●	●	●	●	●			
Behavioral: <b>consequences</b>	●	●	●	●	●	●	●	●
Behavioral: <b>decision processes</b>	●	●	●	●	●	●	●	●
Behavioral: <b>negotiation</b>	●	●	●	●	●	●	●	●
Behavioral: <b>ethics</b>		●	●	●	●	●	●	●
Behavioral: <b>culture</b>			●	●	●	●	●	●
Behavioral: <b>emotion</b>			●	●	●	●	●	●

Table 4. infoEmotion® matrix for "Tom and Jen's Journey to Happily Ever After"

Project 2 earns a similarly high score on the behavioral content elements relating to System 1, with some exceptions, and a similarly lower score for the System 2 financial content elements. The behavioral aspects (as in Project 1) deploy multiple visualization elements both sequentially and simultaneously, with System 1-related elements far richer and more nuanced. The characters' facial expressions in Project 2 are more varied than those in Project 2; however, unlike Project 1, its metaphorical language is confined to the "low credit gremlin," the evaporating fiancé, and devices such as the "thought bubble." The key point of difference between this example and Project 1 is Project 2's greater deficit of specific cultural import in the characters, making little reference to the ethnic or cultural demographic evident in the role-play script and video. In addition, due to the graph paper environment that the characters occupy, the setting does not contribute to behavioral elements.

Although both projects are engaging and effective, the infoEmotion® matrix highlighted shortcomings common to both. Key shared deficits were in the explanation of financial concepts and the amplification of financial data. Both projects also missed

opportunities to explain financial factors using prop-based examples (setting) or by building contextually immersive situations.

### *Findings and next steps*

The authors have found the infoEmotion® matrix invaluable in identifying the elements that are emphasized or overlooked in the two visualizations evaluated in this paper, but clearly the matrix is a prototype and there is more work to be done. By the time this paper is published the Design 4 class will have run again (Spring 2013). This will have given The Visualizing Finance Lab the opportunity to integrate the infoEmotion® matrix explicitly into the development phase of the students' projects and to test the content and visualization elements against the characteristics that emerge in this new group of visualizations. In the longer term we hope to use the infoEmotion® matrix as the basis for an assessment rubric for student narrative visualizations.

We anticipate that the infoEmotion® matrix will also prove useful in better assessing how published narrative visualizations depict financial information. In Figure 1, for example, the primary message involves financial concepts (the nature of credit) as they are manifested in behavioral terms, through emotional factors. These ideas are delivered largely through setting, character, body language, and facial expression.

A number of important and unanswered questions that arose during the class have not been addressed in this article. These questions largely concern socioeconomic and cultural factors, e.g., How do the ethnic and socioeconomic identities of the characters affect the message? What is the impact of nonhuman characters (e.g., the Geico lizard) in communicating sensitive but important information? What are the roles of other popular cultural signifiers (such as recognizable symbols and humor-driven references)? These questions lie at the heart of the design problem and they drive issues of visual styling and art direction.

## **Conclusion**

The authors assert that narrative visualizations can be a powerful tool in increasing financial literacy, and that designers can play a substantial role in this effort by developing visualizations that relate to "System 1 thinking" (Kahneman 2011). Through an overt reliance on metaphors, narrative visualizations can communicate financial concepts in a way that highlights their intuitive and emotional consequences. Narrative visualizations provide designers with a wider range of methodologies than more-traditional information visualizations: methodologies that engage the behavioral-cognitive dimension of financial literacy in a rigorous and systematic fashion. From the financial literacy perspective, work still needs to be done in codifying key design elements across a range of existing financial literacy contexts and materials and in testing their effectiveness; to this end, the infoEmotion® matrix is a beginning. From the perspective of the design educator, we believe that narrative visualization methodologies are an important part of a contemporary design education: one that has many applications beyond financial literacy.

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## Cross-cultural design attitude: open-ended design solution for welcoming the Diversity

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**Abstract:** *Italy draws lots of refugees from the Mediterranean regions: in 2010, Milan received more than 850 people in its welcoming Centres. Municipalities, citizens but also professionals must be involved in the collective answer to such a kind of phenomenon. The ephemeral nature of the settlement in the Centres, the precarious conditions of staying, as well as the variety of tenants' identities (multi-ethnic and gender turns) shape a new research field of great, social, importance which challenges the designer to imagine new strategies and tactics for collective living. These reasons convinced a multi-disciplinary group (designers, social workers and environmental psychologists) to start a dialogical process, addressed to redefine characteristics and qualities of host-structures for asylum seekers and refugees, in Milan. The diversity of disciplines shared methods of analysis and interpretative models, whose availability was granted by designers' work. The research methodology is inspired by a recent approach of AR, called pro-occupancy, which considers target-need as a complex system made by tangible and intangible queries. The research process feeds, in a circular way, the final year studio of the Interior Design BA (Politecnico di Milano): students developed scenarios and practical solution to rethink the current "state of art" of the Centres.*

**Keywords:** *Education and sensitivity; role of habitat; design research for social inclusion; asylum seekers and refugees; place attachment.*

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The papers aims to describe the first results of a research on reception centres dedicated to refugees and asylum seekers in the city of Milan<sup>1</sup>.

The overall objective of the research is to generate ideas, proposals and solutions, through design tools, for spaces that can respond appropriately to the lots of living tasks in an emergency temporary dwelling, that are both primary and cultural instances.

The research comes from the observation of an established phenomenon in western European cities such as the migration of people seeking political asylum, which has become a state of emergency due to the intensification of international economic and political tensions. There is a large demand for new reception areas because the traditional existing residences are unable to respond efficiently nor sufficiently. Milan, with its 859 refugees accepted in 2010, should strive to be an "hospitable city" for this social emergency, as it's preparing itself to host so many tourists and contemporary nomads at the Expo 2015.

From the Nineties, the phenomenon of immigration has become more and more consistent and visible. Institutions and service operators had to rethink methods and tools of welcome actions, also from the legislative point of view. The data reported by the UN Refugee Agency (UNHCR) stated that in Italy there are currently 56 thousand refugees, one for every 1,000 inhabitants, and in 2010 were approximately 10 thousand asylum applications. The national regulation concerning the reception for asylum seekers in Italy provides a "System of protection for asylum seekers and refugees" named *SPRAR* and a system of "multi-functional centres"<sup>2</sup> consisting of structures and processes that provide temporary accommodations and supports for social inclusion.

"Living" in these centres put in place a set of situations that have to deal with the issues of temporary residence, the multi-cultural co-habitation, the need of both privacy and interpersonal relationships and the connection to the wider urban and social context. It mainly relates with a spread meaning of "inhabiting" and "house" and is a privileged place of identity recognition. On this issues was headed the first part of a research led by a multi-disciplinary group of designers (interior, product and visual designers), social workers and environmental psychologists. The research, coordinated by Politecnico di Milano, is focused on the quality of the centres for refugees, both in term of environment and its equipment, in relation to the topic of belonging and, in general, with the chance to develop wellbeing; in background there is a concept of hospitality as a "vocation" that should deal both with temporariness and with domesticity.

The ephemeral nature of these *settlements* and the diversity of tenants<sup>3</sup> define a new field of research, this topic has a great social importance and calls the *Interior*

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<sup>1</sup> The research is supported by the Department of Social and Health Services of the Municipality of Milan, with the collaboration of the care services (Farsi Prossimo Consortium) and a low-cost supplier of furniture (Ikea Italy); it is coordinated from the Research Unit of Interior design of Dip.to INDACO (PoliMi), with interdisciplinary contributions coming by the Research Unit of Advanced Design (INDACO), Communication Design (INDACO), the Dip.to of Geography and humanities environment (UniMi), on the advice of some of the main agencies involved in the management of the building in Milan (Milano City - Sector District Contracts and Aler).

<sup>2</sup> In the cities of Milan, Rome, Florence, and Turin .

<sup>3</sup> As described: in other words, a new population of tenants made by singles, students, mononuclear families and so on

Design discipline to investigate about new strategies, settings and products' families that could support these new inhabiting needs.

## Refugees = the loss of house

The loss of the house, and not so much or not only the trauma, is the shared condition of asylum seekers and political refugees. The text *L'assistenza terapeutica ai rifugiati* clearly and forcefully points out a vision that accompanies this type of user as a "system of attitudes" aimed at facilitating the construction of a surrounding (to the person) able to generate comfort. The assistance elements emerge then as the answer to the complex need requests<sup>4</sup> of which are themselves the harbinger, among which the housing need is listed.

Forced migration represent a wound: a fracture in the temporal (and therefore identity) continuity of the person, from which starts a *before* and an *after*.

...but almost everything that happens inevitably refers to what they once were. [...] They then never seem to feel completely at ease in the hosting country, and this in spite of what this country offers, takes away or allows. The impossible comfort we are talking about is the comfort of a true familiarity, as the one fulfilled with places and people now far away.<sup>5</sup>

Beneduce introduces this concept of "impossible comfort" which puts the refugee in an inaccessibility condition, that can be partially solved through working with the Cultural Language Mediator. Just its presence, besides the obvious language *affordance*, would constitute a prerequisite to build a familiar environment, the one that Descombes (1992) defined as "rhetorical territory", that is a place where the figure (the refugee) is *chez soi*, at home, a ease in the rhetoric of the people he/she shares his/her existence with<sup>6</sup>. A comfort, this one, that La Cecla<sup>7</sup> well described as "the possibility of a space near his/her own" where "to stretch his/her own identity" acting *at-ease*<sup>8</sup> in time and procedure, that is with all the appropriate comfort allowed and assured by the familiarity. A comfort that, besides in the aspects connected to the linguistic communication, can be at stake in the above-mentioned environmental communication, in what we could define as *cultural oriented aesthetic-perceptive affordance*.

The loss of house can be considered like a "disturbance" of the identity substratum and therefore it can create a type of loss of primary nature<sup>9</sup>. Gedo and Goldberg<sup>10</sup>

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<sup>4</sup> "living, educational, medical and financial needs." Cfr. Papadopoulos, R. (curated by). 2006. Papadopoulos, R. (a cura di). 2006. *L'assistenza terapeutica ai rifugiati*. Nessun luogo è come casa propria. Roma: Edizioni scientifiche Ma.Gi. p.28

<sup>5</sup> Beneduce, R. 1998 (rev. 2004). *Frontiere dell'identità e della memoria*. Milano: FrancoAngeli. p.38

<sup>6</sup> Descombes, V. 1992 "Proust, philosophie du roman" in Augé, M. *Non luoghi*. Milano: Elèuthera

<sup>7</sup> Cfr. La Cecla, F. 1996. *Il malinteso*. Antropologia dell'incontro. Bari: Laterza

<sup>8</sup> the English translation do not outline properly the play-of-word in between *agio* (ease) and *adagio* (at-ease), in Italian.

<sup>9</sup> About the form of specific suffering experienced by the "forced migrants", the literature suggests a very significant range of terminology: from the ontological insecurity to the existential anxiety (Giddens, 1991; Laing, 1960), from the death anguish (Kierkegaard, 1975; Sartre, 1948) to the cultural mourning (Manson, 1996; Eisenbruch, 1991), from the crisis of the presence (De Martino, 1995) to the cultural amnesia (Memmi, 1957) or strategic amnesia (Graeger, 1997; Barbiéra, 1996). For in-depth examination cfr.: Beneduce, R. 2008. *Breve dizionario di etnopsichiatria*. Roma: Carocci; Beneduce, R. 1998. *Frontiere dell'identità e della memoria*. Milano: FrancoAngeli; Mazzetti, M. (curated by) 2009. *Il carro dalle molte*, Milano: edizioni di Terrenuove

<sup>10</sup> Gedo, J. E. and A. Goldberg. 1973. *Models of the Mind: A Psychoanalytic Theory* (it. 1975) Roma: Astrolabio

warning, that “the most elementary form of therapy, for the people who function (in a particular time in their life) at a very elementary level, has to be providing a safe and reliable environment, that is what the house represents”, is interesting for what concerns the constructed environment, specifically the structures of second reception which pass as temporary residence for this type of vulnerable user, and reasoning from a point of view of an answer integrated to need/suffering (among which requests, as said, the living need is listed and represents a critical situation).

The house containing capability is the result of its stability in terms of continuity within a physical and emotional space where intimacy relationships are formed [...] The house is the place of concrete and metaphorical meanings of capacity.<sup>11</sup>

Can this stability of sense, this capacity be activated even in a place that, practically, is the abode? The research hypothesis is that the culture of the design can sustain, through the project, this perceptual shifting from *precarious to temporary*. “Dimorare” (from the Latin *Demorari*, to remain, to linger) is to stop, to stay even in a transitory way (if it is an habitual abode we call it residence)<sup>12</sup>.

Renos Papadopoulos explores the levels of meaning included in the idea of house: it represents the objectification in a symbol/metaphor of the subconscious idea of origin; recalls those inter-subjective experiences which make it possible to experiment with a self sense of coherence and continuity. House is the *generative space* where opposites can exist and be contained<sup>13</sup>: in this sense both the idea and the experience of “house” present themselves as forms of representation, intangible and the second tangible, of the organizational basis of the psyche; a sort of matrix of subjectivity that, as we said, allows us to keep existing in time.

*The loss of the house can therefore bring to a sense of elemental void, to a sense of ontological insecurity and, consequently, to a loss of confidence in his/her own existence*.<sup>14</sup> “Casa” - “home” can be considered a **psychological category** which brings together the basic psychological processes that facilitate the first human development (Papadopoulos 2002).

The essential sense of home is part of that “mosaic” of cultural contents integrated in that not-immediately-visible/tangible-identity<sup>15</sup>, that Papadopoulos calls “identity substrate”. The elements that constitute the substrate are that *unicuum* of visual, iconic-symbolic and perceptual elements which derive directly, we can say almost not-consciously, from belonging to a country and to a certain language group: e.g. the custom to certain sounds, scents, colors; the familiarity to landscape and geographical environment of a certain type; the visual ergonomics acquired with specific forms, even architectural; the comfort connected with familiar tastes and climate conditions. Translated for planning purpose, the above mentioned elements convert in so-called

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<sup>11</sup> Papadopoulos, R. (edited by). 2006. Op. cit. p.43

<sup>12</sup> AA.VV. 1986. Entry “dimora” in Vocabolario della lingua italiana. - Dictionary of the Italian language - Roma: Treccani

<sup>13</sup> “This function of the home is extremely important to minimize and even avoid archaic and essential forms of division”. Cfr. Papadopoulos, R. 2006. “Refugees, home and trauma.” in Papadopoulos, R. (curated by). 2006. Op. cit. Roma: Edizioni scientifiche Ma.Gi. p.41.

<sup>14</sup> “This, in turn, can create a particular type of self defense, a “freezing” [...]. Tarantelli, C. “Prefazione all’edizione italiana” in Papadopoulos, R. (edited by). 2006. Op. cit. p.14.

<sup>15</sup> The identity immediately visible/tangible is the subject’s body.

soft planning requests: lighting project, environmental comfort, aesthetic ergonomics, *soundscape* and so on. Planning *soft* variables strengthen the material structure of space inserting/superimposing immaterial *enclaves* which –necessarily- affect the relational dynamics, since they specify potential use and/or specific functions<sup>16</sup>. Going back to Papadopoulos, the main and shared point traceable in the experience of refugees and asylum seekers (generalizing, of “the forced migrants”) is the uprooting, the being “homeless”. Ethos<sup>17</sup> distinguishes between four different variables of the above-mentioned situation (*Rooflessness*)<sup>18</sup>:

- *roofless* (without roof), people without any type of shelter, who sleep outdoors;
- *houseless* (without house), people who have a temporary place to sleep, in institutions or public dormitories;
- *living in insecure housing* (with insecure living arrangement), people who are at great risk of exclusion because of unstable location, evictions, domestic violence;
- *living in inadequate housing* (with unsuitable living arrangement), people who live in caravans, illegal campsites, unsuitable or overcrowded houses.

The loss of “roof”, symbolically, contains a system of losses, or better, summarizes in an image that multidimensional loss described by the author as “nostalgic disorientation”. To generate suffering is not only the object-house or the actual situation from which they are forced to leave, but instead the “home” dimensions (as previously described) which altogether fail: interruption of the continuity of Self between origin and future, loss of the meaning of house in its tangible and intangible (imaginary) components, uncertainty about the possibility of experiencing the return (that is also psycho-emotional reinstatement). The house as a primary container qualifies like a *proto-space* (Papadopoulos 2002) or an *archetype of the organized totality* (Abt 1983) which “vouch for” the proto-experiences and the proto-sense that the individual will (through the experience) allocate to the founding dichotomies of his/her existence<sup>19</sup>.

There is no doubt that the particular way they are carried out affects the structure of the person and facilitates the positive development of the personality or, on the opposite, generates a negative effect which will mark, maybe for life, the individual. (Stern 1985)

In the same way, there is no doubt that the experience of house founding (meant as *imprinting*)<sup>20</sup> plays out in the “first” house the individual experiences in childhood; nevertheless, each house “lived in” or “crossed” during the course of life, constitute

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<sup>16</sup> Cfr. Giunta, E. 2012. PRO-OCCUPANCY. Design dei microambienti urbani contemporanei tra performatività dell'alloggiamento e appartenenze. Rimini: Maggioli ed.

<sup>17</sup> European Typology of Homelessness and Housing Exclusion. This classification is also adopted by Feansta (a non governmental organization founded in 1989, which includes over one hundred organizations that work with people of non-fixed address within the EU - [www.feansta.org](http://www.feansta.org)).

<sup>18</sup> Cfr. FEANSTA. 2009. European Report 2008: the role of Housing in pathways into and out of homelessness. Bruxelles: Harvey. Cfr. <http://www.feansta.org/files/freshstart/Toolkits/Ethos/Leaflet/EN.pdf>

<sup>19</sup> The experience of the opposites, the limit negotiation, the location processes

<sup>20</sup> Cfr. the main theories on attachment (Bowlby, 1988) and Winnicott's ideas on “transitional space”.



new ground where to repeat or evolve/overcome the mechanisms acquired in the previous experiences<sup>21</sup>.

*To live without a house doesn't mean to live in no place, it means to build his/her own existence in relation to different spaces, often temporary and shared with individuals not part of his/her own circle of relatives or friends.*<sup>22</sup>

## Research process

Basing on this theoretical background, the research activities were carried on an investigation of case studies in order to delineate the contemporary "state of art".

Starting from the central issue emerging from the previous considerations - that is the meanings of to receive/to accommodate/to welcome – a big effort was made on one hand in analysing the documented reception centres in the Italian and European area, according to a typological criterion. This research part is strongly related to the existing legal frameworks that are different between a country and the others. The desk research has investigated forms and functions of lots of places designed to host people in many ways, for example as in case of emergencies or in collective buildings, but always responding to the criterion of the temporariness of living in. The result of this step of analysis is a map that was designed connecting the considerations emerging from the bibliography investigation and the case collecting. The map would try to indicate some emerging scenarios that indicate some trends for the design of innovative models of spaces for reception centres.

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<sup>21</sup> Cfr. Stern's thought (1985) on the sense of Self as experiential integration and Jung's thought referred to the "psychoid nature" of the archetype, that is the consideration of the reciprocal influence between the physical and psychological dimension of self as a dialogical procedure that allows the differentiation.

<sup>22</sup> Ivi. p. 9.

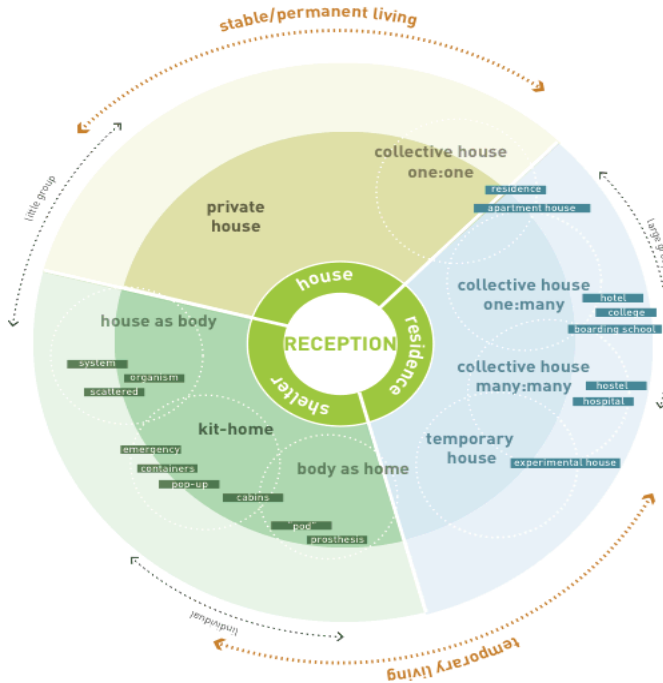


Figure 1. Scenarios map: “reception places”.

Basing on the meanings of “Reception”, there are 3 different groups of relevant directions. First of all, the whole of what is related to the term “House” as a permanent, private, safe place for a unit of inhabitants. It represents a widespread model in lots of cultures and it’s related to a general wish of permanent and stable living. As said before, more interesting for the research goals are the other two groups of meanings concerning a temporary living: on one hand what we call “Residence” that is a conscious, comfortable place where live for a short period, on the other hand what we call “Shelter” that is all is farther temporary, sometimes suffered, often small-size, most of all for singular users. Each of these groups is referred to various forms and spaces and objects that compose a specific environment.

These “frames of sense” are able to suggest possible and potential ways to design innovative environmental systems for refugee’s accommodation. Wondering about instruments, methods and forms through which designers could concept new kinds of spaces for the refugee accommodation in a foreign country, implies first of all the capability of considering that this special “inhabiting” has lots of implications, such as social, psychological, cultural and political too. It means for the designer to compare his own skills with disciplines able to read and decode the variety of needs that this dwelling involve, in order to design effective and appropriate places.

The possible role of the object-house within the path of integration of the migrant individual is questioned by Maria Golinelli in the text “Le tre case degli immigrati”: the book hands over theoretical premises and outcomes of exploratory research on habitation (and its related discomforts) read as a mediating element in/with the landing place and in relation to the possibility to start an effective integration process. The

house is considered a potential and powerful integration tool since it enables, on one hand, to attest the “normalcy” of a “territorial permanency” condition and, on the other hand, it is a tool for identity conservation (and even preservation), as a privileged place that allows community/cultural aggregation, containing its rituals and objects<sup>23</sup>.

In particular the research examines the possible (sometimes impossible) transitions between the “three houses” that the migrant individuals find themselves crossing, the one of origin, the ideal home and the one actually available in the landing place.

*Human feeling to the living space is essentially of three types: physiological, psychological, emotional. These three types of sensitivity [...] respond to three fundamental functions: security, fulfillment of needs, intentment (that is identification of the home with the ego of its inhabitants).*<sup>24</sup>

*The home emerges as a fundamental need:* to say it like Maslow, it functions as the gratification of primary needs (shelter, nourishment, survival of the species); it meets the essential individual needs of identity recognition, accomplishment, esteem, ingenuity, conviviality; it also partly assures the fulfillment of the so-called “secondary needs” (social and relational) which are similar to the previous ones, but in this case referred to the social group. Golinelli subtly distinguishes the *living need*<sup>25</sup> (from residence) from the *housing need* (from *habitat*), which concern the physical space where to live.

*The living need of the immigrants is as complex as the migratory projects and the variety of the type of housing pursued [...] or in any case, available to them and it includes: open-air solutions for who has no fixed abode, homeless centers, accommodation with compatriots or locals, hotels, squatting or illegal occupation (of lands, garages, abandoned buildings or apartments), living arrangements at the work space, renting public housing, renting private housing, arrangements at private social housing, proprietary house.*<sup>26</sup> *The quality of living results from the psychological and cultural assessment of the distance existing between the lived reality and the coveted reality*<sup>27</sup>;

it follows that the living discomfort

*is a negative value both of the quality of individual life and of social integration [...] furthermore, transversely to living well-being and discomfort, a discomfort ‘from house problem’ is emerging [...] it is the discomfort that derives from having to*

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<sup>23</sup> “Objects in particular function as an important support in the visualization and narrative of his/her own belongings [...] they are important to the identity because they are vehicles for significance and because they are signs and symbols of relationships. In the contemporary society, the objects and therefore also the object-house and the objects contained in the house” Golinelli, M. 2008. *Le tra case degli immigrati. Dall’integrazione incoerente all’abitare*. Milano: Franco Angeli. p.53. “constitute the system of symbols through which we present ourselves [...] we build an image of ourselves that we try to support and defend in the social interactions, an image that reflects the perception we have of ourselves as well as our personal ambitions.” (Leonini, 1988

<sup>24</sup> Golinelli, M. 2008. Op. cit. p.12.

<sup>25</sup> “concerning the act of living with all the social-relational and individual self-fulfillment implications which that entails”; cfr. Golinelli, M. 2008. Op. cit. p. 24 ff.

<sup>26</sup> Golinelli, M. 2008. Op. cit. p.58.

<sup>27</sup> Golinelli, M. 2008. Op. cit. p.26.

*commit many resources, economic as well as organizational and planning to live in a way suitable to his/her own needs and to his/her own means at that moment.*<sup>28</sup>

The author points out, as an additional factor of discomfort, the impossibility to use the aesthetic aspect (in other words, the image) of contemporary houses to communicate and tell about the Self, an expressive and conforming dimension that is therefore transferred on other "object-house substitutes" such as car or clothing. The author, lastly, stresses the relational nature of living that she defines as "*living in relation to a physical space formed of variable elements, whose functions and symbolic significance change in time and culture*"; a space that, just because of its structuring and managing, is the image (it represents) of the interpersonal relationship model conceived/accepted by the family-group-community-culture which inhabits that same space. Golinelli warns: "*to change the usage model of the space means to change the society*". Imposing a usage model of the space too distant from his/her own culture, that is sometimes imposed, can bring to borderline situations of "disorientation" (i.e. the case of the *Immeuble d'habitation*, in the outskirts of Casablanca).

Case studies collection has been followed by a second, field research, phase: the team of researchers built up a system of shared tools in order to read the existent or, in other word, to analyze the current situation of the Centres, in Milano. The research would use a methodological approach "through" design (with its own imaginative and empirical roots)<sup>29</sup> aimed at enhancing the participation, in various forms, of "social component".

The adopted methodology has been structured in two main research-actions: the first one, a complex process of *post-Occupancy* Observation, consisted in visiting Centres and made sorts of "building profiling". The second, launched a *pro-Occupancy* Research<sup>30</sup>: that phase would draft new metadesign criteria to organize future housings and, by which, should be developed the concepts for the new families of products (furniture and fittings) above mentioned.

The structure of the participated model connects the phases of the concerted project with different levels of active involvement of the social component. In order to take part in a transformation process (i.e. to actively influence it) it is necessary to differentiate the possible intensity levels<sup>31</sup>.

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<sup>28</sup> Olangero, M. 1998. "The walls and the barriers" in *Rassegna italiana di sociologia – Italian Review of sociology* - n°1. pp.44-45.

<sup>29</sup> See Laurel, Brenda. *Design research. Methods and perspectives*. Cambridge: the MIT Press.

<sup>30</sup> Cfr. Giunta, E. 2012. *Op. cit.* Rimini: Maggioli.

<sup>31</sup> "Ladder of participation" (Arnstein 1969). In addition to the five levels cast, the scale admits intermediate situations which include additional degrees and providing for the inclusion or exclusion of voices and local interests that in this paper, has chosen not to consider.

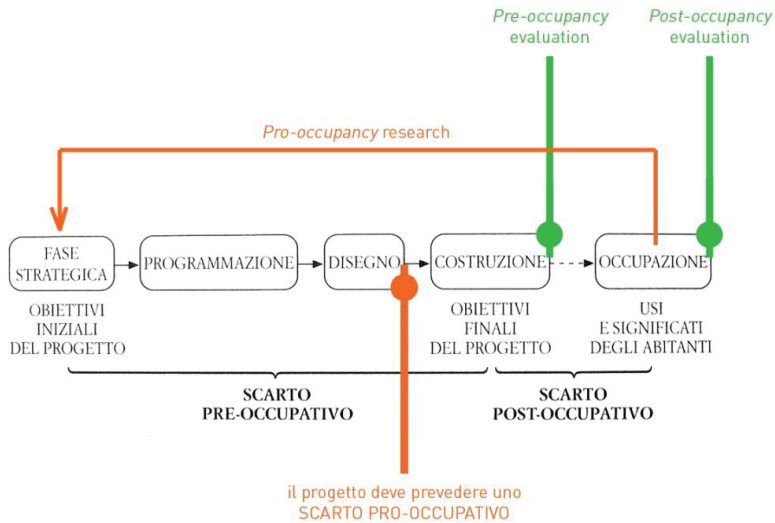


Figure 2. Notes to (Giunta, 2009) Costa's model about design process and related "types of gaps" (in Amendola, G. 2009. *Il progettista riflessivo*. Roma-Bari: Laterza)

Specifically, the first part of this phase use of some techniques among those proposed by Christopher Ireland<sup>32</sup> as methods of qualitative research in design. The author, arguing the similarities between ethnographic research and design one, explores the issue of direct feedback by the final user/client or, in other words, the topic of participatory methods. Also Brenda Laurel<sup>33</sup> returns to the importance of evaluating the effectiveness of the project: the satisfaction concerning research's outcomes is related to the perception of user/consumer. Therefore, to launch the *post-Occupancy* Observation phase would trigger methods of "structured listening" in order to share the prioritization of preferences.

- consultant methods: data search and "active listening"<sup>34</sup>

Priority Search  
e.g. Focus group or Philips

a micro-team which represent the population has to structure a survey questionnaire. Data collected are as an overview summarizing the different priorities, hopes and opinions, criticisms in the community, and also the contradictions and conflicts between social groups.

Community Visioning

stakeholders are divided in small working groups, in order to more easily develop a set of ideas and graphic representations on the possible and desirable state.

<sup>32</sup> Ireland, Christopher. 2003. "Qualitative methods: from boring to brilliant" in Laurel, Brenda. Cit.

<sup>33</sup> Laurel, Brenda. 2003. "Reports from the field." in Laurel, Brenda. Cit.

<sup>34</sup> See Sclavi, Marianella. 2003. *Arte di Ascoltare e mondi possibili*. Come si esce dalle cornici di cui siamo parte. Milano: Bruno Mondadori; Sclavi, Marianella. 2002. *Avventure urbane*. Progettare la città con gli abitanti. Milano: Elèuthera.

- planning methods II: S and XS design scale

Design Workshop

small groups of professionals and inhabitants are working together in a creative way (through problem finding, project proposals, drawings), the most significant ideas are then summarized and fixed in design diagrams.

A sub-team (one psychologist plus one designer) has applied these techniques in an active workshop session, of a couple of days, with asylum seekers and refugees. Results are concerning imaginaries and qualities of “welcoming places” and micro-planning solutions for new Centres (in particular sleeping rooms, collective spaces and convivial ones) according to users desires.

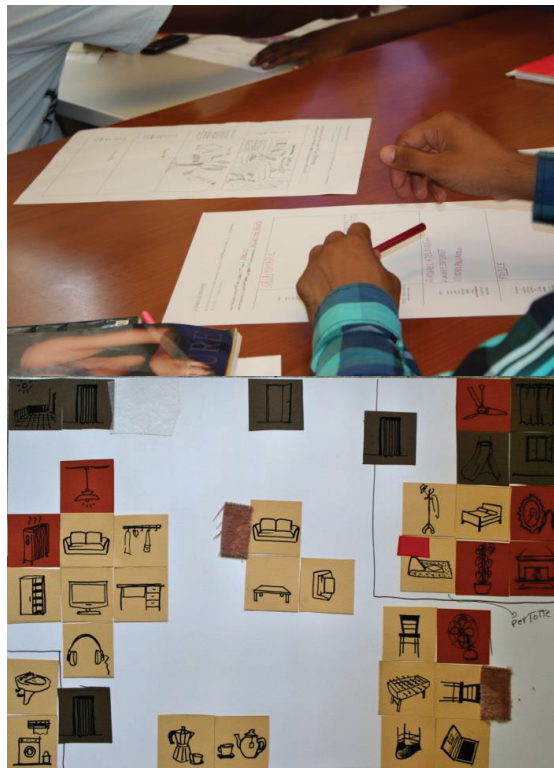


Figure 3 and 4. Examples of “Welcomely places” sheet and micro-planning solutions made by users.

For the second phase, so called of *pro-Occupancy Research*, the team has decided to involve students, both of School of Design (Politecnico di Milano) and of Faculty of Environmental Psychology (Università Statale di Milano). The latter were concentrating in testing qualitative research tools; the previous started a traditional design process (in

final year course of BA in Interior Design) based on data, scenarios and consulting results already collected through research.

## Design education process

That practice multiplies the benefits of multidisciplinary team working. Due to this practice, research and education feed each other in a circular, virtuous, way according to the scheme below.

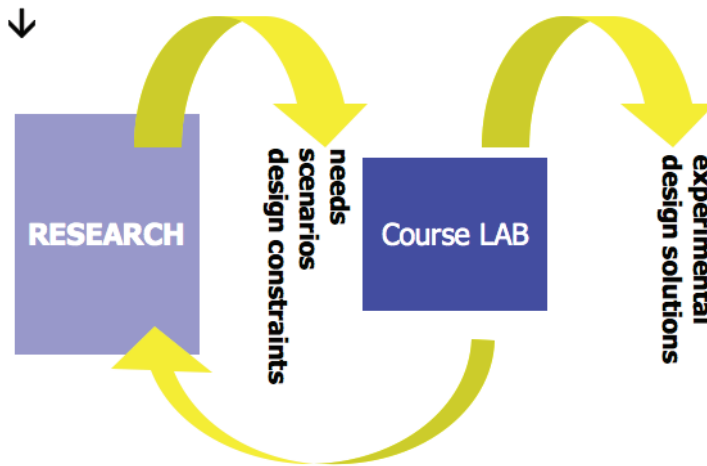


Figure 5. Illustration of implications between research in background and design education. Questions we have asked students to answer are: How to enhance cultural diversity as a key-value for design process? May design environment play a role in the process of welcoming/integration of forced migrants?

The system of results, at the end of the first research-year, have been given to students as design constraints; on the other side, the course itself is playing the role of experimental studio for innovative design solutions, strongly research based.

About didactic process, and in different terms from usual ways, teaching team has asked students to think in a cross-cultural way: the target (users) was considered and analysed basically from a cultural point-of-view, focus on diversity as a value and a key vision for the project. Arguably, the concept of perceived quality, in post-modernity, would be easily described with words such as: dynamism, subjectivity/intersubjectivity, modifiability, and traceability. Each inhabiting place is primarily seen as a *relational field*<sup>35</sup> or, in other words, a specific “environmental system” shaped by the interaction between three main elements: *the Bodies*, or the social component; *the Objects*, or inanimate actors of the inhabiting scene; *the Spaces*, or the whole of physical containers.

<sup>35</sup> The definition takes origin from the concept of expanded field (expressed by Rosalind Krauss). That concept, which particularly represents the last stage of research about the expansion of artwork influence in dialogue with its space of exhibition, results to be not only a ‘way of using’ space but it has changed the perception of environments. As a consequence, the concept of expanded field could be considered more generally as a ‘way to inhabit’ places.

In this framework, to work in a cross-cultural way means to use design ethnography and cutting edge collaboration methods (inter- and trans-disciplinary methodologies) to understand users in different national cultures and to design appropriate solutions for these groups or, basically, "culturally accessible". The warning is simply to consider, in our globalized society and world culture, that localism and "vernacular" still survive with their own instances and that fact impacts on perception and effectiveness of designed products and spaces. In the temporariness, that characterizes the contemporary way of living, it is even more important to design interior scenarios capable of collecting and displaying the symbols of continuity of the "new" nomads, using the ethnographic method as the main instrument.

*Interior Design* practice acts with an overwriting logic<sup>36</sup> where places designed as artifices might enable users, to activate situated processes of 'temporary inhabiting': these physical and cultural dynamics gain the result of restructuring<sup>37</sup> space/interiors through a semantic/performative interface; the project overlaps the existing space, taking form in a system of objects. "Reversibility + participation = belonging"; this trio of keywords (that appear coherent with described logics) might be translated into design parameters, where *reversibility* becomes "degree of structuration of the space physical component" (layout) and *participation* means "user potential to intervene in the process of signification of the place" (pre-determined use vs. extemporaneous one). The frame, designed by these criteria, is established as essential new reference for the understanding of design needs which the contemporary project is called to answer. The idea of space as process exceed the one of space as product; the latter is considered like a "device", able to meet the reconfiguration request of interiors, which should be completed by users, designing them (living in) almost in *real time*.

Cultural constraints are just one of a series of "design constraints" that were given to students, according to figure 10, through which they could follow design driven innovation. Each students-group chose its own favourite scenario, trying to think melting cultural instances, as said, and answering up to one function/need of space.

After to have developed a concept, based on these previous constraints, students are currently thinking in term of cross-cultural design solutions. Teaching staff opinion is that, due to the complexity of topic, it is not possible to exhaustively define the project: promising outputs would be temporary settlements that should be able to "welcome" personalization practices and support *cultural affordance*.

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<sup>36</sup> due to an overlapping logic, a continuous overwriting in between functional and semantic

<sup>37</sup> the users continuously (ref. the 'Intermediaries' by Sterling) activate processes of construction and re-construction of space.



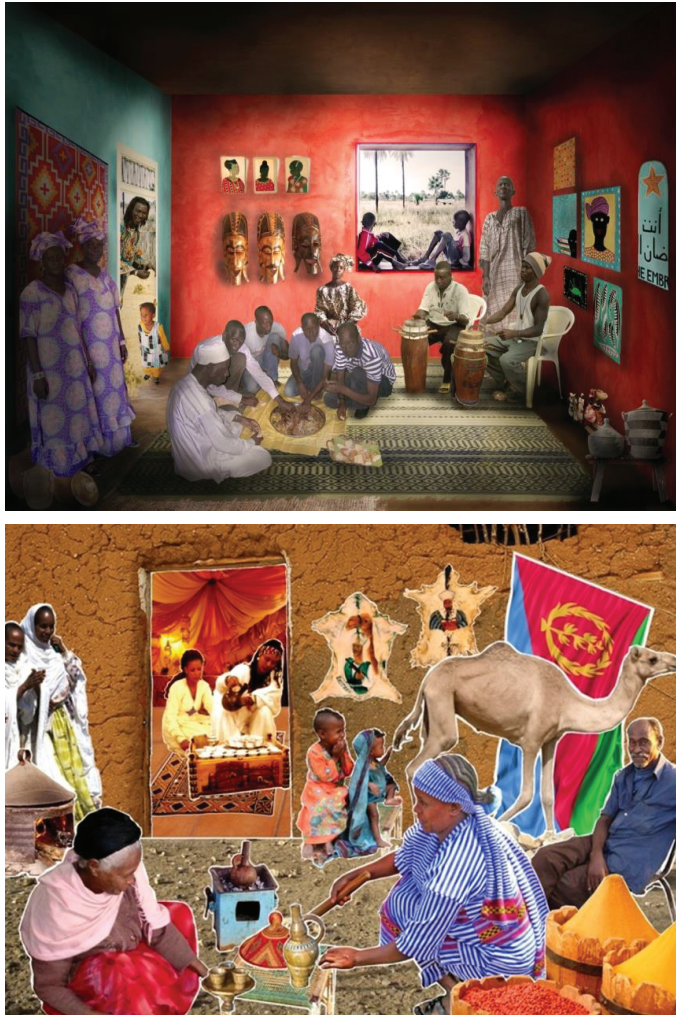


Figure 6 and 7. Examples of *IDENTITY.boards*, made by students of BA in Interior Design. The aim of the tools is to visualize, synthetically, a “cultural-based” idea of welcome and related inhabiting model (arguing also about colors, materials, indigenous objects and even symbols)

The design process will be applied on a specific site, a male refugee Reception Center in the west side of the city of Milan. After to have defined the concept, students are going to develop projects on an existing place, starting from a verisimilar situation.

As we considered *Interior Design* practice an overwriting action on a pre-existing architectural-box, students were provided by a broad set of writing instruments and tools; it is arguable to call them *design strategies* and *design tactics*. In the course, we asked to students to adopt one of them as a favorite way to design their projects. *Design strategies* refer to the main aspects, of an interior space, that project is able to manipulate such as the limits (vertical, horizontal plans), the light, the color, the material, the objects/furniture. On the other side, *design tactics* refer to a specific

“design attitude or procedures” adopted in order to develop the project: such as D.I.Y.<sup>38</sup> practices, reMIXING *assemblages*, temporary furniture, lo-fi design, and many others. Design strategies and design tactics are respectively related to the general setting and the techniques involved into the project; to the syntax and the semantic field.



Figures 8, 9 Case studies about design tactics. ReMIXING culture by Collettivo Orizzontale: KIUI project, a kit for instant urban interaction, Rome 2012; Temporary furniture by Molo Design: Softwall + softblock modular system.

Didactic steps and specific, required, outcomes were respectively:

- visual representation of a scenarios around the topic of “home” (by Figure 1, above mentioned) e.g. kit-house, body-as-home, collective houses one:many and so on;
- ethnographic portraits or *IDENTITY-boards* listed about the ethnic groups mainly present in the Centre (Figures 6 and 7);

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<sup>38</sup> do-it-yourself

- analysis of the users' needs in term of space, which are results of consulting actions (in research); such as privacy, access to water, socialization, good relation with urban scale;
- choice of a design strategies for interior design; i.e. new design trough light use, colour-scape or use of horizontal or vertical dimension and so on;
- choice of a design tactics for development of final design solution; such as lo-fi design<sup>39</sup>, self-made furniture, time-based (temporary/degradable) furniture, under- and over-design.

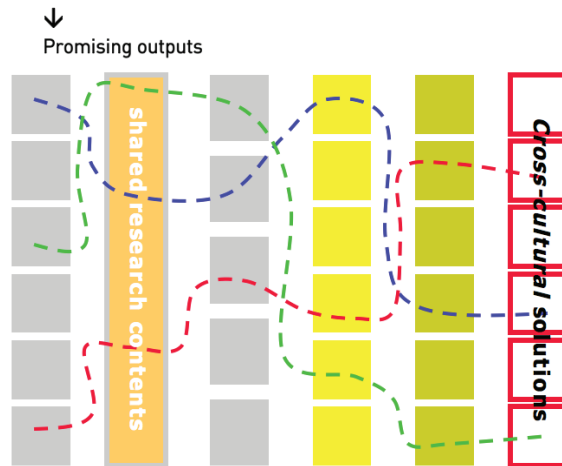


Figure 10. Illustration of education iter in design class.

## Conclusion

To deal with the project of “temporary home” dedicated to multi-ethnic users, as refugees and asylum seekers, seemed a great challenge for interior design. It’s a challenge that required a multi-disciplinary approach, in order to understand the diversity of aspects involved in the inhabiting, in the loss of home and in the rehabilitation process that follows.

<sup>39</sup> The term is inspired by the most famous LO-FI architecture practice. Cfr. [://architetturabassadefinizione.blogspot.it/](http://architetturabassadefinizione.blogspot.it/)

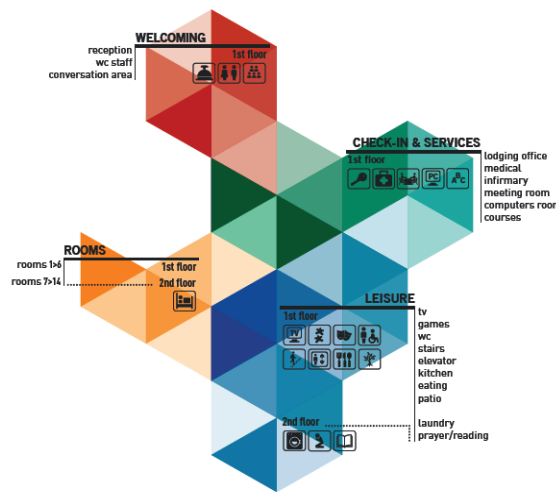
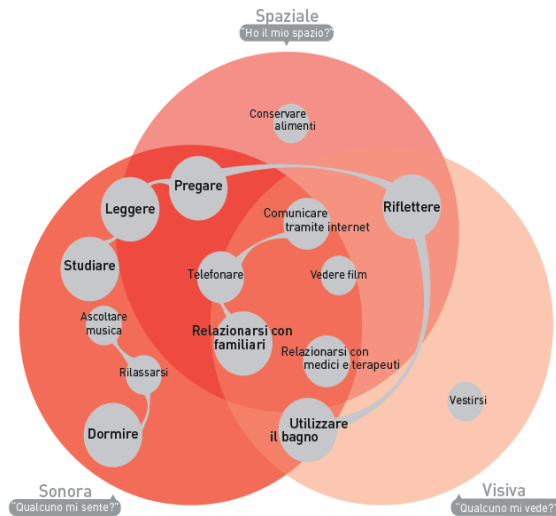
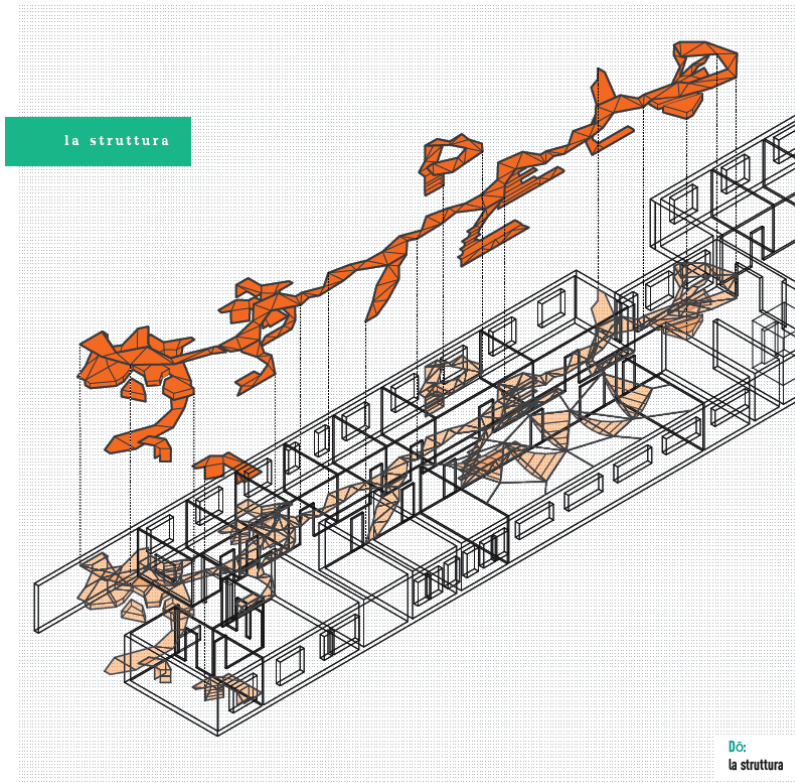


Figure 11. Students have visualized some mapping of needs, based on data research and their own interpretation and visit on-site.

The loos of home implies to re-design a temporary place that is a house although not a home, that should be able to establish a significant relation with the hosts' cultural background but also to introduce them into the new (Western) culture. It's a place that hosts a process of changing, of learning, of redemption. In this sense we should think to a place "on the move", which explores a multiplicity of strategies and tactics over time, which is able to respond to the wide range of requirements from the guests. In this It's a place that has to consider the people precarious condition of life, that must deal with the temporally limited permission of stay, with a constant hosts' turn-over. It's a place that should support this process both individual and collective,

that supports a re-orientation in those who are dis-oriented, a re-location in those who are temporarily dis-located.

In this sense the design attitude is fed on a cross-cultural approach, so to be able to foresee places and scenarios that speak a multitude of languages and signs to a multitude of "identity in progress"<sup>40</sup>. The process allowed students to produce design solutions that are mostly focused on adaptable spaces, visual wayfinding, trans-ethnic/integrated aesthetic and decorative pattern, private spaces which could be "open" to external communities (and citizens) at different degrees.



<sup>40</sup> cfr. Bauman, Z. 2009. Intervista sull'identità. Bari-Roma: Laterza



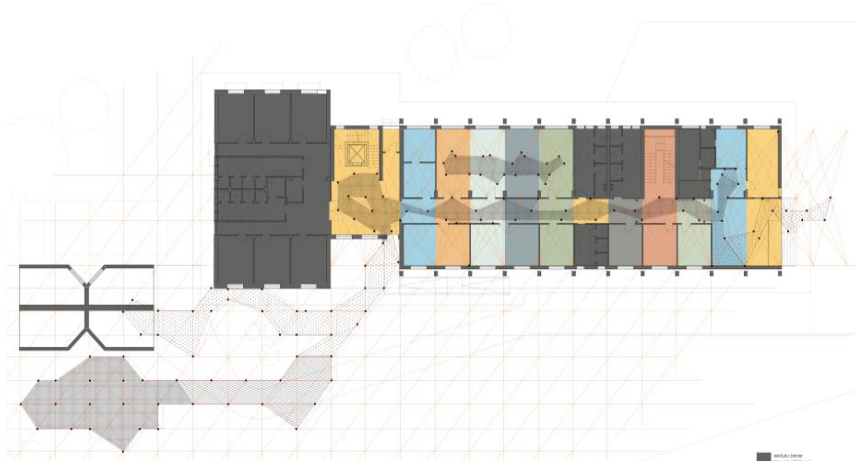


Figure 12. Project by students of BA: example of design strategy (color plan based on cultural research + unique macro object which includes furniture and basic wayfinding) applied on Gorlini male Center, Milano.

This new kind of place, finally, should be able to build figurative “bridges” to the future, capable to link people to a new stable, safe, dignified life. But we also think that we could build cultural bridges between reception sites and the city around them. What we imagine and hope, as an outcome of the process, is a system of spaces that have a great cultural value, even before humanitarian. If we build places where the inter-culture is not only practiced, but also promoted and spread, we’ll be able to imagine and design a better future.

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## Wicked Futures: metadesign, resilience and transformative classrooms

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**Abstract:** *This paper presents an Australian case study entitled “Designing Futures”. It examines a six month multidisciplinary design program offered by a large co-educational, inner-city state school in Queensland in 2011. The program extended an already successful and innovative school-based design curriculum and involved students in Philosophy, Science, Mathematics and English classes, as well those in Art and Design. Additionally, there were 5 full-day workshops where students combined a wide range of skills to brainstorm, design and create sustainable solutions. The design thinking used in this program was based on the concepts of metadesign, design activism and design futuring. “Designing Futures” linked over 700 middle and secondary school students and staff with nine designers-in-residence from diverse disciplines, including bio-ethics. The program aimed to empower students from highly diverse cultural and social backgrounds to engage in authentic, participatory design processes, prepare them for future social and environmental challenges, and increase personal and community resilience. The research results will inform ongoing program development and research in K-12 design education, both within the school and in conjunction with university and community partnerships in Queensland.*

**Keywords:** *Metadesign, design activism, resilience, participatory design, social inclusion*

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## **Introduction**

Faced with a 'perfect storm' of climate change, rising sea levels, food and water shortages, escalating impoverishment of biodiversity, and human population growth, it has to be acknowledged that John Ehrenfeld's hopes that "humans and other life will flourish on the Earth for ever" (Ehrenfeld 2008, p. 49) may well be dashed, tipping points will be passed and very few humans will survive, let alone flourish; and that the rest of the earth's biota will be left greatly impoverished for many millennia to come. With this threat comes the very real question of whether or not our future citizens are empowered to actively and collaboratively participate in refuturing our world (Fry 2009). This is qualitatively different and much more demanding than developing the general public's competence for informed decision-making.

This paper describes a project and ongoing approach to design education at Kelvin Grove State College, Queensland, Australia called "Designing Futures" (Kelvin Grove State College 2011), which reflects the accelerating concern over a future worth having, and embraces concepts including "metadesign" (Wood 2007), co-design/co-creation as part of metadesign (Giaccardi 2005), "design activism" (Fuad-Luke 2009) and "design futuring" (Fry 2009). These all call for a fundamental shift, not only in how we approach design education but also, crucially, whom we educate and what we hope to achieve with such education.

Metadesign is seen as encompassing the practical and philosophical aims of "Designing Futures" while avoiding obvious political difficulties when working within a school system. Terms such as "design activism" would not be acceptable to many educational administrators and parents, while terms such as "slow design" (Strauss and Fuad-Luke 2008) are sympathetic but do not cover the full range of project objectives. Metadesign is cross-disciplinary, holistic, consensual, ethical and transcends a problem-oriented approach (Wood 2007), providing a cultural shift from the concept of design as 'planning' to design as 'seeding' (Giaccardi 2005). Importantly, metadesign represents a shift away from "predetermining the meaning, functionality, and content of a system to that of encouraging and supporting end-users to act as designers and engage in these activities" (Fischer 2010, p. 59).

As the name implies, the "Designing Futures" program also acknowledges the design futures approach of Fry (2009). Indeed, project planners and collaborators have followed the views of Fry and others that the future is not empty, but instead cluttered with all the things we have thrown into it, and that we all need to work together to design better futures. "Designing Futures" also has strong social aims; these are inclusivity, participation and individual and community empowerment, all found to be highly compatible with the metadesign framework. The overall environmental purpose was "...the creation of new societal values to balance human values with ecological truths. In doing so design contests the notion of material and economic progress, and its inherent ecological untruths" (Fuad-Luke 2009, p. 141). The paper presents findings from three Design-All-Day workshop sessions for Middle School students and makes recommendations for a future Metadesign Education/Design Education for Resilience research agenda.

## The Educational Context

### *Contested educational space and education for resilience*

By definition, all education systems for school-aged children are designed to educate ‘for the future’. Thus, priorities depend on the view/s of the future held by those who are empowered to sustain or change system priorities. Currently, across much of the English-speaking western world, including in Australia, the USA and the UK, the dominant narrative has swung back to viewing the future as ‘business as usual’ and the skills needed for success as being the ability to obtain good test results in the so-called core subjects of Mathematics, Science and English and a good university entrance score. The emphases are not dissimilar in many Asian education systems. Unfortunately, on their own, these core teachings of our education systems are insufficient to equip students to be resilient in the face of an increasingly uncertain future. Many of the non-core subjects taught at schools have important contributions to make here within the framework of ‘Education for Resilience’. Design education under the metadesign framework is able to make an especially salient contribution in this regard. There should be no need for the educational space to be contested because metadesign embraces core as well as non-core subjects.

The validity of spending scarce time and resources on programs such as “Designing Futures” may be seen in Australia as less important than a more ‘back-to-basics’ approach. This is in sharp contrast to the Finnish education system that is considered to be an exemplar as measured, for example, by the OECD Program for International Student Assessment (PISA) (OECD 2010). The Finnish system places high value on the sort of skills taught through “Designing Futures” and comparatively low value on standardised testing (Sahlberg 2011). However, it is possible to balance both of these approaches and the “Designing Futures” program offers one example of how this can be approached.

### *Wicked Problems: employing design education to enhance thinking skills*

An educational environment that requires a considerable amount of assessment unavoidably tends to favour convergent thinking over creativity and divergence, if only because creativity is so difficult to assess fairly. Assessment and the resultant accountability are crucial to our schooling system, but a balance is needed whereby students are also encouraged to extend their divergent thinking skills. The sort of complex problems with which design education challenges our students can generally be described as Wicked Problems (Rittel and Webber 1973). Frequently, the problems students are asked to address at school are ‘tame’ problems i.e. well-defined, subject to clear rules and having either a single goal or a very limited number of goals (Coyne 2005). However, the big issues that will dominate our students’ adult lives are wicked. Wicked problems:

...are only loosely formulated. There is no “stopping rule”. (i.e. defined point where the problem is seen to be solved). Wicked problems persist, and are subject to redefinition and resolution over time. Wicked problems are not objectively given but their formulation already depends on the viewpoint of those presenting them. There is no ultimate test of the validity of a solution to a wicked problem. The testing of solutions takes place in some practical context... (Coyne 2005, p. 6)

Wicked problems are typically design problems requiring the ability to work together with a wide range of stakeholders and deal with high levels of complexity and uncertainty. Participants in programs such as “Designing Futures” get the opportunity to practise this kind of authentic, integrated and connected thinking leading to practical outcomes—whilst also having fun!

### *Metadesign and Designing Futures*

The evolving concept of metadesign (Attainable Utopias Ltd 2011) is seen as the overall framework for “Designing Futures”. Metadesign constitutes an overarching narrative rather than a single story. The following three principles and aspirations are especially relevant to the “Designing Futures” story. Firstly, belief in the validity of co-creation underpins the whole project framework, including the chosen research methods:

...metadesign has been conceived as co-creation: a shared design endeavour aimed at sustaining, emergence, evolution and adaptation. According to this development, the operational terms and potential of designing at a higher-order level must be joined to a more reflexive and collaborative practice of design. (Giaccardi 2005, p. 347)

The emphasis falls on facilitation, consensus-building and ongoing process rather than immutable designed outcomes. For this reason, visiting designers from various disciplines were invited to collaborate in these processes with students and staff, thus playing a mentoring, rather than simply an expert, role. Secondly, the project was consciously situated at the interface between art and science: “Rather than a new model of design, metadesign represents a constructive mode of design: an enhancement of the creative process at the convergence of ‘art’ and ‘science’ ” (Giaccardi 2005, p. 348). Thirdly:

Metadesign represents a cultural shift from design as ‘planning’ to design as ‘seeding’. By promoting collaborative and transformational practices of design that can support new modes of human interaction and sustain an expansion of creative process, metadesign is developing towards new ways of understanding and planning with the goal of producing more open and evolving systems of interaction. (Giaccardi 2005, p. 348)

“Designing Futures” and other continuing design-based education at the school aims to ‘seed’ the awareness, skills, confidence and resilience required by all students who wish to take part in (co)-creating the future. Without this education they will be severely disenfranchised.

## **The “Designing Futures” framework**

### *A Practice Framework*

“Designing Futures” was premised on metadesign, partnerships, authentic experiences, inclusivity and participation. Many of the values espoused were embedded in the teaching/learning processes used, rather than addressed overtly. As such, the project was offered to a diverse group of students in terms of English-language skills, educational attainment levels and backgrounds, and the contributions of all students in the groups were supported and valued. In the words of one of the planners, “which design thinking strategies were used...and which terminology was

applied were of less importance than providing a palette of strategies to be employed (in different parts of the design process).” Our approach was partly modelled on IDEO’s version of design thinking, because this is human-centred, collaborative, experimental and optimistic, and provides a useful structure to the students’ design learning (IDEO 2012).

The program’s practical aims, as described on the website, start with this overview:

The 2011 Designing Futures program... puts the spotlight on design pedagogy at a time when design practice around the world is rising to the challenge of change. It’s a timely reminder that our College, in preparing students for the new century, needs to encourage flexible, connected and, sometimes, unorthodox ways of thinking. Design offers powerful tools for doing this kind of thinking, and this program set out to road-test many of them. (Kelvin Grove State College 2011)

The “Designing Futures” program provided a lot of inspirational, alchemical moments that are hard to describe theoretically—times that transcend the sum of the parts when the students’ learning and excitement are palpable to all participants. As depicted in the reflections of one of the planners: “...all three events (the Design-all-Day events for Middle School) were high energy, high output and high on affirmation of teamwork and thinking power. Excellent models to build on.”

The “Designing Futures” project was undertaken under the auspices of the Visual Arts Department at Kelvin Grove State College, a large (approximately 1300 students) inner-city school in Queensland, Australia, over a six-month period during 2011. It was funded through the Artist in Residence (AIR) program, which is a collaboration between the Australia Council for the Arts and Queensland Government Arts Queensland and Education Queensland. The Artist in Residence program recognises good practice and encourages innovation in arts and education programs in Queensland (The State of Queensland Arts Queensland 2012). The school is a co-educational state school catering for 13 years of schooling (Kindergarten to Year 12). The student population is highly diverse and includes a large number of international students, Australian students from non-English-speaking backgrounds, and indigenous students. The Visual Arts Department has very high participation in arts and new media, and a history of innovative leadership and creative partnership building in design-based learning programs.

The project was extensive, rich in variety and highly participatory, engaging with over 700 students, representing more than half of the school’s population. These students were from across the full school age range and came from a wide variety of academic, cultural and language backgrounds. Adult participants included more than 20 teachers, some of whom were student teachers, and nine designers and artists taking part in the Designers-in-Residence program. The designers’ specialties encompassed various branches of design and future-oriented art including product and interior design, urban planning, origami, ecology and bio-ethics. Despite this diversity, all the participating designers and artists shared strong values in relation to social and environmental sustainability. Students engaged in the design process were also enhancing their overall education by tackling complex problems involving multiple stakeholders, integrating theory from a range of different subject areas with hands-on design practice, and working together in teams where everyone had their disparate contributions valued.

“Designing Futures” consciously adopted the approach of inclusivity and therefore of providing design education for non-designers. The project was trans-disciplinary and involved students and teachers from the following subject areas: Art and Design; Biology; Chemistry; English; Mathematics and Philosophy. It was also trans-disciplinary in that participants used and integrated a wide range of skills, such as Mathematics (measuring and spatial); Visual Arts (drawing, model making/prototyping); English (written and oral communication); working effectively in multiskilled teams; brainstorming; Physics of structures, practical Chemistry (extraction of DNA from fruit as part of the Bio-Art program) and ethics (relating to environmental and social concerns and, in the case of the Bio-Art section, relating to the implications of biological research).

## *The Case Study*

### SIX-MONTH PROGRAM OUTLINE

The six-month program included the following elements:

- An extensive integration of Origami programs in Science, Mathematics, problem solving, prototyping and design, across the full school age range;
- Two off-campus design days for senior students - a Zero-waste Fashion workshop and a Slow Food workshop;
- Three Design-all-Day programs for Middle School students (details below);
- A visiting designer with a wide range of expertise who gave extensive in-class presentations and mentoring to students in the last four years of schooling. Design mentoring was also provided to Visual Arts staff;
- A Bio-Art/Ethics program targeted at Visual Arts, Philosophy and Chemistry students.

### THE DESIGN-ALL-DAY SESSIONS

Three fully funded full-day workshops were held for self-selected Middle School students. Thus the sole criterion for entry to the program was that the student wished to take part. No one was excluded on the grounds of ability or aptitude and no cost was involved for participating students. Students were divided into teams of five, carefully structured to include diverse talents. Teams were monitored throughout the activity to make sure that everyone had a chance to participate fully. The Designers-in-Residence delivered short presentations to the students, but for the majority of the time, adults participated as mentors and facilitators of practical, enjoyable and authentic design experiences.

Having been introduced to the day’s topic, teams engaged in brainstorming and mind-mapping, then the results were shared and discussed with the larger peer group. A considerable amount of experimentation took place and students were encouraged to question the brief and rethink the parameters within a wider context, echoing the concept of the redirected brief [Fry 2009]. When groups had explored and decided on the underlying problems they wished to tackle, i.e. problem-finding (Getzels and Csikszentmihalyi 1976; Runco 1994), they made presentations to ‘pitch’ their ideas to a team of designers, and constructed prototypes. All students, as well as teachers, planners and designers, were asked to fill in written feedback questionnaires at the end of the day. A 100% response rate was obtained for feedback from the adults who took

part in “Designing Futures”. The volunteer researcher was present each day, and the web designer attended to video proceedings as frequently as possible.

*Day 1: Designing Edible Futures*

Participants: Teachers 4, Designers 3, Students 31

Age of students: 10–11 years

Activity:

*Food Miles*: A practical exercise discovering the origin of different food items provided to each group.

*Edible Bling*: A practical design exercise using food miles items to prepare a dish that could encourage the consumption of healthy, local food. The results presented to the designer mentors and peers took many forms, including song and dance, new packaging ideas, posters, a healthy pizza and healthy iceblocks (prepared from unlikely ingredients and later consumed with enthusiasm).

*Day 2: Safe Landings for Soft Bodies (Saving Humpty)*

Participants: Teachers 4, Designers 3, Students 30

Age of Students: 11–12 years

Activity: *Saving Humpty* - Rationale/Redirecting the Brief

This activity challenged student teams to design and construct ways of protecting an egg from breaking before it was dropped from a height. Teams considered whether they should redirect their briefs from designing personal safety gear to ways of altering spaces and atmospheres within the city. In the words of one of the organising team, “Is it about harder hats or softer landings?” The prototyping was facilitated by designer/mentors, one of whom has particular expertise in origami and another in the sustainable use of bamboo. A wide variety of imaginative prototypes were presented to the panel of designer mentors.

*Day 3: Zero-Waste Chair (Somewhere to sit and chat that doesn't cost the earth)*

Participants: Teachers 4, Designers 3, Students 50

Age of students: 12–13 years

Activity: *Zero-Waste Chair*

This was the last of the three Middle School Design Days, involving the oldest and largest group of students. A particularly important change to the program based on previous experience, was that student teams received designer mentor feedback prior to the construction of final prototypes. These prototypes were made from one 2 ply cardboard sheet measuring 3m by 1.4m and a limited palette of other materials such as tape and glue. Once complete, the prototypes were (gently) tested by a teacher to the delight of the assembled student audience at the end of the day. The concepts of minimising the use of materials, design process, sustainability and user empathy were emphasised. Each team's impressive seating prototypes followed a unique approach, both in concept and in form development. Final prototypes included, amongst others, an empathetic mood chair, planned to change colour according to its occupant's frame of mind; a welcoming chair with a smiley face on the back and open arms with hands forming the sides; and a Yin/Yang chair. All seating had a strong relationship to the idea of community.

As it is impossible to provide detailed information on all of the above in a short paper, the detailed findings will focus on the three Middle School Design-All-Day sessions.

## Methodology

### *Participatory Action Research*

The program included Participatory Action Research procedures where planners, teachers, designers and students were all encouraged to voice and reflect on their experiences. “Designing Futures” was an internally-based action research project initiated within the school rather than being a product of external research conducted, for example, by a university, as is the case with many comparable projects. As such, “Designing Futures” was run with comparatively low funding, including a volunteer researcher, large stakeholder input, and a high level of commitment to authentic collaboration. “Designing Futures” was multifaceted, explorative and wide-ranging with large numbers of participants. Also, some aspects of the project, for example the Bio-Art section

were controversial, even confronting. For these reasons, it is crucial but challenging to give a picture of the range and individual narratives of as many participants as possible. As such, this project cannot be written about both authentically and with unequivocal research questions and outcomes. Where choices have been made in writing this paper, validity and presenting as many genuine voices as possible have been the guiding principles.

The “Designing Futures” program can be described in terms of action research as it pertains to a situation in which participants reflected about, improved and developed, their own work while also making the experience public. This model of action research values was chosen as it is:

- Practical
- Participative and collaborative;
- Emancipatory and egalitarian;
- Interpretive - a strong emphasis on authenticity is integral, and the researcher/s interpretations of the results need to be recognised and validated by the participants;
- Critical - participants look for practical improvements in their own work and learning, they also act as critical change agents by sharing this learning with others (Zuber-Skerritt 2012, p. 8)

Events were observed and progress monitored and reflected upon through formal and informal meetings. Video and still photography provided a visual record. The questionnaires constructed for each group of participants were worded differently so that they were clearly relevant to the particular activity that had just been engaged in and quick to complete (Bradburn, Sudman and Wansink 2004; Frazer and Lawley 2000). Formative and summative information was obtained from the teachers. The designers/artists and teachers involved provided written feedback and, finally, the information was shared with all these participants, as well as all other Middle School teachers, and a report was prepared for the funding body. Unfortunately, it was not practical to share the final information with the students. A website has been constructed to share information about the project with other schools across Queensland and beyond, and also, importantly, with parents and prospective students.

The participatory action research spiral was especially relevant to the adult participants who were able to contribute to and benefit from the feedback cycles. Alice McIntyre describes it in this way:

This process of questioning, reflecting, dialoguing and decision-making resists linearity. Instead, PAR is a recursive process that involves a spiral of adaptable steps that include the following:

- Questioning a particular issue
- Reflecting upon and investigating the issue
- Developing an action plan
- Implementing and refining said plan

...various aspects of the PAR process are fluidly braided within one another in a spiral of reflection, investigation and action. (McIntyre 2008, p. 6)

As well as describing the research process, this spiral neatly reflects the recursive design processes that students were engaged in learning about.

### *Findings*

This paper reports on the combined findings of the three Design-all-Day activities for Middle School students, derived from written feedback and supplemented by observation and records of formative action research. Information on the other aspects can be obtained from the website (Kelvin Grove State College 2011). Results focus on what the students learnt during the Design-All- Day sessions as this is seen as the most salient information when evaluating whether this part of the “Designing Futures” program fulfilled its aims and objectives. The learning questions were:

#### *Designing Edible Futures*

- “One thing I learned today about food is?”
- “One thing I learned today about design is?”

#### *Safe Landings for Soft Bodies*

- “One thing I have learned today about safety design is?”
- “One thing I have learned today about design in general is?”

#### *Zero-Waste Chair*

- “One thing I learned today about seating is?”
- “One thing I learned today about design is?”

Out of a total number of 111 students who participated in the three-day program, 84 students (76%) responded to the questionnaire. The 84 students were encouraged to nominate more than one response to the learning questions and this resulted in a total of 136 responses. Only one student gave a negative response to these questions. This student claimed to have learned “not much.” As there was a wide range of responses, they have been grouped according to the most commonly mentioned themes, as discussed below.

#### DESIGN PROCESS / DESIGN THINKING

A total of 56 students (representing 41% of the 136 responses) commented on design process and thinking. There were various strands to this conversation. Students



wrote about learning to use their creativity and “use our imagination and turn it into something real”. Also, “you can be really creative with it (design) and express your feelings when you set it out on a plate”. An understanding of the processes by which ideas turned into good designs was demonstrated in comments such as: “A lot of ideas are put in and rejected”; “It takes a long time to find a proper idea”; “You can change designs to make them better or simpler”; “It is important to plan everything that is to occur”; and “It takes time and thought to create or pitch an original idea”. The younger students remarked on design being easy; the older students were more likely to describe it as difficult, but this was not generally seen as a negative, more as a challenge. One student commented, “Sometimes to win you have to think hard”, and another, “If you put your mind to it and stick with it, it will come out the way you want”.

#### DESIGN FOR HEALTH AND SAFETY, AND THE ENVIRONMENT

A total of 38 students (representing 28% of the 136 responses) responded to questions regarding design for health and safety and the environment. Students from the *Designing Edible Futures* day remarked on how design could make healthy food look good and persuade people,

especially young children, to make better food choices. Students from *Saving Humpty* learned that good design has the potential to make public areas, especially busy streets, safer for pedestrians. One learned “how to think about ways to make public areas safer”. Designing public seating during the *Zero-Waste Chair* day taught students that this carried a big responsibility to make the seating safe. A major theme of their responses was the importance of load-bearing internal structures.

Balancing the needs of people and the environment was also a strong emerging theme, with one student learning “that people come first...and it’s not just about designing individual things, you need to think about the environment as well”, and another commenting, “I could put my ideas into something that didn’t destroy the planet”.

#### TEAMWORK FOR DESIGN

A major learning theme for the three days was teamwork. Students were specifically asked whether they enjoyed working in a team. 89 students answered this question. 63 students (71%) enjoyed working in a team, 24 students (27%) sometimes enjoyed working in a team and 2 students (2%) did not enjoy working in a team. Even where there were some teamwork challenges, most students acknowledged the importance of teamwork to the design process. One student noted that “I learnt to communicate with members of the group better to get good ideas and to discuss” and another responded, “I learnt that in a design team everyone has their strengths and the team works best if you work with them”.

The following comments from three of the Designers-in-Residence are in accord with the overall impression of enthusiasm and learning:

My own personal view and experiences...were that many of the students left inspired and enthusiastic about how they could apply these experiences to current and future learning tasks, whilst inspiring fellow students about their own ideas and the importance and merit of these ideas, not just within their educational environment, but also outside within the wider community. The unexpected outcomes generated during the workshops meant that students had to let go of

preconceived ideas and adapt to group-led discussions whilst discovering a more additive or evolutionary solution was as important as a definitive resolution. (Designer Participant 1)

These kids are my super-heroes...I watched them grapple with food miles maths, an edible bling dinner party, blenders and fusion icy pops before getting down to the stuff of redesigning what we can do to green our food systems. Move over food monopolies...the kids are coming...and they are good! (Designer Participant 2)

The input of an industrial designer, interior designer and origami artist into the design evaluation process allowed students to see that the design of products is not just an exercise in form, but requires an ability to empathise with the user and client, to create an emotional connection with the product and user, a succinct visual and verbal communication of ideas, an ability to respond to a diverse range of challenges during construction, and an appreciation of the larger world around us. The depth and complexity of the thinking behind the design was revealed. (Designer Participant 3)

The picture is also reinforced by this summative statement from the Visual Arts staff:

The Middle School Design-All-Day program provided a laboratory to test the effectiveness of design approaches, as well as the 'futures' framework. It was clear that with the activities framed in an appropriate and engaging way, students worked with confidence and responded imaginatively to these quite challenging themes. Again, the opportunity to work with design mentors provided an authentic context. Success was measured by the effectiveness of teamwork and the quality of the ideas generated in a comparatively short time rather than by the usual 'performance' values. This was a model that could be applied in our practice in many other contexts.

#### Summary & Recommendations

The findings indicate that programs like "Designing Futures" can make a major contribution to educating students towards individual and community resilience and empowerment, and working together to help design and construct viable futures. The program has been shared with other schools and this paper represents a continuation of this sharing process. The desire is to let others know about the possibilities, demonstrate what a program of this kind can look like, and inspire other schools to run their own metadesign-based programs in their own way.

The feedback for "Designing Futures" indicated a powerful desire to see similar programs in the future. Sadly, it is becoming ever more difficult to obtain funding or class time for such projects. Whilst the Visual Arts department of the host school continues to run innovative and inclusive design programs, it is unable to extend these to the large numbers of students who are not actually studying design at the school, as achieved with "Designing Futures". At the same time, the incoming National Curriculum in Australia reduces the availability of class time and resources for perceived 'extra-curricular' activities. This situation is made more difficult by the previously discussed emphases on testing around the core subjects of Mathematics, Science and English. Thus the sort of teaching and learning espoused by "Designing Futures" and similar programs is increasingly seen as expendable. This is unfortunate for our communal future, especially in terms of equity. Students who are currently not performing academically are unlikely to benefit from more of the same programs they currently struggle with. In contrast, programs such as "Designing Futures" offer students the

chance to integrate and enhance their skills, gain confidence and thereby also improve their academic results. Programs seen as 'extra-curricular' are available to, and valued by, those families who can afford to pay for them. They are highly likely to improve the life chances of those who can participate and disadvantage those who cannot. This is against a background of increasing economic and social inequality in Australia and other countries such as the USA. Therefore, it is recommended that:

- Metadesign education/design education for resilience should be offered to as many students as possible, not solely to specialist design students, as it offers a powerful way of equipping students to tackle future challenges in an ethical and co-operative manner and it has a symbiotic relationship with other segments of education whereby both design and general education are enhanced.
- Active school and community partnerships, employing the skills of a diverse external network including design professionals and artists, need to be encouraged to enhance education opportunities for school students from Kindergarten to Grade 12. This includes valuable links between the tertiary and school education sectors in order to both articulate student pathways, and to facilitate and document ongoing research in the area of design education.
- Ongoing design education programs in schools in Queensland, such as "Designing Futures", "goDesign travelling workshop program for regional secondary school students" (Wright et al 2010) and "Living City" (Verge Pty Ltd 2013; Wright, Hooper et al 2010), receive continued and increased support from local and state governments to ensure sustainability for continued design education research.
- To extend "Designing Futures" and complementary programs, into an international community, a metadesign schools network should be established to allow increased sharing of ideas and resources and mentoring between schools. This network could also be influential in encouraging much needed policy reforms in design education.

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# An effect of multidisciplinary design education: creative problem solving in collaborative design process

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**Abstract:** *This study verified whether the students who received multidisciplinary education can be considered to have attained more creative problem-solving abilities than the students who majored only in design, based on their completion of a project after teaming with students from various other departments. When it is heterogeneous and in the in-depth discussion stage, the EMT(heterogeneous teams, including multidisciplinary design major) produced more creative output than the EDT(heterogeneous team, including design-only major) as a result of an experiment. Therefore we compared the creative process of the EDT and the EMT in the in-depth discussion stage of the heterogeneous groups by the conversation analysis. In the problem-solving approach, the EMT focused more on context and the multidisciplinary students considering much more diverse aspects of design content. Analysis of the group activity process showed that the EMT and multidisciplinary students actively engaged in idea generation and review & summary. As such, this study was able to confirm that students who received multidisciplinary design education, when they form a team with various other majors to do a project and in the in-depth discussion stage, show differences in creative process to solve problems and more creative output than students majoring in design only.*

**Keywords:** *group creativity, multidisciplinary design education, design process*

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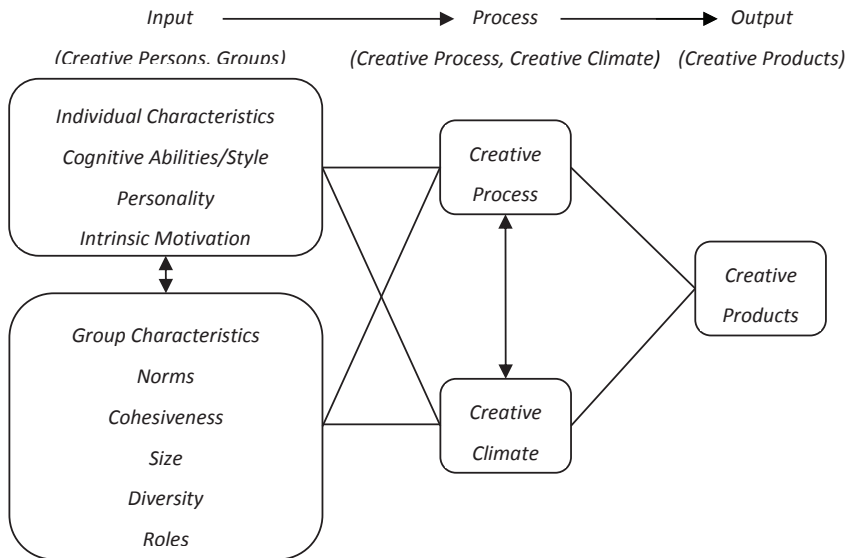
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## **Introduction**

A study by Denton, published in 1997, examined some factors involved in the planning and practice of multidisciplinary team-based design project work at undergraduate level. The study reports that since industries increasingly require more multidisciplinary project work than monodisciplinary team work, the demand for design college graduates with experience in the former is increasing. Several British universities, including Central Lancashire University, which offered education programs that combined design and other academic disciplines, were mentioned as subjects in that study investigating the components required for inclusion in multidisciplinary team design project planning. For more than a decade, therefore, beginning in countries such as Great Britain, the need for multidisciplinary design education has been felt and related research and education programs implemented. Following this trend, Korea also launched in 2007 the Capstone Design project, which marked the start of multidisciplinary design school development policy. The Capstone Design project was mainly a program for fostering the comprehensive problem-solving abilities of students by bringing design students together with students from other departments to form a single team and having this team complete a project in partnership with a corporation. Intensifying this program format further, the multidisciplinary design school development project was launched in 2009. The aim of this project was to nurture design talent with creative and integrated problem-solving abilities. It consisted of combining the curricula of three or more departments from different academic disciplines and, based on this, creating a new major within the department of design, as well as operating a related industry-academy cooperation program. In the present study, we seek to verify whether, after three years of this project, the students who received this multidisciplinary education can be considered to have attained more creative problem-solving abilities than the students who majored only in design, based on their completion of a project after teaming with students from various other departments.

## **Group Creativity**

At the group level, creativity is a function of group processes in addition to group composition and group characteristics (Shalley & Gilson, 2004; Woodman, Sawyer, & Griffin, 1993). The input-process-output model (Cohen & Bailey, 1997; Shalley et al., 2004; Zhang et al. 2011) suggests that a group's creative output is a result of the group's processes. Group creativity performance can be viewed as the result of interactions among several important components or dimensions of creativity. These various components or elements can be categorized into Input, Process and Output. Figure 1 diagrams the relationships among these components (Siau 1995).



**Figure 41.** The relationships among creativity components (Siau 1995, p204)

In seeking to understand the factors contributing to work group creativity, Zhang et al. (2011) explored the roles of two different leadership styles that leaders play in group creativity through influencing internal group processes, i.e., collective efficacy and knowledge sharing among group members. They included group diversity in members' age, gender, education, and job function as control variables because group creativity may be affected by group size (Curral, Forrester, Dawson, & West, 2001), members' group tenure (Shin & Zhou, 2007), or group type (Shin & Zhou, 2003).

With respect to design, creativity is the process of making a product that will be accepted as lasting, useful and satisfactory by a group gathered together for a specific purpose. The five components that must be included in the theory of creativity are person, problem, process, product, and climate (Taylor 1975). Taggar (2002) and West et al. (2003) beg the question of what produces these creativity-generation processes. Taggar investigated the interaction between group members' individual dispositions (e.g., cognitive ability, openness to experience, and conscientiousness) and group processes (e.g., involving others, providing feedback, and effective communication) in the creation of products by groups of college students. West et al. found that group processes (e.g., group participation, commitment to team objectives) consistently predicted group creativity.

## Creative performing and team communication

Diversity research suggests knowledge complementarity as a creativity-enhancing mechanism (Jackson 1996, p. 60). New perspectives are explored in response to dissent, and new ways to look into an issue that is disputed (De Dreu and Beersma 2001, p. 270). Some research has found that diversity is related to higher creative

performance (Andrews, 1979; Payne, 1990; Visart, 1979). Increasing diversity should increase the range of knowledge, skills, and perspectives available within a group that should positively impact creativity (McLeod & Lobel, 1992; Pelled, Eisenhart, & Xin, 1999). A series of studies conducted by Hoffman and colleagues (Hoffman, 1959; Hoffman et al., 1962) found that diverse groups experienced more conflict and consequently were stimulated to search for different answers and alternative solutions. However, stressing the benefits of diversity may cause the difficulties of heterogeneous team collaboration to be underrated. Such difficulties have frequently been reported, particularly communication, coordination, and efficiency problems. In the ‘pessimistic’ view, diversity is seen as problematic as it introduces differences that produce communication problems and tension, thus hindering effective teamwork (Reagans and Zuckerman 2001). We need to explore how the creative process of students who received multidisciplinary design education changes depending on group diversity compared with students majoring in design only. Therefore we compared the creative performance of multidisciplinary design students and design-only students by dividing the subjects into a homogenous group comprised of same majors and a heterogeneous group made up of different majors.

The creative performances of the design teams show a difference between the initial design brainstorming stage and the subsequent more in-depth discussion stage. Rosalie and Jerry (2008) measured the design team performance in terms of creativity of design and quality of design and divided the teams into high performing teams and low performing teams. The analyses of their communications showed that high performing teams spent less time in brainstorming activities. It was found, however, that the high performing teams conducted more in-depth discussions. Irina and Vanessa (2009), in their study on understanding the communication mechanisms of collaborative design teamwork, analyzed the visualization in a 15-minute brainstorming session and the subsequent session separately. In this study, the design process was also examined by dividing it into an idea generation stage and an idea deepening stage.

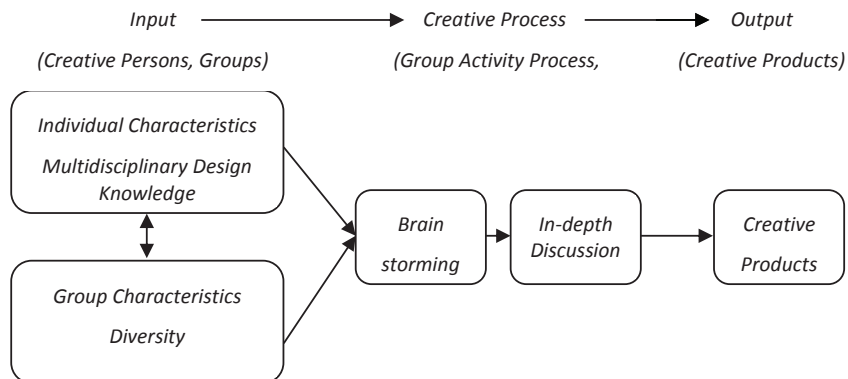


Figure 2. The research model



## Method

The experiment lasted a total of 100 minutes, proceeding in the order of individual creativity examination (30 minutes) and design task (70 minutes). Each group was provided with 10 sheets of B4 paper, pencils and erasers as the tools needed for the experiment. The entire process was videotaped with two cameras per group.

### Participants

The experiment participants comprised 12 junior design majors from the multidisciplinary design education program, 12 junior design majors from the traditional design education program, and 12 sophomores to seniors from other departments for a total of 36 students. They were grouped into 12 teams of three. Of these 12 teams, 6 teams were heterogeneous with each group consisting of 1 design major and 2 non-design majors, while the remaining 6 teams were homogenous with each group made up of all traditional design majors or all who participated in the multidisciplinary education program. The multidisciplinary design education students all participated in the two-year multidisciplinary education program and have industry project experience ranging from 2.5 to 11 months. The non-multidisciplinary program participants were selected to have as much as possible similar GPAs, and the non-design majors in the heterogeneous groups, similar majors and class years. Also, in order to obtain a similar level of interest in design for the non-design majors, the subjects were chosen from students taking elective courses in design who wanted to participate in the experiment.

**Table 1. Form a group**

Major Design Education	Homogeneity	Heterogeneity
Design	<ul style="list-style-type: none"> <li>• 3 homogeneous design teams(ODT)</li> <li>• Each team members</li> <li>: 3 design majors</li> </ul>	<ul style="list-style-type: none"> <li>• 3 heterogeneous design teams(EDT)</li> <li>• Each team members</li> <li>: 1 design-only major</li> <li>+ 2 non-design majors</li> </ul>
Multidisciplinary Design	<ul style="list-style-type: none"> <li>• 3 homogeneous multidisciplinary design teams(OMT)</li> <li>• Each team members</li> <li>: 3 multidisciplinary design majors</li> </ul>	<ul style="list-style-type: none"> <li>• 3 heterogeneous multidisciplinary design teams(EMT)</li> <li>• Each team members</li> <li>: 1 multidisciplinary design major</li> <li>+ 2 non-design majors</li> </ul>

### Task

Dorst, Kees and Cross (2001), in their study on creativity in the design process, stated that the industrial design domain is particularly interesting for the study of creative design because it calls for new, integrated solutions to complex, multidisciplinary problems. They argued that the design task for creativity evaluation needs to be challenging, realistic, appropriate for the subjects, not too large, feasible in the time available and within the sphere of knowledge of the researchers, and that the problem is typical as far as industrial design practice is concerned, in that it calls for the integration of a variety of aspects. In a similar vein, the present study examining design creativity selected the task that can reveal integrated problem-solving ability. The task was also something on which the major of design had little impact and which was easily

accessible to non-design majors in everyday life. The topic given as the design task was “It is 7 PM in the evening. How can we make people feel better after work?” The time allotted to perform the design task was divided into experiment A and experiment B. Experiment A (brainstorming) required sketching or writing the description of the ideas produced in the group during the 20-minute period, without limitations and consideration of implementation methods. Experiment B (in-depth discussions) required, within the 50-minute period, choosing an idea from the prior session (Experiment A) or a new idea and further developing it based on a specific method for its realization and then writing and submitting its design background, design concept, and design solution image.

### *Torrance Tests of Creative Thinking (TTCT)*

In order to verify whether an individual’s creativity affected group creativity, individual creativity tests were given. The participants each performed three actions: receiving one TTCT Figure A test sheet and following the test giver’s instructions, completing the figure and attaching the name during the given time. The TTCT results confirmed that in both the homogeneous groups (P-value: 0.725) and heterogeneous groups (P-value: 0.294) there were no statistically significant differences between the individual creativities of design-only students and multidisciplinary design students.

### *Creativity Measure*

Design output creativity was judged by three experts through prepared evaluation sheets. The judges consisted of two professors and a doctoral candidate in design. The evaluation sheets were prepared based on the Korean creative product evaluation tool (Kim and Lee, 2004, p. 305) developed by modifying Besemer’s (1999) Creative Product Analysis Model (CPAM) and Creative Product Semantic Scale (CPSS) to reflect the cultural peculiarities of Korea for the purpose of assessing the degree of product creativity. The evaluation tool is structured with three components and eight sub-components - novelty (surprising, original), resolution (logical, useful, valuable), style/elaboration and synthesis (organic, well-crafted, elegant), with each sub-component having 2~7 questions. The responses to these questions were evaluated on a 7-point scale and the average of the three components was taken as the ‘creativity’ measure. Separately from this, a single ‘score’ question was established to assess the overall creativity of the design. It asked, “On a scale of 100, how many points would you give to this design?”

## **Result of the evaluation of products**

The output evaluation results showed the Chronbach’s  $\alpha$  coefficient value, which signifies the degree of congruity among the 3 judges, to be 0.6 or higher for all evaluation items, indicating high measurement reliability.

**Table 2. The inter-rater reliability of the output**

	Novelty	Resolution	Elaboration & Synthesis	Score
Experiment A	0.767	0.722	0.696	0.892
Experiment B	0.844	0.897	0.864	0.815

In the homogeneous groups, the differences in output creativity of the design-only teams and the multidisciplinary teams were shown only in elaboration & synthesis, as given by Table 3. In the heterogeneous groups, as presented in Table 4, the differences were shown in resolution; average, the average of the three components (novelty, resolution, elaboration & synthesis); and score, indicating the overall degree of creativity. But these differences all appeared only in experiment B. There were no statistically significant differences shown in experiment A, since the p-value was found to be much greater than the significant level 0.05. In other words, for idea generation during a short time period, there were no differences between the EDT and the EMT, but in terms of deepening a small number of ideas overtime, the multidisciplinary teams produced more creative outputs.

**Table 3. The evaluation of output creativity (homogeneous groups)**

	Experiment A			Experiment B		
	ODT	OMT	P-value	ODT	OMT	P-value
Novelty	3.84	3.87	.954	3.86	4.69	.113
Resolution	4.40	4.77	.544	4.66	4.26	.473
Elaboration & Synthesis	3.88	4.22	.462	<b>4.49</b>	<b>5.39</b>	<b>.019</b>
Average	4.04	4.28	.601	4.34	4.76	.274
Score	58.89	61.11	.770	62.22	65.00	.723

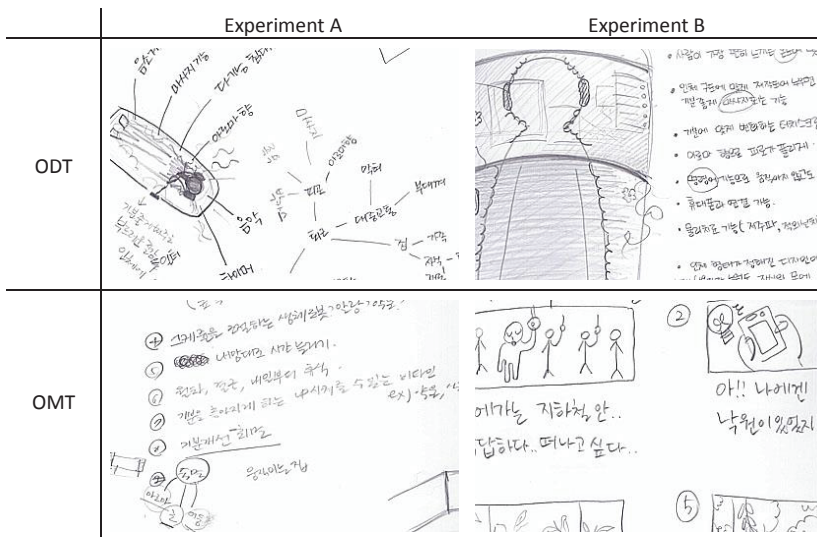


Figure 3. Examples of output in homogeneous groups

Table 4. The evaluation of output creativity (heterogeneous groups)

	Experiment A			Experiment B		
	EDT	EMT	P-value	EDT	EMT	P-value
Novelty	3.39	3.46	.917	2.86	3.34	.191
Resolution	3.39	3.46	.903	<b>3.59</b>	<b>5.32</b>	<b>.000</b>
Elaboration & Synthesis	3.71	3.26	.223	4.22	4.14	.770
Average	3.80	3.69	.815	<b>3.54</b>	<b>4.27</b>	<b>.009</b>
Score	53.00	51.11	.851	<b>44.33</b>	<b>61.11</b>	<b>.029</b>

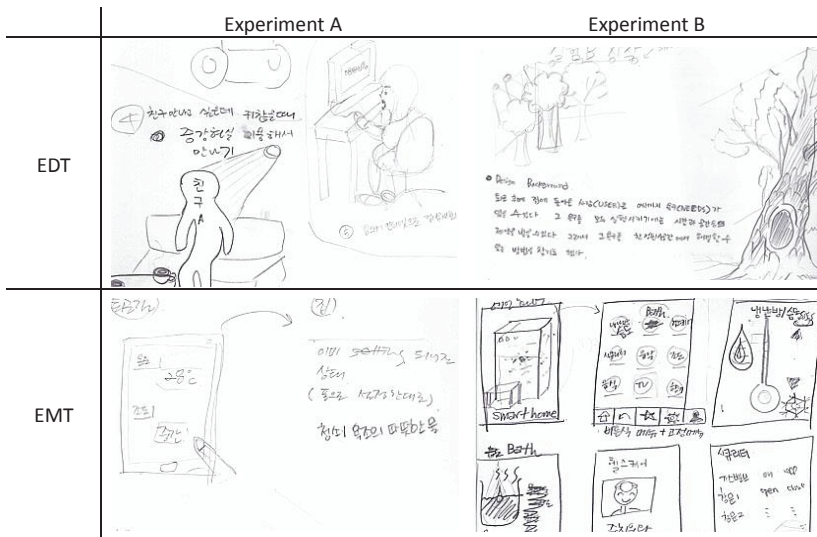


Figure 4. Examples of output in heterogeneous groups

We therefore examined the reason for these differences shown between the design-only teams and multidisciplinary teams in the heterogeneous groups of experiment B (in-depth discussion) by performing a transcript analysis of the creative process. To do so, we transcribed the recorded conversations of the participants and then performed an in-depth analysis by using Nvivo9, a tool for qualitative study of the problem-solving approach and group activity process.

## Coding scheme for group creative process

### Problem-solving approach

In order to examine which components the participants placed interest in approaching the problem to do the design task, we divided their communication details according to the categories presented in Table 5. This allowed us to know which design characteristics the participants focused on to solve the problem (Jin and Kim 2006, p. 112).

Table5. Coding scheme for the problem solving approach

	Code	Explanation	Example
Form Visual factor	Overall Shape	Main object, Size, Color	There are lots of round objects.
	Component Shape	Unit	Speaker, Lamp
Function	General Feature	Common function, Usage	Give emotional security
	Technical Feature	Explicit function, Operation	To drill a hole
Context	External Knowledge	User social context	Get off work
	Physical Elements	Body elements, Human Moving, Gestures	Sit, Dip her feet in water
Human	Mental Elements	Feeling, Responses	Boring, Sad
	Designer Intent	Domain knowledge, Designer's Judgment, Process management	What do workers want? I think it needs a light.

### *Group activity process*

In order to examine the structure of the discourse showing the group work process, the activity process of the group was divided according to the categories presented in Table 6. In their on-site study of group activity, Olson et al. (1992) made 10 observations of software design problem solving meetings that were a part of a small group project. They discovered that the design meeting activity can be classified into 10 categories: 'issue, alternative, criterion, clarification, summary, walkthrough, goal, project management, meeting management, digression, and other.' Rosalie & Jerry (2008) developed this further and differentiated design team communication into three stages: 'design, review & summary, and coordination.' In the present study, we wanted to examine in detail the process of presenting an idea and resolving the design-related demands and issues. We thus divided the process into categories of 'issue, alternative, and criterion.' Also, since in this study there is already a given topic in the task, the 'issue' was further divided into 'task' and 'new topic.' The 'task' is the communication that takes into account the elements '7 PM in the evening,' 'after work,' and 'make feel better' included in the topic; 'new topic' is a new problem that needs to be considered in the design task outside the topic given in the task.

**Table 6. Coding scheme for the group activity process**

Code	Explanation	Example
Task	Considering the questions for given tasks	What makes us happy?
Issue	New Topic	Shall we offer this capability to the user?
	Alternative	A function to auto-play according to their mood.
Criterion	The reasons, arguments, or opinions that evaluate an alternative solution or proposal.	I think it's an impossible idea because we have to make tangible products.
Review and Summary	Reviews of the state of the design or implementation to date, restating issues, alternatives, and criteria. Clarification and walkthrough.	As I make a list of what we discussed on functions and services.
Management	Project management or meeting management.	Let's finish talking about this idea in 10minutes.
Other	Time not categorizable in any of the previous categories. It's not related to their work.	I'm hungry.

## Communication analysis results

### Problem-Solving Approach

The codes that showed significant differences between the EDT and EMT were the problem-solving approach, component shape, general feature, external knowledge, and design intent, as presented in Table 7. For all codes other than designer intent, the number of related conversations was greater in the EMT, and among them, external knowledge showed the greatest difference. In other words, the EDT placed a greater weight on the inner knowledge and judgment of the designers during the process of deepening the design, whereas the EMT showed more interest in the knowledge (social relationships, circumstances, design problems) brought from the outside.

The EMT focused on general features and contexts while the EDT placed more weight on designers in the proportion of each code in the conversations regarding the problem-solving approach of a group compared between the EDT and EMT.

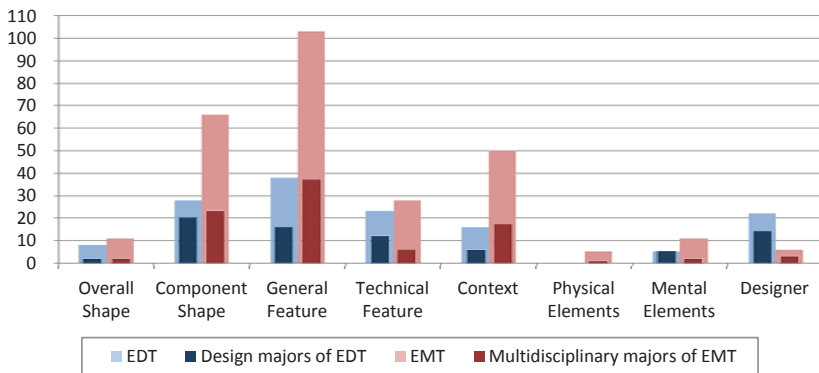
**Table 7. Comparing the conversations relate to the problem-solving approach between the EDT and EMT**

		Number			Proportion	
		EDT	EMT	P-value	EDT	EMT
[Problem Solving Approach]		134	263	<b>0.012</b>	1.00	1.00
Form Visual Factor	Overall Shape	8	11	0.260	0.06	0.04
	Component Shape	28	<b>66</b>	<b>0.021</b>	0.21	0.25
Function	General Feature	38	<b>103</b>	<b>0.004</b>	0.28	0.39
	Technical Feature	23	28	0.321	0.17	0.11
Context	External Knowledge	16	<b>50</b>	<b>0.001</b>	0.12	0.19
Human	Physical Elements	0	5	0.060	0.00	0.02
	Mental Elements	5	11	0.132	0.04	0.04
Designer	Intent	<b>22</b>	6	<b>0.044</b>	0.16	0.02

Figure 5 shows the comparison between the participation rates of design majors and multidisciplinary majors within their own groups in the conversations for each code of the problem-solving approach. The multidisciplinary students showed relatively uniform participation in each code, while the design-only students tended to concentrate on particular codes (component shape, mental element, designer). Those which showed clear differences in the number of conversations were codes leaning greatly on the internal knowledge or judgment of designers.

**Table 8. Comparing the conversations relate to the problem-solving approach between design majors in EDT and multidisciplinary majors in EMT**

		Number			Proportion	
		Design Majors	Multidisciplinary Majors	P-value	Design Majors	Multidisciplinary Majors
[Problem Solving Approach]		70	86	<b>0.338</b>	1.00	1.00
Form Visual Factor	Overall Shape	2	2	0.500	0.25	0.18
	Component Shape	20	23	0.419	0.71	0.35
Function	General Feature	16	<b>37</b>	<b>0.017</b>	0.42	0.36
	Technical Feature	12	6	0.236	0.52	0.21
Context	External Knowledge	6	<b>17</b>	<b>0.033</b>	0.38	0.34
Human	Physical Elements	0	1	0.157	x	0.20
	Mental Elements	5	2	0.209	1.00	0.18
Designer	Intent	14	3	0.101	0.64	0.50



*Figure 5. Comparing the conversations relate to the problem-solving approach between design majors in EDT and multidisciplinary majors in EMT*

### Group Activity Process

The codes which showed significant differences in the number of conversations on the group activity process between the EDT and the EMT are group activity process, alternative, review & summary, with the EMT having more conversations on all three codes. The EMT also had a greater number of conversations in the group activity process code measured by the overall number of conversations. The reason for this is

that the EMT participated in much greater number of idea generation (2.8 times) and review & summary (2.4 times) than the EDT.

In terms of the proportion of each code in group conversations, the EMT placed more weight, as is the case with the number of conversations, on alternative and review & summary. Meanwhile, the biggest difference in weight was shown for the code 'other,' which the EDT emphasized. In other words, compared to the EMT, the EDT placed relatively more weight on idle talk than on engaging in new idea generation.

**Table 9. Comparing the conversations relate to the group activity process between the EDT and EMT**

	Number			Proportion	
	EDT	EMT	P-value	EDT	EMT
[Group Activity Process]	309	<b>570</b>	<b>0.008</b>	1.00	1.00
Issue	Task	12	5	0.091	0.01
	New Topic	6	7	0.440	0.01
Alternative	70	<b>193</b>	<b>0.002</b>	0.23	0.34
Criterion	34	38	0.360	0.11	0.07
Review & Summary	109	<b>269</b>	<b>0.003</b>	0.35	0.47
Management	45	58	0.202	0.15	0.10
Other	55	15	0.080	0.18	0.03

Of the conversations on the group activity process, for most codes, the multidisciplinary students showed about 10% more than the design-only students, and large differences were shown only in task and new topic. However, since the number of conversations falling under these two codes was small, and the numerical differences of 0 and 5 each were slight, it is difficult to consider these to have a substantial impact on the group design process. Hence although the weight of conversations within their group by design-only students took up about half and was generally greater than that of the multidisciplinary students, there were no differences concentrated on specific codes.

**Table 10. Comparing the conversations relate to the group activity process between design majors in EDT and multidisciplinary majors in EMT**

	Number			Proportion	
	Design Majors	Multidisciplinary Majors	P-value	Design Majors	Multidisciplinary Majors
[Group Activity Process]	150	<b>221</b>	<b>0.058</b>	0.49	0.39
Issue	Task	4	4	0.500	0.80
	New Topic	6	1	0.229	0.14
Alternative	32	64	0.137	0.46	0.33
Criterion	17	16	0.423	0.50	0.42
Review & Summary	55	110	0.056	0.50	0.41
Management	24	24	0.500	0.53	0.41
Other	29	7	0.203	0.53	0.47



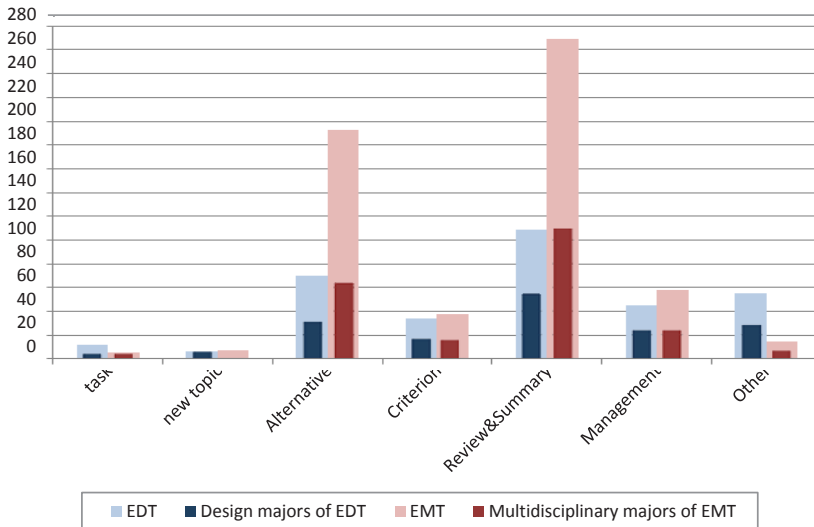


Figure 6. Comparing the conversations relate to the group activity process between design majors in EDT and multidisciplinary majors in EMT

## Conclusion

In this study, we examined how the creative process changes depending on the multidisciplinary design knowledge of the group members, i.e., the person creativity element, as well as consider the creativity of the output.

When it is heterogeneous, an multidisciplinary design team with experience of doing projects as a team formed with diverse departments and of taking multidisciplinary courses linked with other departments produced more creative products than a design-only team. Also, although the difference was small at the initial stage of brainstorming over a short time period, a clear difference was shown in the in-depth discussion stage where ideas were further developed over a longer time. Hence we compared the creative process of the design-only teams and the multidisciplinary teams by performing a communication analysis in the in-depth discussion stage of the heterogeneous groups which showed a clear difference in output creativity.

Firstly, the number of conversations on the problem-solving approach and group activity process was about double for the EMT, agreeing with the characteristic that high-performing teams are more verbose (Rosalie and Jerry 2008, p.64).

Secondly, the weights of the conversations by design-only students and multidisciplinary students in each team showed that the latter (about 1/3) participated in the conversations at a ratio for commenting more equally than the design-only students (about 1/2).

Thirdly, in conversations on the problem-solving approach, the EDT placed greater weight on the internal knowledge and judgment of designers, whereas the EMT focused more on outside knowledge and general function. The design-only students tended to concentrate on particular content, especially giving much weight to designer intent. The multidisciplinary students considered much more diverse aspects of design content. According to Chakrabarti and Bligh (1996), generating a wide range of concepts is

important, so that valuable concepts are not overlooked. If designers can develop promising concepts, this should increase the possibility of creating better products. Hence it can be said that the possibility is higher for the multidisciplinary students in the heterogeneous groups, who considered design contents from more diverse aspects, to produce better outputs than the design-only students.

Fourthly, Analysis of conversations on the group activity process showed that the EMT actively engaged in idea generation and review & summary. This difference was similarly found when the conversations between the design-only majors and multidisciplinary design majors within each team were analyzed. The EMT characteristic, an active review & summary, was the same high design performing team's in study of Rosalie and Jerry (2008, p.63). Their study has shown that in the high performing teams, typically a member sifted through the team's communications in order to summarize discussion content on a given topic. The summaries provided a structuring mechanism that organized the team's work and progress-to-date on a topic. Summaries also served a "check and balance function," as members made certain their ideas were included and accurately represented. In severe contrast, summary comments were either almost non-existent or only recapped a single individual's input in the low performing teams.

As such, we were able to confirm that students who received multidisciplinary design education, when they form a team with various other majors to do a project, show more creative output and solve problems with a different creative process than students majoring in design only.

## **Limitations and future research**

We recognize several limitations in this study. First, this research would need to be based on a much broader statistical range. The conclusion may therefore only have hypothetical status. This research helped build up several hypotheses. We would need further studies on one of the hypotheses that the heterogeneous team, including design-only major place greater weight on the internal knowledge, whereas the heterogeneous teams including multidisciplinary design major focus more on the outside knowledge on the problem-solving approach with more participants.

Secondly, the current study treated knowledge of individual level, group diversity of team level and design field. The individual character of group members is factored out to the largest extent since we focused on how to use knowledge in problem solving to confirm the effect of multidisciplinary design education. In the future study, we'd like to take a look at cognitive styles in the study hereafter, as the styles seem to be another possible element in individual levels associated with individual knowledge on which multidisciplinary education can have an impact.

Lastly, a limitation to consider is in the introduction of design group members into a study focused on academic settings. Jeffries(2011 ) suggests academics differ to practitioners in their conception of skills relevant to creativity within a specific design related subject. We need to study creative performances of participants after being practitioners in organizations to explore multidisciplinary design education effects from practical work environments.

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# Tell it with colours: Case study of Multidisciplinary educational program for non-designer

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**Abstract:** *The aim of this paper is to identify qualities associated with pupils' interactions with aesthetic learning processes when creating multimodal texts. The study addressed the following research question: How do pupils experience and interact with the appearance of aesthetic elements when they create multimodal expression? The topic chosen is associated with an interest in children's encounters with art and developing an understanding that will assist practitioners who work with creative processes in their daily activities to take part in teaching in schools. This facilitates the expression of creativity as well as innovation and the development of the pupils' sensibility with regard to cultural expression. The meaning making that occurs during interactions among the pupils, the teachers, the art form and the tools is explored. The theoretical perspective for this study is socio-cultural, and a socio-semiotic multimodal theory is presented and discussed. The method used was a case study. The data generated within this project were qualitative, including field notes, video observations, photos and children's multimodal texts. The study subjects included six pupils in the first grade of primary school. In the analysis, a narrative approach was applied to provide nuanced descriptions of situated aesthetic learning processes and experiences.*

**Keywords:** *Aesthetic learning, multimodal texts, multidisciplinary, creativity, encountering the art, early childhood education.*

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## Narrative 1 - A beautiful treasure

A small group from Thea's class is gathered in a circle. They have made books entirely by themselves. A sheet of paper is painted and folded into a book. First, the children searched for a narrative in the colours, then the narrative was reinforced, and now they are ready to both tell and listen to each other's stories. "Could you please hold the book so that we'll see it as you tell it," says the art teacher. "It's about a girl who has a best friend, but she has to move," says Thea, as she looks up at the audience. "Shh, Christoffer, we have to listen to Thea's story," says the art teacher to a boy who is a little uneasy. Christoffer turns his attention to the story, and Thea continues. "The friend had to move, and it is very sad. She had to take a plane to another place." "Wow, how did you draw this?" Christopher exclaims. His undivided attention is drawn toward the narrative. Thea looks at him and continues. "The girl could see a light, and since she does not know what it is, she goes further." Everyone is sitting as if spellbound, following her story. "She sees a beautiful treasure, and she would like to take the treasure with her, but it is very heavy. Thea goes on ... "And then there was an airship with some bad boys, which threatens to take the treasure, but in the end she manages to pick up the treasure." Thea finishes her book, and the art teacher exclaims: "We have to applaud this fine story!" Everyone claps. ... "Can I have a look?" Christoffer is stretching out to take hold of Thea's book. "What a great story it was, says the art teacher. I think the whole group was completely speechless when you showed us your book; let's look at the plane again." Thea holds up the page with the plane. The art teacher turns to the other pupils and says "Wasn't this nice?" "How did you manage to make it?" Christoffer wonders. "I saw that there were some colours that resembled a plane, so I thought that I could just create a wing, and then it was a plane; it just came out of the colours." Thea points into the book on the plane. "Wow, that was really good," says the art teacher. "... But how did you make the mountains?" Christoffer wants to know. "I saw that the colours acted in this way, which is why I decided to draw the mountains this way," Thea responds with evident pride. [Narrative 1 - A beautiful treasure]



Figur 1: Thea's picture book "A beautiful treasure"



## **Introduction**

Creating and experiencing art is a dialogical process involving meaning making. Experience with the arts provides material for education and training in all disciplines. Løvlie goes so far as to claim that such an aesthetic experience can be seen as fundamental for all educational activities. Given the works of Hegel, Løvlie argues that "to create something unknown to the self is to return to yourself. Man realises himself through the face of things he creates; he meets himself in creation" (Løvlie 1990). Given these perspectives, it is important to strengthen schools as an arena for aesthetic learning processes. If schools could facilitate aesthetic learning processes that enable individuals' self-education, it would be productive to include practitioners who work with creative processes in their daily activities. There is the possibility that generalist teachers with a breadth of knowledge can work together with practitioners in the arts so as to generate creativity and innovation and develop a sensibility with regard to the cultural expressions of the child. Such interaction forms the basis for common knowledge across different stakeholders and professions. The distribution of the knowledge generated through these projects requires a meta-reflection and an analysis by a researcher in the field.

With this paper, our goal is to identify the qualities of interaction that are observed in pupils' meaning making through the production of multimodal texts. The research question for this study is as follows: How do pupils' experience and interact with the appearance of aesthetic elements when they create multimodal expressions? The theme of the paper rests on the view that encountering the art is an important catalyst in the child's cultural expression.

## ***Background***

We are two assistant professors, X in arts and crafts and Y in drama and theatre the teacher training program. Together, we have a multidisciplinary professional background in product design, graphic design, storytelling, and college lectures on teacher education. In the autumn of 2009, we were contacted by second-grade teachers at an elementary school. Their desire was to receive input from our fields. Based on this interaction, we designed an educational program entitled "Tell it with colours". In the implementation, we saw that this program would have a useful application in teaching students and would provide an opportunity for us to bring this method of teaching closer to practice. When, in the spring of 2010, we were asked to visit the first grade of another school, we responded positively. This time, we wanted to act as practitioners interacting with general teachers. The goal of the teaching program was to investigate the interaction among the artists, teachers, pupils, materials, tools, and techniques and to look at how this interaction led to a situated expression. This has been an educational program with qualities that are of interest in an age in which books represent something that is almost "magical" and where there are high expectations of pupils' to learn to read and write. In this paper, we will focus on the implementation taken with a single class, which is of significant interest to our students from a didactic perspective. To convey the experience and discoveries we made, we both wrote logs and filmed what occurred in the classroom. After each session, the two of us also engaged in reflective conversations. It would have been interesting to interview both pupils and teachers after each session, but this was essentially an educational program and not a research project. Nevertheless, we see the value of the knowledge and experiences we did obtain, and we wish to pass this on in a scientific



form through this paper. This approach enables us to present our work not only as scientists but also as practitioners in the arts. Although the research requires completely different requirements for testability and transparency in regard to constructing meaning, there is room for poetic elements within a research text, which is relatively open to interpretation in its form. Eisner (1992) has defended qualitative research as an art form as it is based on connoisseur properties and criticism. He accepts personal, literary and poetic knowledge sources as valid (Kvale, Brinkmann, and Torhell 2009, 172).

When we retrospectively look at this material, we have chosen to look at it as a case study, a case we eventually would want to analyse and discuss with regard to the multimodal theory of Kress and van Leeuwen (2001). In the following section, we give a brief account of the elements of this theory that seem relevant to our context.

## Theory

The epistemological foundation this discussion rests upon is a social tradition. The social constructionist approach is both Dewey's idea-based constructivism and socio-cultural theory, which is based on Vygotsky's ideas (Vygotsky 1978). All learning takes place contextually, which means that knowledge is constructed by interactions with others in a physical and social environment. In a social learning theory, children are looked upon as active constructors of their own knowledge.

### *The multimodal theory of Van Leeuwen and Kress*

Through multimodal theory, with its grounding in discourse theory, all interactions are seen as text. Today, we have a rich landscape of signs available when communicating. Through complex texts, also called multimodal texts, there is a wealth of communications and representations both for meaningful communication and for meaning making. In these texts, items such as audio, images, colours, fonts, and shapes are put together to represent and communicate meaning. Thus, all of the properties and opportunities related to the representation of meaning will be important to investigate. In the present work, the child's creation of multimodal texts is examined. In this context, it is appropriate to make use of Kress and Van Leeuwen tools for the analysis of meaning in multimodal texts. Kress and van Leeuwen explain that the production of texts of different types can mainly be seen as on-going in four different strata. These strata are Discourse, Design, Production and Distribution (Kress and Van Leeuwen 2001).

### *Four strata in the production of multimodal texts*

#### Discourse

Discourse is about how reality is understood and presented in different cultural groups. According to Kress and Van Leeuwen (2001), discourses are social constructions, and they have been developed in specific social contexts. Furthermore, these authors claim that discourse is constructed in such a way that it fits the interests that social actors have in the various cultures. These cultural groups can be large groupings, such as discourse related to views on democracy, or a family's attitudes about who does the dishes and who cooks the food. Discourse is used to define what one can say in a society about a certain topic. Within literary theory and narratology, discourse is the way that a story is presented in contrast to the history behind it. According to Kress and van Leeuwen, discourse is related to language, and, using even

stronger terms, they claim that discourse exists only in language. All semiotic modes that are provided as a means to represent reality in a particular culture depend upon the culture as a means of articulating any discourse (Kress and Van Leeuwen 2001). In this context, it becomes important to look at how pupils use different discourses in their representations of reality and how the discourses are referred to by those who work with children. Which discourses is children part of? How do they reflect upon the representation of the semiotic content of their lyrics?

#### DESIGN

Design is, according to Kress and Van Leeuwen, in between content and expression; it is the conceptual aspect of expression and expression of the concept. Design is about the use of semiotic resources and which semiotic resources are chosen in the representation of reality. These are choices made in relation to the various possibilities and limitations that lie in the various resources, in other words, the affordans (Gibson 1977) of the resources. How we understand the design is influenced by formal methods and how these combine to communicate meaning or content. Whereas discourse provides an outlook on how the different products/texts should be interpreted, design addresses the structure of this discourse. In the educational program, we want to look at how pupils discover and use different formal methods in the various modalities they use to communicate the content they create in their books. We are interested in how the oral text's structure is related to the colours and shapes in the pictures.

#### PRODUCTION

Production is the stage in the process during which materials are processed with different tools depending upon the type of artefact that is involved. The tools and the technologies used in the project investigated in the present study were watercolour paper and paint, brushes, tape, voice and body. The media used to present the semiotic content play a significant role in the communication. This includes the technical skills and how children create different multimodal texts when mastering the medium through which they communicate their content. Production takes into account the crafts, the skills related to the use of different tools and knowledge of the tools' capabilities.

#### DISTRIBUTION

How a multimodal text is presented also affects the semiotic content of the text. In this context, the distribution is about the technical side of the presentation of the semiotic material. As we understand Kress and Van Leeuwen, distribution is the multiplication of the product. In our context, it may be helpful to think about distribution as the sharing of the product. It is therefore not a question of reproduction in a material sense but of the distribution of a meaning that has been transferred to a listener.

## **Methodological viewpoint**

The quality of research rests upon its ability to be transparent; this is important in all aspects of the research process. It is important to provide information about how the study is designed and what is contained within and excluded from the study. This process includes how the data are collected, processed and analysed and how this analysis is used in the interpretation and discussion. In addition, a valuation of the ethical and qualitative aspects of the completed study is needed. To explore the qualities of interaction that unfold when pupils create meaning through the production

of multimodal texts, a case study is an appropriate method. The empirical material that forms the basis for our case study is not collected through a research project but rather as concretisation material for use in our didactic teaching at a teachers training University College. Educational research conducted in this project, would also work well as a formative research project. This is disciplined inquiry conducted in the context of the development and of an educational product or program (Bresler 1994). Since the material was collected in advance and we were forced to examine the material retrospectively, we saw it as an advantage to define "tell it whit colours" as a case. Looking at it as a case provides a distance to the material, which is useful taken our active role in consideration. Below, we describe the characteristics of a case study as a foundation for the research design. Furthermore, would we like to describe how we transform our concretisation material into empirical material with the intent to perform a scientific analysis. The intention is to be open and transparent about the transformation of the material.

### *Case study as a foundation for research design*

The specific requirement for a case study is a few units that are studied in depth. According to Gall, case studies are often characterised based upon four typical features. These are studies that

- examine a phenomenon that is associated with one or more cases,
- go into great detail for each case,
- are carried out in a natural context, and
- seek the informants' own perspectives (Gall, Gall, and Borg 2007).

We wanted to examine the educational program "Tell it with colours" as a case study by going into depth and analysing reflection logs, video observations, photographs and artefacts. The pedagogical project was implemented in its natural context for pupils who were in the first grade of primary school. An important principle in the case study is that it explores a "bounded system", a system that is bound in both time and place (Basse 1999; Hammersley and Atkinson 1996; Merriam 1998; Stake 1995; Postholm 2005; Yin 2009). The educational program "Tell it with colours" is such a bounded system. It is time-bound because the project took place in a period of three sessions, and it is place-bound because it was carried out in one specific first-grade classroom. The idea that forms the basis for this study is visualised through our research design (Figure 2).

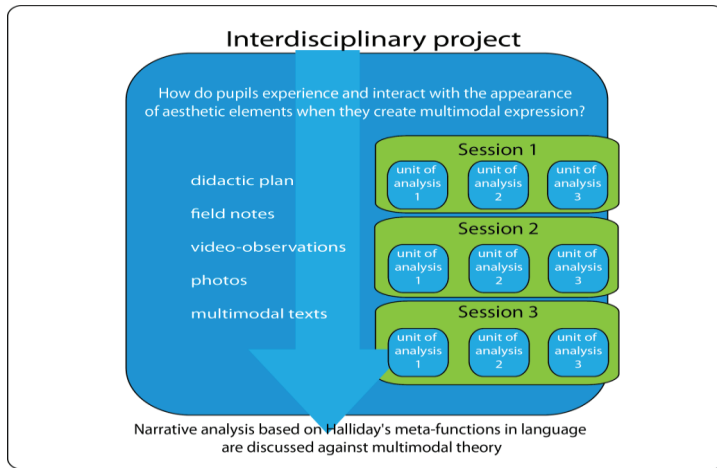


Figure 2 Research design

To examine the qualities of the interaction between pupils, the units of analysis were defined and reduced to three. Below, we describe how the analysis units were selected and how the concretisation material was transformed into empirical material.

To analyse the processes of all 40 pupils would be outside the scope of this work. As the project evolved, we became aware of three pupils situated multimodal texts with interesting process, product and distribution. These three situated multimodal texts stand out in contrasting ways and were therefore selected for an in-depth analysis, and they will function as analysis units 1, 2 and 3. The pupils involved in interaction in the tree unit of analysis, we have chosen to call Thea, Hugo, Herold, Christoffer, Emma and Rebecca. The reasons these situated multimodal texts caught our attention were that they exemplify the different strata of Kress and van Leeuwen in a contrasting manner, and they each say something in particular about the various strata.

#### FROM CONCRETISATION MATERIAL TO EMPIRICAL MATERIAL

In this study, there are different types of data materials. First, the most important and basic data from field research are the researcher's own field notes (Hammersley and Atkinson 1996). After each session, the different events that took place were written in a log. Although this was initially conceived as reflections that should be used for didactic teaching, we choose now to look at these reflections as field notes and use them as data material. Second, the three sessions were videotaped; these tapes were intended to be examples for subsequent didactic teaching, but because they now are transcribed, we have utilised them as data material in our study. Third, the project was documented through photographs. These photographs also serve as a visual document and may be used as visual data. Fourth, we have the pupils' picture books. These are the children's artefacts, and they contribute to the analysis as well. Finally, the pupils' dissemination of their picture books was videotaped. This footage works in retrospect as data material and provides important information for the analysis. The conditions for the collection and storage of the videos and photographs were changed when

transforming them from concretisation material to empirical material. This process made it necessary to register the project with the NSD<sup>1</sup> and to obtain agreement from the participants' parents.

### *Analysis Strategies*

A narrative analysis is used in this study because we understand that the narrative is an important structure of human experience. Narrative research has earned a strong reputation as a scientific theory and method. To create a narrative is a complex process. A narrative contains many layers of information about people and situations being studied and the surrounding environment. It also contains many layers of information for the researcher. The attitude and perspective that is important for the researcher, the discourse of which the researcher is part, influence the story that is told:

Stories express no real underlying "essence"; their significance and meanings are produced through verbal communication and social interaction in a precise cultural and historical context. They are social constructions (Johansson 2005, 26).

By articulating experiences, we make an interpretation. The selection being made and the presentation given exclude some aspects and highlight other aspects of the experience. Field logs and transcribed video observations, photographs, and artefacts provide access to the interactions that take place among the different players. The strategy of the analysis is a narrative analysis of different types of data as inspired by Polkinghorne (1995). Polkinghorne distinguishes between two methods of analysis, namely, analysis of narratives (stories) and narrative analysis (reconstruction as narrative):

- analysis of narratives includes studies whose data consist of narratives or stories but whose analysis produces paradigmatic typologies or categories
- narrative analysis includes studies whose data consist of actions, events, and happenings but whose analysis produces stories (e.g., biographies, histories, case studies) (Polkinghorne 1995).

In this study, what Polkinghorne calls narrative analysis has been used. Below, we explain how this analysis is conducted. The analysis lies in the construction of narratives, and those narratives will illuminate qualities of the interactions between the actors in the various processes. To analyse a text, one must examine the meaning and how it is communicated.

The linguist Halliday argues that language has a meaning potential, and when put in a system, its meaning is realised. "The most important fact about language as a system is that it is organised into functional components" (Halliday 1998, : 259). Halliday has incorporated three basic components of meaning in his language model, which he calls meta-functions. These are the ideational, interpersonal and textual meta-functions. All three components can operate in parallel and with the others.

- The ideational meta-function in a text refers to the content of what is said. When addressing the ideational meta-function in a textual analysis, one focuses on the content - the facts, processes, participants and circumstances. A focus on the ideational meta-function involves studying paragraphs and sentences in

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<sup>1</sup> Norwegian Social Science Data Services for privacy

the language as representations of how the person perceives reality and creates meaning.

- The interpersonal meta-function in a text refers to the relationships and interactions between the actors in a situation or conversation and how social and personal relationships are expressed through language. The language user positions himself or herself in relation to others through linguistic structures. The "Modality and Mode" are the semantic categories with which this dimension is reflected.
- The textual meta-function refers to the structure of the text and how the parts of the text are connected to each other in terms of their syntax and semantics. The language is in connection with the context. In this way, the textual meta-function involves the verbal and nonverbal components of the language environment. A description of a textual sense function is based upon the understanding that all utterances have a message; they do not exist in isolation from other linguistic expression but form parts of a larger message. Together, these utterances constitute a text (Maagerø 1998).

From these three distinctions, we can follow Johansson (2005) to describe the three different dimensions of narrative analysis, content analysis, and analysis of expression. The structural analysis and interpersonal dimension can also be elucidated. These will serve as tools in the construction of the four narratives presented in this paper. The narratives are discussed with regard to the multimodal theory with its four strata - the discourse, design, production and distribution functions - as a structure for the presentation and discussion of narratives.

### *The material tells*

#### Discourse

As practitioners in the field of creative processes, we are part of the discourse in the academic environment from which we come. We bring these influences with us into the classroom. In practical subjects, such as the ones we are coming from, parts of the discourse is so-called tacit knowledge. Discourse that draws participants into the classroom allows for various possibilities for pupils. In the creation of a picture book and the presentation a narrative, it becomes visible how the pupils operate in different discourses and how they sometimes become the subject of a negotiation.

Narrative 2 - Negotiation of a "happy ending"

Hugo sits in front of the group. He holds up the first page of his book and tells about parachutists who jump out of a plane. We follow the stretched-out parachute through the sky and over to the next page. Oh, no! One of the parachutists is on fire: it's an emergency. Fortunately, another skydiver comes and rescues him. The audience breathes a sigh of relief when they both land on the ground, safe and sound. Hugo flips to the next page and continues the story: "There was a fire in a house, and when they went into the house, they died. Then, a fire engine arrived and extinguished all the flames. Snip, snap, snout, this tale's told out." Did we get it right? Did they die? We are sitting a bit in silence, wondering. Then, the art teacher asks, it was a dramatic story. Did it simply end with them dying? Or were they saved?" The answer comes from Hugo "they died!" "In the fire?" Asks the art teacher, who must admit, it can happen ...Then, Herold interjects, "They must have died, we die when we are old." "Yes we do, and also if we go into a house on fire," confirms the art teacher. "If someone dies, they don't survive," the narrator states. "If the ambulance arrives, they can ...," Emma sees a glimmer of hope for the parachuters, but she is interrupted by Rebecca "If they entered it themselves, then they are responsible." "But they couldn't see the fire inside the house," Hugo defends. "No, they did not see the fire," states the art teacher. "It is possible to survive if the ambulance comes," says Emma, who does not quite go along with the tragic turn the story took. [Narrative 2 - Negotiating the "happy ending"]

Stories introduce themes addressing the human condition, life and death, betrayal and love and occasionally a battle between good and evil. The stories we brought with us into the classroom were a mix of adventures, tales and even experienced stories. Stories in which the Ashlad overcomes the troll and saves the princess can provide inspiration for different needs. A narrative often presents many perspectives at once. This depends of course on how it is communicated and how well it is received.

The narrator of the parachute story seems to have an attraction to both action and drama. Without going into an analysis of the differences between the genders in the design of the text, we may say that the boys' texts to a greater extent than girls are affected by speed, danger, blood and scorched rubber. Hugo refers to some recognisable genres through his text. Even the brutal end has a clear point of reference, such as the reality presented by the media, war movies or even the Disney Channel. In the conversation that follows, it is clear that he has challenged his audience. Should the story not end well? Is there no hope for the two? Several of the audience members become involved in negotiating their concerns into the text. Emma has experience that it is possible to be saved when the ambulance arrives. Even the adults try to suggest a happy ending. Through conversation, different discourses are thrown forward. What about this? Another argues for another perspective. The conversation has caught us, and we listen intently to each other. It is, after all, talk of life and death. But it is the creator of the text who holds the power, and he concludes the negotiations. The two parachute jumpers are, and will be, dead. End of story.

DESIGN

Any multimodal text is constructed by using formal relations among, for example, colours, shapes, sizes, proportions, lines, and compositions. With regard to design, we discuss Thea's picture book, which is presented in narrative 1. We use this example to

explore how visual modes are composed to create meaning. The formal qualities in Thea's book are solid.

The colours on the pages in the book are nicely organised; both the first and last page have a strong and clear reddish tone. This quality frames the book in an exciting way. It is in these pages that the scary and sad incidents take place. On the first page, the friend of the girl moves, and on the last page, she is nearly deprived of the heavy treasure. The six pages in the middle of the book are a lighter blue colour, which is more melancholic and agrees with the content of these pages. On page 5, a bright yellow colour appears, which affects the tone and mood of the book. Thea states in narrative 1 that she allows the colours to decide what she draws and what the story is. This ensures that the colours match well with the story.

Thea's use of heavy, black contour lines makes the motives stand out. With this contour line, she emphasises and reinforces some of what she finds in the colours. Where the colours do not "behave", in Thea's own words, she enhances them with coloured pencils in accordance with some of what she finds; an example is the white plane on page 2.

A third formal tool Thea has mastered well is the use of depth in pictures.

The plane overlaps the clouds. The mountains on page one overlap each other so that they appear to be mountain ranges. In addition, the motifs on the different pages have different sizes, which also create depths in the pictures.

#### PRODUCTION

The pupils are sitting in their seats working on their books. Colours, shapes, and texture shall find their place and work together featuring in a multimodal text that can be communicated to others. The production and the medium semiotic content to be presented play a significant role in the communication of that content. This includes the technical skills and how those who create the various multimodal texts handle the medium through which it is communicated.

#### Narrative 3 – Only a crocodile

One pupil asks curiously of another, how did you get that fine sun? One pupil needs to borrow a red crayon. Two girls are laughing out loud at the sight of a man who has huge ears. By a desk sits a boy with his head in his hands who is staring down into his book with dark eyes. The book does not speak to him. In contrast, it lies there holding back. Let's see, a cheerful helping hand grabs the book and asks: Why is there a crocodile here? The narrator wakes up. It is simply because it has eaten the others. Quickly he presents how it occurred, and then he takes back the book and draws a thick, lazy crocodile lying down in the middle of the book page. [Narrative 3 - Only a crocodile]

Production is about crafts and skills related to the use of different tools. It is also about a positive interaction between participants. During production, several rich moments occurred in which pupils had to articulate how they worked because others wanted to know "how they had done it". In narrative 3, we saw how a pupil became "stuck" in a modality (drawing). The challenge from another was a catalyst for the story of the crocodile, and it also helped "unstuck" his drawing skills.



#### DISTRIBUTION

Distribution is the fusion of different modes to a situated expression that is in focus. This fusion involves a finely tuned interplay between the actor and a multimodal expression when the picture book and oral storytelling techniques will be used together and recreated in the face of the audience.

#### Narrative 4 - The smell of burnt rubber

"May I see your story?" The arts teacher smiles encouragingly to a boy who wanders into the classroom with his book. He lifts it up, shows the book and tells a story of two cars in a race. The book is an anchor in a physical story, where the book and narrator are so closely linked together that the book is incomplete without the narrator. His right arm shoots forward like a car through the sky above and lands on the book page right in the car lane of the road that winds from page to page throughout the book, which is effectively conveyed with a streaky line. Brrrrrrrr, svooooosjjj, vvvrrroooooommm, the red car closing the gap on the blue, they go into a turn, careening, gases.... With sounds and mighty arm movements, he tells the story so that the arts teacher can almost smell burnt rubber. The red car sneaks up in front of the blue one over the finish line, and dust and exhaust settles. Now we are back to a boy with a mop of fair hair. He proudly holds up his book, which apparently consists of a road that winds between the covers, from side to side. [4 Narrative - Smell of burnt rubber]

The boy's story engages the listener. The book and the storyteller become one when the story is conveyed. The dust clouds the cars generate almost get the listener to cough loudly. The story is to be told once again - this time for a small group. The book is the same, the narrator is the same, but the story does not get the same speed and pace. It is almost as if the educator must rub his eyes. Is it really the same book? What happened to the cheering crowd who stood along the road on the last page?

The pupils must be either very talented or have tremendous luck to be successful when the content is to be communicated. Sometimes we succeed; sometimes it is not quite as we had planned. This example tells us something about how the audience is a co-creator of the text according their experience base. Each audience member adds to and subtracts from the situation, based on what we bring to the encounter with the text that is being communicated. Thus, perhaps we can say that we are talking about a diverse distribution, not in the form of blueprints but in the transformation of a possible reality that allows for multiple possible realities.

## Narrative interaction

In this paper, we have analysed and discussed how the multimodal creation of texts facilitates pupils' interactions. In projects in which art and cultural workers collaborate with educational institutions, there is potential space for aesthetic learning processes. Aesthetic learning processes, according to Selander (2009), are deeply rooted in the artistic institutions' activities and are an inseparable part of the artist's process, development and change. To facilitate and guide aesthetic processes in the classroom is to know and be part of an academic discourse. In this case, the artists are practicing art activities. By making the classroom into a venue for such meetings, encountering the arts can be an important catalyst in the child's cultural expression. The experiences

of teachers and students get in these meetings will provide nourishment to the teaching and learning in other subjects. In this way, the arts provide help to the teaching methodology. Defining art as an instrument of learning is to reduce the art, but to say that one cannot learn through art is also a reduction. What it is we get out of participating in an artistic project, or experiencing art, is highly individual. And though we cannot easily plan what pupils should experience through art, we give such knowledge value. Such a project can be engine in learning that involves several disciplines. This is a process where the learner is at the helm. More specific, project "Tell it with colours" will provide the research field with benefits related to among other things; understanding of textual structure, multimodal entrance to text creation and development of multimodal literacy. Children growing up today consume large amounts of multimodal texts. Experience in the production process of such cultural expressions will develop participants' critical thinking and provide them with skills in both being able to express themselves and to understand other cultural expressions.

The ability to express ourselves in a public space is important, and it is important to give children the opportunity to experience this, both to express themselves and to learn from the risks and uncertainties associated with this process. Through an aesthetic learning process, it appears that the pupils will retain control in the meeting with the art teacher. Despite the fact that there is a collective process, it also becomes a personal project. Man cuts, chisels, sings, dances, gestures, shapes, illustrates and paints (Dewey 1934) to create meaning. Through this perspectives the school arena are strengthened to facilitate aesthetic learning processes that enable individuals' self-education.

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## Mobile Museum Communication Design and new literacies

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**Abstract:** *The relationship of technology to museum practices is a field that continues to evolve; acknowledging the potential for generating innovative engagement with museum visitors. Engagements that will require understandings on the part of museum communication that include: content travelling across contexts, iterative participatory methods suitable for mobile social media participation, and sustainability of the media involved. In this paper we demonstrate how the use of a small-scale prototype experiment is used as the basis for generating methods in which design thinking and cultural investigation can contribute to understanding emerging literacies for museum communication design. As a team of researchers making inquiries into the role that social media can have for extending the space of museum communication, we see this rising need of understanding the cultural practices of these media as an active design-thinking problem, rife with opportunities and potential pitfalls. Opportunities to develop deep-seated investigations that lead to new knowledge and pitfalls that result in limited scope, outcome or attitude.*

**Keywords:** *Participatory design, small scale prototyping, social media, cultural heritage, urban participation, design literacies*

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## Introduction

Generations of emerging designers and museum personnel, well versed as both active participants and/or passive users of social media, are entering a professional environment where what can be considered a competency is a continually evolving discussion. The call for a realignment of 'digital', 'media' and 'design' literacies to accommodate this new generation are many (Giovannella 2012, Prensky 2012, Burdick and Willis 2009) and for very good reasons. Designing for mobile museum communication platforms outside of the museum goes beyond design as implications for structuring and redefining the nature of a visitor experience. It also goes beyond providing a more or less attractive medium for presenting content (Macdonald 2007), into design as implications for making museum content relevant in a variety of experiences in public spaces.

For purposes of this paper presented in a pedagogical context of 'Design for Learning Tomorrow', we will outline below three different challenges for educating emerging designers who will enter the field of museum communication, challenges related to design research which have arisen as valid investigative needs from observed outcomes of a co-design experiment. These challenges are related to museum content travelling across contexts, participatory methods suitable to exploring mobile social media participation, and sustainability of the media involved – all of which we feel contribute to the conversation of needed literacies within museum communication practices. This we argue is applicable across scenarios beyond just this investigation. It should be stated up front that this is not to imply there only to be three potential challenges. Rather, that these are three of the most valuable research outcomes from the Akerselvadigitalt experiment.

In museum design and digital cultural heritage a central discussion is how digital media shapes the transformation of cultural institutions. Central issues within the contemporary re-conceptualization of museums as knowledge institutions include efforts to build new relationships to society and thereby relationships with the museum visitor (Vergo 1997, Davies 1998). A number of concepts are used to define this transformation of visitor roles in new museum encounters; the integrative museum, the engaging museum, the participatory museum, the social inclusive museum. Museums current explorations into the possibilities of integrating social media and mobile technologies do align with these longer institutional transformative processes. Social media is embraced as a feature in the new museum, capable of taking the conversations beyond the museum and integrating multiple "voices" (Black 2010). While these media provide multivocality and new forms of re-mediation, they also recast well known questions about control, authority, ownership, voice and responsibility (Knell 2003, Russo et al 2008, Stuedahl and Smørddal 2011a, Stuedahl 2011). Meanwhile, museums are ambivalent to practices of computing (Parry 2007) which comes forward when e.g. different ontological systems meet with categorizing in digital archiving (Stuedahl 2007), or when museums meet with visitor created content. The new museum paradigm offers not only opportunities for reimagining interactions within a physical museum space, but also allows affordances that can be found within taking the museum beyond the walls and grounds of its physical location (van Mensch 2005).

## Design challenges of the mobile museum in the city

Handheld technologies have long been used for guiding and giving access to additional information sources in museum exhibitions (Aoki 2001, Filippini-Fantoni 2008, Hsi 2008). More recently, mobile phones have been embraced as a method to enhance museum learning by experiencing documentation processes (Hsi 2002, Walker 2008, Vavoula et al. 2009) or to enhance co-compositions and sharing of photos (Arvantis 2005, Stuedahl & Smørđal 2011 a & b), featuring structure, contextualization and personalization of museum visits (Kahr-Højland 2011). Some museums are currently exploring smart phones, IPADs and augmented software and apps as mobile guides for outdoor experiences to provide content from collections and archives into new contexts, such as fairs and events (e.g. Stejdelike museums ARtours), and as part of city guides (e.g. Streetmuseum provided by Museum of London), where images from the museum collections and archives are showcased by way of GPS-coordinates. Also QR-code based projects such as *Decoding Art*, where QR-code plaques are attached to public art provides examples of how museum content can be technologically distributed to new situations of use (piloted by Manchester Art Gallery).

Mobile phones have also enabled amateur image making, or “Photography 2.0” practices to expand the dominant museological narrative (Galani & Moschovi 2010). Photography-based social media applications such as Tumblr, Instagram and Pinterest have allowed museums to build new relationships with online communities of interest through imagery (Colquhoun and Galani forthcoming 2013). The focus on photographs has emerged as part of studies on museum visits, where Instagram- photo taking has been defined as a new visitor practice in exhibitions (Hillman, Weilenmann & Jungselius 2012) while projects related to the photo sharing database Flickr (Dalton 2010) or to online collection based projects, explore the social and cultural dynamics of social tagging and folksonomies related to museums art collections (Trant 2009). As well, dynamics of crowdsourcing actions of correcting, contextualizing, complementing, co-curating and crowdfinding of photographic historical content provided by cultural heritage institutions (Oomen and Aroyo 2011) have become a part of this conversation.

While mobile media opportunities to foster social connectivity and provide opportunities to re-encounter experiences beyond the museum walls are welcomed, very few museums have ventured into the use of mobile media to build sustainable visitor relationships (Wasserman 2011). While sustainable relations with visitors are part of current crowdsourcing and community projects, these projects mainly translate participatory activities of co-creation, contribution and collaboration (Simon 2010) by inviting online visitors and communities into tasks that increase the quality of museum collection (Oomen and Aroyo 2011, Colquhoun and Galani forthcoming 2013). There are few studies of what motivates visitors in mobile, virtual communities and how the relationships with museum content are established outside of museum contexts. There is also a growing need for a new design language and new methodological approaches (Wasserman 2011) for ways that museum content may connect to people’s sense of ongoing presence (Licoppe 2004) and therefore relate to the emerging conventions of interpersonal relationships (Ling 2008) that mobile technologies provide.

## Experimental design research and design education

The aim of our research based design experiment reported from here is to explore the cultural and social dynamics, tensions and potentials that museums may meet when integrating social media in their communication and exhibition practices. In

particular, when museum content is encountered in external spaces by users who do not enter the physical museum space. In our case, museum content was presented in an outdoor setting within the city center. We see potential for this small scale experiment and in-process documentation to illustrate how new literacies of design thinking are needed beyond the core functionality of digital technology, ones that will be relevant to shaping and forming the concepts of what a museum experience may mean in the not to distant future. In turn, this design research project illuminates some challenges for design education related to preparing future designers with the methodological and analytical competencies required when addressing such communication complexities and situations of use.

It should be understood that the range of literacies emerging designers bring to the field upon graduation varies greatly from program to program, that design education is a continually morphing target. Design no longer fits within the boundaries of any one particular setting, borders are blurring across disciplines, across devices and across modes of cultural production (Danzico 2011). Discourse in and around design education continues to stress the need for emerging designers to be prepared for an increasingly networked, complex and unstable information culture (Colina 2011, Davis 2008, Thackera 2005). Methodologies for understanding the deep-seated socio-cultural affects of the use of the technology will be critical for this rising generation of communication designers who could potentially ground mobile-driven initiatives in predisposed opinions of use, application and value stemming more from personal immersion than conscientious understanding.

Beginning with a description of the research-driven design experiment with a mobile photo-sharing platform, we will share the results as three defined challenges that we see as relevant to evolving the relationships between the museum and its visitors outside the context of a physical museum.

## **The Akerselva Digitalt project: advancing the audio guide**

The Norwegian Museum for Science, Technology and Medicine has the responsibility for archiving and exhibiting industrial heritage in Norway. Together with Oslo City Museum and Oslo City Archive they embarked on a project entitled Akerselva Digitalt with the objectives of establishing active museum communication outside the museums— more specifically, along the river where the buildings and sites that lie along its path tell the industrial history of Oslo, Norway. A walk along this river holds potential to provide insights and understanding of the central cultural, economic and societal transformations in Norwegian society over the last 150 years. The museums both have communicated this history by arranging city walks, allowing access to online portals with documented industrial architecture, labour history and everyday life, published in text books and participated in cultural events along the river. Most recently, they have started to develop a mobile guide that will transmit content via audio accessible by smart phones with 3G, or wireless, at various locations along the river. The guide will also be accessible in the form of location specific mp3-files. Building upon this audio guide, the museum invited researchers to explore how users and visitors can be involved in participatory and social activities through a mobile social platform – and how visitor contributions can be integrated in concert with the museum-produced content.

The river has the character of being a place for recreation, an alternative road for walkers and bikers. While inside the old factory buildings along the river there is an emerging creative industry and a variety of educational activities that have settled in the area. In investigating the challenges related to understanding what kinds of mobilities and participatory activities groups of users and visitors along the Akerselva River may find meaningful, the research team developed a design method that consisted of both a social-media component and a physical installation. It was decided that a small-scale experiment, an operable prototype, would allow for critical reflection upon which a deeper set of research questions could be developed as part of an ongoing investigation. Thus allowing the team to identify the strengths and weaknesses of the platform in order to iterate subsequent prototypes (Brown 2008) toward conceiving a new concept of museum interactions along the Akerselva River.

### *The Digital Design Set-up: Instagram for Social Sharing of Historical Museum Content*

The social and cultural interaction of this experiment was framed using the photo sharing app Instagram acting as a digital version of design probes (Gaver and Dunne 1999) to help us explore the variables of cultural and social practices using social mobile technology and historical photos along the river. We discovered that Instagram had several photo streams related to the river #akerselva, and that citizens seemed to share natural as well as social and culinary experiences of their time along the river. Therefore the first probe centered around using the photo-sharing software Instagram as a distribution channel for historical images within these already established mediated relationships with the river location. The images that were published in the experiment were derived from the online and open photo database oslobilder.no provided by the Oslo Museum, and the portal industrimuseum.no provided by the Norwegian network for industrial history. We established a new Instagram account called @akerselvadigitalt to give people the ability to follow this stream of historical photos.

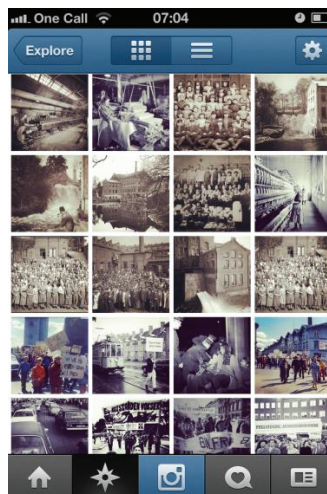


Figure 1: @akerselvadigitalt photo stream on Instagram



The design decision for publishing historical images in Instagram was related to discovering ways that the museum content could fit into the ongoing cultural practices of contemporary photo-sharing. Some photos were published with excerpts of the museum text used in *oslobilder.no*, and some were published with only one sentence that provided context for the image. The photos were published with the name of the photographer, the year, the owner of the archive and the digital source where the photo was taken from. All photos were tagged with the #akerselva hashtag, and with clusters of hashtags that drew attention to themes related to the Akerselva history. The themes could be place related, such as “#seilduken”, one of the main factories – or it could be related to a historical phenomena, such as “#children work” or “#osloactivism, #politicalprisoners, #russia, # pussy riots”, or “#mathallen, #akerselva, #brenneriveien, #vulkanoslo, #teknisk museum”. The hashtags were closely related to the descriptive text associated with the image, and thus related to historical phenomena such as past and current work and leisure relations, the role of children in today's society and so on. The use of hashtags became a semantic tool for both outreach and a way to trigger for historical reflections. The choice of hashtags became a matter of conceptualizing the museum content and framing the relationships between historical images and current ongoing cultural and social activities in Instagram. Then, together with the images could the hashtags provoke and direct reflections onto historical issues.

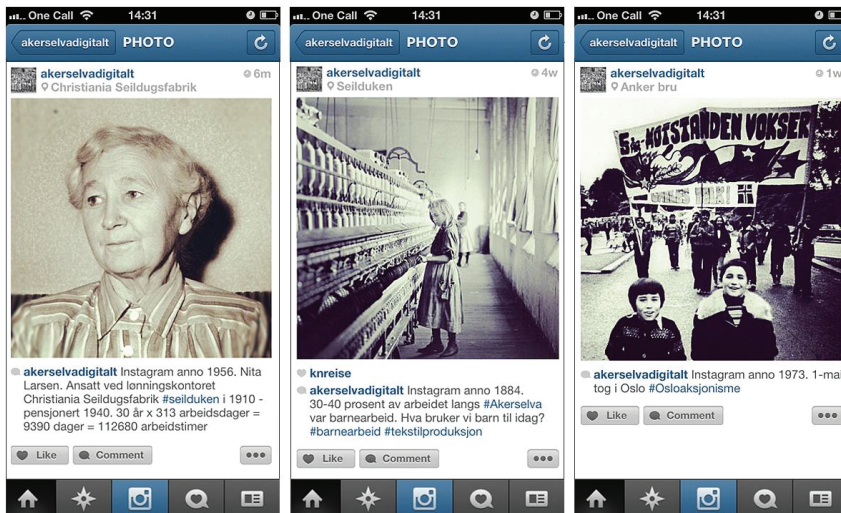


Figure 2: Photos from the archives published through Instagram

### *Physical Installations along the river walk event*

To observe how the situated use of Instagram may connect museum content to the physical context in the city, the design team arranged a physical installation. This could provide empirical clues on how contemporary social practice may play out with place specific historical content on mobile photo sharing applications. The goal of the physical set-up was to explore a) visitors experience with the cultural dynamics of Instagram related to place, and b) the media based dynamics of social following of which we will not focus on here. It was decided to arrange the installation as a

performance activity at the yearly riverwalk, or Elvelangs, that occurs on 21.september, the day of autumnal equinox. This event samples installations from artists, musicians and local people living along the river. Up to 3000 people attend various parts of the 5-mile walk along the river which begins around 8 in the evening and lasts until 11. It is a very stimulating performative evening in which visitors, young and old, participate in various cultural exhibits and performances along the river. This seemed like an opportune time to set-up an engagement activity capitalizing on the interest of people in the environs of the river walk.

Being a physical area for pleasure and leisure time while at the same time having multiple histories of working class, women's history, immigration, gentrification e.g. there was an obvious need to consider the content as part of the selection of the installation of the sites for engagement. Three installation points were defined according to the physical accessibility in accordance to the number of people taking part in the walk with each addressing a theme derived from historical narratives of the sites;

- women's work related to the canvas factory #Seilduken that today houses Oslo National Academy of Arts
- cultural activities and music related to #Brenneriveien and #Blå with several concert locations, art studios and a hip-hop youth clubs
- citizen activism related to a bridge marking the ending point of the Elvelangs walk #osloaktivisme



Figure 3: One of the three installation points set-up for the experiment. iPads were available for viewing the photo stream in real-time (left), while the cards represented the images within the stream with text prompts to encourage interactions by way of the QR codes (right).

Printouts were made of the Instagram- photographs that were published on the @akerselvdigital stream, scaled 200%, and marked with a QR code. These printouts were then laminated for durability and strung at the specific locations relevant to each

theme. The QR-codes on the lamented printouts linked users directly to the Instagram stream, making an onsite connection between the physical site where the event occurred and the digital space being curated on Instagram. Accompanying texts were intended as trigger points for reflection over contrasts between the past and now. Asking questions was another trigger. For example some photos of women workers contained questions related to issues of working hours in the past and today, while other photos of children workers were juxtaposed with questions on what role children have in society today. By inviting river walkers access by way of reading QR-codes, we hoped to provide an incentive to participate by adding their own photos or comments stimulated by the prompting texts.

It became important to also allow access by those who did not carry a smartphone with Instagram. For this iPad's were wired and strung across at the three sites – allowing access to the stream of photos from @akerselvadigitalt. Therefore in each of the installations there were 10-12 historical photos digitally-enhanced to replicate the Instagram aesthetic, an iPad allowing for instant access to the @akerselvadigital stream on Instagram and a researcher who acted as a silent observer of the activity surrounding the activity.

### *Observations from the Akerselva experiment*

The installation was installed during the entire three hours of the riverwalk event and remained up for some days after (minus the iPads), in the end gaining around 50-60 new followers in Instagram. We found that the sites chosen for each installation were important in regards to awareness and attention. The sites at points where there was enough physical space to dwell naturally enough gathered the most people. People were intrigued by the blending of the historical photos with instant snapshots from contemporary life that were appearing together in the Instagram feed. They made sense of the text on the photo-cards but did to a lesser degree engage in submitting their own documentation of contemporary photos of same phenomena – such as the text that was encountered via the QR code encouraged them to do. We got more comments and likes on the published photos that had an open description – while nobody answered prompting questions or the solicitation to contribute.



Figure 4: The most popular installation point of the three locations.

It also became clear that defining the features for participation had to be defined differently for the digital participation – and the physical. The physical translation of Instagram photos into laminated cards seemed to require more descriptive text and clearer prompting than in the mode of the mobile phone. These text had to be designed with a clear idea of what kind of contribution people could make that was relevant for their situated context of the walk. Also, we had to reflect upon how the user created contributions would land in the Instagram stream from @akerselvadigitalt that we had edited and manipulated to keep a museum visual identity. People participating in the walk constantly uploaded photos of installations and situations experienced, and it was difficult to find ways to tune them into historical reflections in this context.

The solicitations articulated in our Instagram entries did not work well in crossing context between online and physical representations. And it seemed that translating the Instagram photo and hashtag texts into a physical form required another level of prompting – a physical invitation which set out verbatim instructions on what the user was to do in the interaction.

## **Towards New Literacies for Mobile Museum Communication Design**

While this experiment generated outcomes that will serve as a starting point in the continued discussion of how to create engagement in the industrial history of Norway outside of the physical museum, for this paper we are going to discuss what arose as outcomes in relation to what we see as critical competencies needed for the evolving relationship of museum content and visitor experience via mobile devices. From the outline of the experiment above, it can be stated that deriving meaning from social media-driven communication platforms within the context of a museum has become less about the devices themselves and more about the activities that are performed with, around or through them. Such activities are driven by a sociocultural evolution that can be described as unstable at best. There is no valid prediction method for determining what type of engagement will have lasting legacies or which will only exist

as momentary blips on the cultural landscape. In advancing the concepts of the Akerselva guide as a socially mediated experience the project will need to ask deeper questions of use, or intention and outcome in order to determine the next appropriate iterative path to follow. The following represents our findings of the Akerselva Digitalt experiment in relationship to the design literacies and competencies needed for engaging with meaningful outcomes.

### *Museum content across contexts: Tensions between the social classification of collective memory and museum taxonomies*

In assessing an outcome for participation along the river, the social-sharing site of Instagram was chosen over other relevant social-media options as it differs from web-based hybrid databases such as Flickr, that have been used in present museum, library and archive commons-based projects (Colquhoun and Galani 2013 forthcoming). In Instagram we encountered a challenge in that we had to translate and connect the institutional metadata with the existing folksonomies that were connected to place in Instagram. Mixing such social tagging and folksonomies with the structured metadata of an institutional classification system has become a major discussion as institutional cultural memory content then mixes with the social processes of online communities (Trant 2009, Dalton 2010). Studies of museum crowd-sourcing photography project involving amateur photos show that these forms of integration may transform the authentic photos into curatorial frameworks, stripping the amateur imagery of its unique spontaneity and subjective context (Galani & Moschovi 2010). In this experiment we turned the question of museum participation around, asking how museum content could participate in the ongoing stream of amateur photographing on Instagram. It is in this turn, the mixing of curatorial content into everyday amateur content offers up a potential investigation into the relevance of the hashtag and the relationship of the hashtag to the user and thus the museum content.

In the river experiment, the choice of hashtag was a strategic decision in that it should poignantly address the specificity of place, while at the same time being flexible to work as location unspecific designations (Wasserman 2011). Hashtags were also chosen to connect historical photos to existing tags of contemporary reference with the intention of connecting pre-existing communities of users. This was both an endeavor about connecting ongoing social practices of place making in Instagram with historical phenomena – and about connecting the interpretative tags of historical photos to existing tags that connect communities of users. A multisited structure of hashtags provided focus on the types of interpretive material the project hoped to receive from the users. Ideally we would like people to contribute with contemporary documentation photos mirroring the historical photos - but realized that this required an engaged community of followers that would contribute independent of the physical event. This made us aware of the power of the semantics, the hashtags and the descriptive texts as well as the photos chosen from the archive. In this way defining the features for contributions required a design awareness that was deeply informed by knowledge about everyday events of the river.

However, if we now consider this perspective from a more intensive ethnographic study of the patterns of use within the assignment of social-media hashtags, and what those patterns reveal as far as perception and understanding of the subject, we may now begin to cultivate a system of classification that could begin to bridge the gap of

institutional metadata and the folksonomies associated with social media consumption. This made us aware of the need for preliminary ethnographic research into the assignment and application of hashtags, to be able to provide prompts for the participation that could then provide insight into the associations that users make with their interactions with the content.

### *Participatory methods suitable to study ways of mobile museum participation in the city*

The experiment was based on a Participatory Design approach in exploring modes of engagement with museum content in mobile social media spaces. Participatory design (PD) traditionally has been focused on developing methods for democratic approaches to workplace technologies and settings. Today the concepts of the Scandinavian tradition of participatory design take a role in addressing issues of empowerment, democracy and controversies in innovations, and thus articulating the socio-material aspects of technical change. Traditional participatory design methods in the strictest sense are now challenged by a turn towards user-involvement, understanding innovation processes as part of social innovation that depend on collaboration over time and distributed across many stakeholders. To position design as a provider of democratic entry into innovations, corresponds to design now serving as a feature capable of opening up spaces for questions and possibilities (Björgvinsson, Ehn, Hillgren 2010).

PD has recently drawn attention towards social technologies as tools to support design processes. While these technologies seem to disrupt traditional design methods depending on physical interaction, they also create new opportunities for participation (Hagen and Robertson 2009). Social technology applications are used to provide spaces for stakeholders to co-create, explore, experiment and evaluate design (Schaffers et al., 2007; Westerlund & Leminen, 2011) in Living Lab projects (Følstad 2008, Näkki & Antikainen 2008). Also social media spaces have been used to explore online Future workshops (Reyes & Finken 2012, Reyes 2012).

Several design related perspectives have been proposed to highlight the social interaction and situated experience that unfold while using digital technologies during museum visits (Brown, 2005; Vom Lehn et al. 2001; Galani & Chalmers 2002; Economou 2004). The physical nature of exhibitions, the material qualities, the sensory characteristics and cultural identity of the site as well as the digital layers involved, all assemble into the situated context that has an impact on how a visitor interprets a site in a way that provides for meaningful understanding. Social and material aspects of museums exhibits are grounded in the experience of place and the lived experience of the physical world in the museum, and have been analyzed at the personal, social, cultural and physical levels (Tuan 1977, Ciolfi & Bannon 2005, Ciolfi & McLoughlin 2011). These categories are quite relevant in designing for communication platforms to establish mobile forms of social, personal and cultural encounters in the physical sites of cities as well. Theoretical investigations into these categories can lead to frameworks through which the process of not only questioning the context and intention, but also addressing the physical interaction as it relates to user experience within the space can occur. Media-moderated communication is as much tied to a place as anything, however there is a fundamental change in which the place is now experienced (Malpas 2012).

In employing Instagram as a space for a participatory approach that examines equally the layers of personal, social, cultural and physical interaction with the



Akerselva river, we have used an interventional ethnographic approach to participatory design. Intervening by adding museum content in existing Instagram-streams, we define the design as activities of breaching ongoing cultural practices. These breaching interventions are inspired by the breaching experiments introduced by Garfinkel and Goffman where breaks into small, everyday rules are used to understand the psychology of social systems. By using a breaching approach to participatory design, the design team was the participatory actors and the existing cultural practices in Instagram was the established design space to relate to. By turning around the question of who participates in what in the design process, we had to realize that the design space is given – and we as designers had to think about ways we can participate in the ongoing activities of imagery and representing activities and objects of the city.

### *Sustainable outcomes and lasting legacies*

Sustainability practices remind us that we can't implement an outcome without being fully aware of its technological shelf life. Museums have been keenly aware of this for decades; knowing that a science exhibit that once served for novel and curious engagement for the visitor can slowly, or even quickly, fade into a backdrop of jurassic structures, silently calling out to be addressed when finances and time allow. This is a continued evolution, however the stakes are now even higher as technology and social engagement advances at a much faster rate and becoming outdated and/or irrelevant can quickly outpace fiscal resources. The 2012 Mobile in Museums Study funded by the AAM (Tallon 2012) cited the primary challenge in museums with an already established mobile platform as 'keeping the experience up to date.'

All communication platforms follow an adoption curve: a timeframe that allows for introduction, familiarity, acceptance, integration, and even rejection within any socio-cultural setting. The currency of mediated experiences continues to rise with the convergence of platforms accessible through mobile devices. Such experiences have also been challenged by the potential open-ended nature of the activity and the manner in which they can come to be shaped through collaboration as well as the reliance of the software for the outcome. These experiences are often application-dependent in a world where cultural practice very often privileges one form over another. The livelihood of hardware can be measured by sales whereas the livelihood of social media is quite often measured in likes and clicks. Without the ability, or wisdom, to conduct analysis and critique of the underlying cultural relationships regarding technological engagement, ones that can lead to meaningful experiences and deeper understandings of the use, content, and place actors that are at play within these new communication platforms, fatigue of continual participation requests and technology interactions will become inevitable. Choices of application interaction, such as the ones made in our project with Instagram, will continually need to be readdressed and re-evaluated in order to make decisions that will lead to prudent use of the technology in the quest to provide value and knowledge as a viable outcome (Prensky 2009)

Perhaps even more vexing than technological sustainability is the diligence given to content sustainability. In a world where social media is being used to capture historical events in real-time, where it has also been documented that the world loses 0.02percent of its culturally significant social media every day (Nelson & Hany 2012), what becomes of content generated via participation needs to be a vital part of the sustainability conversation. It opens up larger questions of how collective memory

building will be housed, archived and studied in the future context of a museum collection.

## Conclusion

Emergent designers and young museum professionals, defined as entering the field from the recent completion of undergraduate or graduate coursework, are on the precipice of a perfect storm as they enter the cultural heritage workforce. This student population, well-versed in digital literacy, is easily at home in the roles of both active media contributor and passive media spectator, making them keenly aware of the space of social media and mobile technologies. However, the design literacies needed to work in a more meaningful manner within this arena are constantly evolving. It is not enough to assume competency from one's own everyday practice of engagement with digital media. It is the role of education to help this population develop a multidisciplinary understanding of how cultural shifts shape technical use. The Akerselva Digitalt project foregrounds competencies addressing the use of ethnographic research to result in stronger application of media affordances, the understanding of participatory design as an interventionist action, and the long lenses of technical and content sustainability. Each of which leading to new challenges and potential outcomes for the engagement of museum content outside of a physical museum space and thereby underscoring the awarenesses needed in shaping the future of museum communication practices within an increasingly complex and unstable digital information culture.

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## Energy and Emotions: transdisciplinary design education for resource conservation

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**Abstract:** *In our contemporary world we are using resources extensively to the point of their depletion. The call for more sustainable ways of living is louder than ever before, asking for a better awareness of the flows of resources and energy. This paper looks into existing design perspectives towards energy use in our daily living. By exploring relevant literature in social sciences and in design, and earlier research related to energy use, we identify a need to connect the design for conservation more strongly with human emotions and their relations in the social realm, and thus iterate the systems collaboratively in real-life settings through constructive design research approach (Koskinen et al. 2011). The questions arising from the earlier research on design in such context are elaborated further into notions relating to design action and education. Consequently, we suggest elements for such action, as well as an educational model to further the inquiry between energy use and emotions.*

**Keywords:** *design for sustainability, design education, emotions, conservation, feedback.*

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## **Introduction**

As of today, global consumption is not on par with our intention to preserve the ecological system. Annual use of resources exceeds sustainable levels (see e.g. Pollard 2010; Rockström et al. 2009). Along with resource usage there also exists evidence of a rise in the overall energy consumption. Systems for feedback are built upon one another but they still seem to fail to deliver energy and resource conservation. The call for more sustainable approaches still demands further iteration on the ways design can help to raise awareness of these topics.

Energy in the form of electricity becomes more and more essential yet ubiquitous in our contemporary life, thus rendering it more integral to our daily living. The material implications of energy production and use, however, remain rather detached from our emotive selves in being often invisible during the particular moments of consumption. This poses the following dilemma: how to transform the invisible flow of particles into something tangible and socially connectable?

Designers must look for ways to better induce human understanding of the material impacts relating to resource and energy over-use. This calls for alternative approaches that could be experimental and artistic, taking into account the power of human emotions, which are neither simple nor straightforward or reducible into mere seemingly objective numbers. In this light, we call for design research that is curious to investigate into a range of encounters dealing with daily energy consumption and artefacts in the process.

### *Aim of this paper*

This paper aims to describe how contemporary design research connects emotions to the use of resources by the means of interface design and its collaborative iteration. The descriptions emerge from literature studies and are then elaborated further into suggestions for important elements to consider in design research and education. In the context of energy conservation, the main guiding questions of this inquiry are:

- What are the important elements in design action?
- What are the necessary focus areas in design education?

In the following sections we elaborate these questions further, and suggest implications to design action and education.

## **On emotions and resource use**

In our contemporary everyday setting, we are often unable to perceive the energy and resource flows that are yet essential to our life. Extending the confusion even more, electronic artefacts describing these systems are again embodying and using energy, concluding in a mind-bending combination of conceptual models, symbolic logic, software, electrons and matter (Dunne 2006). Technology has – whether intentionally or not – been unsuccessful in presenting these dimensions to its users, or in helping comprehend the flows of electrons and the impacts of their production. Thus, the ever-growing use of resources falls short of connecting to human perception, thinking, emotions and, ultimately, behaviour.

For emotions to emerge, something needs to be perceived either consciously or subconsciously. Emotions are ephemeral or lasting evaluations that present us with information about the world influencing our attitude or behaviour. This makes

emotions an interesting topic in the context of design and in particular relation to the invisible flows of resources and energy. According to Shove (2004, 114) in contemporary daily living energy consumption (as well as any other unperceivable resource) becomes part of “the routine accomplishment of what people take to be the ‘normal’ ways of life”. Pierce et al. have demonstrated (2010, 1985) that “everyday interactions with technology in the home are performed without conscious consideration of energy consumption but rather are unconscious, habitual, and irrational”. Their study also reveals that people are often unaware of the resource-conserving options of products, and people often ignore visible options, instead relying on habit and split-second decisions (Ibid., 1991).

It is by now well established that energy – being transparent and invisible – will always be expressed in some other form of perceivable representation (e.g. light, heat, movement, sound or information) and hence does not itself manifest in its own physicality. Also the information related to it remains often very abstract. This is indicative of the above-mentioned relation and of the gap in understanding the relation between the actual resource use and its perception in daily living. Such a gap has not existed for long. Less than a century earlier there were times when resources for everyday living (e.g. water and heat systems) were more perceivable in the everyday life (see Fig. 1). Today with the advances in technology, we as designers should look for new ways to induce awareness of this topic. To achieve this, we suggest that consumption of resources should be not only easily perceivable and understandable, but also connected to the social existence in our shared, physical reality.



**Figure 1.** Logs for heating in Hakaniemi square, Helsinki, Finland, around the second World War (Source: Helsinki City Museum).

## **Social studies on emotions**

While both these entities of interest, energy and emotion, are matters that have been studied crossing disciplinary boundaries, combined studies to relate these two together with design are of recent emergence. As mentioned before, while the design research community exploring the energy-material relation has shed some light on this matter, the explicit relation is yet to be set in design education. Lutz and White (1986, 408) – considering emotions from an anthropological perspective – suggest that emotions are embedded in socially constructed categories, and hence the truth about emotion becomes problematic. While the view that emotional experience is almost endlessly mediated through language and culture (Ibid., 408) is fairly popular as a social science approach, its relation to electrical energy from a historical materialistic perspective is a fairly niche area of study. Lutz and White (Ibid., 417), through the review of numerous studies also note that emotions are a primary idiom for defining and negotiating social relations of the self in a moral order, and emotions emerge as socially shaped and socially shaping in important ways.

Research relating to conservation, behaviour and attitudes has received special attention from environmental psychology (Bechtel and Churchman 2002; Lindberg and Steg 2007). Within this field – and its related sub-disciplines – studies that focus on the emotional aspects of conservation have also received due consideration. Vining and Ebreo (2002) describe three functions of emotions and their importance for understanding conservation behaviour, namely emotion and motivation, structure of emotion and emotion and communication. They point that self-evaluative emotions such as pride, guilt and shame are central to conservation motivations and such emotions become functions of moral and social norms. As studies have shown a social comparison of consumption increases efficiency improvements. Evidence from prior studies (Acharya and Mikkonen 2011) also shows that a social network approach to communicate and publish energy use has the potential to reduce the resource consumption as competitive conservation. From a sociological perspective of associations (Latour 2005) it has been argued that materials, which are considered as non-human actors, have agency, and that material objects help in tracing social connections. These associations that are generated when interacting with material configurations as things, objects and resources, and the non-human entities as actors, have been argued to be an integral part of the social (Ibid., 70-78).

## **Creating perceptions of energy use through design research and education**

There are several theories studying the differences in how designers intend their products to be used and how they are actually used in their use context, but they remain "largely disconnected from each other" (Crilly et al. 2008). Furthermore, we find that design research and related studies that address resource and energy usage seem to rarely attend to self-evaluative emotions, such as pride, guilt and shame through objects, interfaces and services. To bridge these gaps, the relation between emotions and electricity need not only be explored from the perspectives of multiple sources from hard science, engineering and social science, but also from its manifestation in designed objects as artefacts in a social realm. A work of design, whether a product or an interface, can be appreciated for its "perceptual properties", attributed qualities, and "elicited feelings" (Ibid.). The design of a product or a system "can intend these



features to elicit certain interpretations" (Ibid.). Hence, design can be embedded in dialogue within society by its very nature (Fuad-Luke 2009) and used to convey embedded messages, whether social or emotional.

### *Transdisciplinarity and sustainability in design*

According to Schön's definition, design focuses not merely on knowledge in action, but "reflection-in-action" (1983), where existing knowledge is iteratively reflected upon in new problem contexts, fittingly to tackle the wicked problems of sustainability. Inter-professional collaboration in the context of sustainability requires a "transdisciplinary design dialogue" between different professionals and laypeople in real-life contexts (Wahl and Baxter 2008). Such process would increase the knowledge base for decision-making (Ibid.). Important processes of innovation and learning are increasingly taking place in collaborative constellations and networks, and a growing number of institutes and new actors such as private enterprise and government agencies are adopting inter-professional practices (Bruun et al. 2005). This calls for better understanding to set the stage for collaborative design and learning.

Sustainable design often aims to tackle with difficult and complex problems and problem-contexts. These problems can be described as "wicked problems" (Rittel and Webber 1973) – their assessment requires systemic understanding and knowledge from several perspectives. Design thinking and reflection can help in this collaborative process by creating new integrations of signs, things, actions and environment (Buchanan 1995). As problems of sustainability call for negotiations between several interests and stakeholders, the developments in the design process itself are deliberately seeking new frontiers. These developments require widespread discourse on the values and driving forces behind the process. How to prioritize stakeholders or their interests and from which perspective to assess sustainability? These questions should be brought into everyday discourse in design. Nevertheless, when design begins to be about the aesthetics of the message, it is also about the ethics of communication, whether in the actual interaction or embodied in the product-relationship. The sustainable designer has to use a consequentialist approach – in which the emphasis is on "means to an end" (Ritter 2008). This also raises a question regarding this end, and regarding the designer's ethical responsibility for making such a matter visible.

### *Increasing energy awareness*

From a historical perspective, the development of electricity in the western world – and its social implications – has been well attended through the works of Hughes (1983), and Akrich (1992) has studied the relations of electricity use and technological objects from a Science and Technological studies perspective. Shove (2004; 2005; 2007) and Strengers (2009; 2010) have helped in broadening the understanding of the effects of electrical energy in relation to our daily living. The works of Pierce and Paulos et al. (2010; 2011), and Blevins (2007) have also been useful in furthering this perspective from the sustainable HCI point of view. Sustainable HCI and interaction design, as recent sub-disciplines in HCI, are not just looking at generating more awareness of consumption of resources like electricity through personal communication devices but in the recent past have also been critical with questions relating to the material relations that are needed support such functions.

Also in design research there has existed an active interest regarding the representations of energy use. Studies have both explored and focused on the relation between energy, materiality, visualization, domestic living and behavioural change by

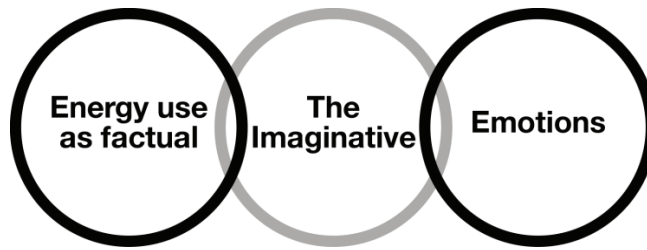
researchers such as Redström, Backlund, Gustafsson, Gyllenswärd, Ilstedt-Hjelm, Mazé (2007; 2008; 2009), Pierce, Paulos (2010; 2011) and Blevis (2007), Shove (2004; 2005; 2007), Strengers (2009; 2010) and many others. While some members of the design research community have been specifically looking at the relation between energy and materiality, we wish to emphasize the importance of the human dimensions, including the emotional, social and cultural aspects.

In this respect a very recent work of Broms (2011) on sustainable interactions is worth mentioning, for it directs focus towards emotional states, such as anxiety as an emotional state, generated by “energy awareness artifacts” (Ibid., 62). Besides the dimension of usability and effectiveness, people's attraction towards products depends also on the products ability to satisfy needs related to the emotional dimension (Norman 2005). This dimension, however, should not be supported by only embedded ideologies of efficiency or performance (Dunne 2006), but rather with aesthetically surprising interactions that can induce critical and collaborative reflection. Sustainable behaviours are most effective when emerging from the users themselves, and from their interaction with other actors in a system. The social network around the user and the activity plays an important role in this development. Hence, we posit here that within the contemporary setting the approaches promoting conservation should be promoted as well as studied foremostly in their social context.

Sharing of knowledge alone, however, is not sufficient to change attitudes and actions towards models promoting sustainability (Saito 2007). Such design approach must also emphasize aesthetics, as most of us will be more disposed to act “responsibly and respectfully” towards nature or an artefact if we perceive them “aesthetically positive” (Ibid., 71), even more so if it can be connected to positive cultural or social values by the means of design. This development does not necessarily mean that more aware interaction with our material world requires only more aware, aesthetically positive technology. Rather it calls for more conscious approaches towards the resource use within products or systems, humane “skepticism” (Dunne 2006, 22) and critical awareness those that are able to connect to our emotional selves.

### *Imaginative feedback systems*

From a socio-economic and institutional exchange perspective the provision of electricity remains regulated by the state or by a corporate entity deciding its production, cost and distribution. This current model is highly hierarchical. A ‘fact’ of consumption reaches its metering address often in mere numbers through abstract scalar quantities (money, kilowatt hours) or then gets invisibly incorporated as a cost within products, services and spaces. In the context of this proposal it is argued that these facts are hard to be felt as emotion – consumption of energy only generates feelings through its contextual use. We propose a research inquiry that encourages ‘imaginative’ dimension to fill this gap, the ‘imaginative’ stemming from the practice of art, design and research (see Fig. 2) and manifested in artefacts’ aesthetics and interaction.



*Figure 2. Energy use as factual and through emotions combine in the "imaginative"*

Krippendorff and Butter represent "four semantic infelicities" that may hinder successful product (and system interface) design (1984). These concern shortcomings in 1) identifiability, 2) perceived possibilities to "manipulate" (differentiation, arrangement and indicativeness), 3) enabling user exploration, and finally 4) compatibility with the symbolic environments (Ibid., 5-6). However – as they conclude – after an awareness of the importance of such semantics has been gradually identified, the next step is "the development of concepts and suitable language" to discuss the "transmission of meanings" (Ibid., 7). The findings presented here suggest that art and design, supported by engineering skill, should aim towards making consumption of energy more apparent in social context, and to connect it to our human emotions. With respect to more sustainable models for consumption, designers could be encouraged to induce social friction (Jensen and Lenskjold 2004), perceived to be at play whenever people challenge existing norms. When this understanding is positioned within the contemporary educational setting, the process of inter-professional, transdisciplinary and constructive prototyping linked with artistic reflection, social and cultural understanding and systemic scope would support design knowledge creation for more energy-aware user approaches. The strategies proposed by Krippendorff and Butter (1984) remain meaningful – designers have a role as communicators and nodes in a bigger network of topics and stakeholders. We further this approach to suggest that the most promising approach to tackle these aspects is through constructive design research and experimenting in real-life setting (as in Koskinen et al. 2011).

To establish relations and new knowledge on the role and use of electricity as something that mediates social relations in contemporary daily living can be a formidably large subject to address, but yet through transdisciplinary design dialogues these matters can be taken into tests, through a collaborative network of people sharing a like-minded interest in the subject. Hence, to engage in the mentioned subject focus we propose 1) a set of essential elements for design for conservation, as they seem to be necessary dimensions to address to make interactions more emotive, and 2) implications for design education that follow from these.

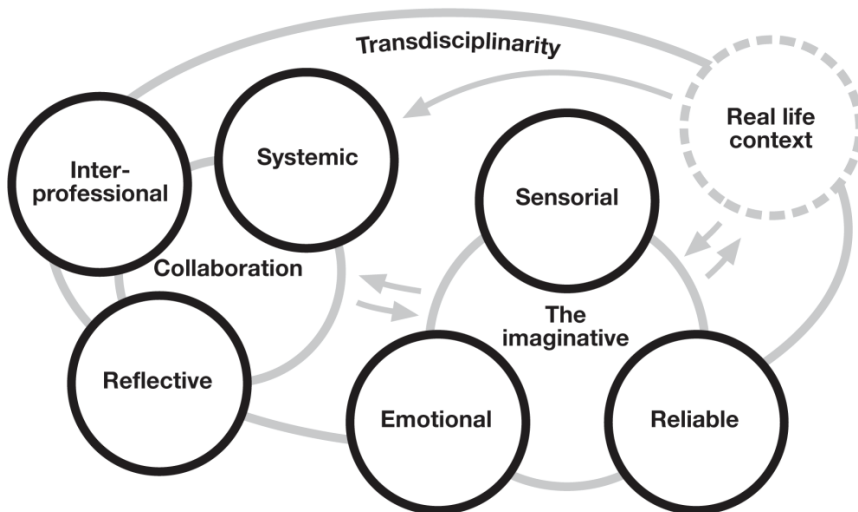
## **Design for energy conservation: the essential elements for feedback design**

So far this text has described several elements that seem to be of importance in designing for energy conservation. We have identified the importance of systemic approaches and collaborative reflection, and also the power in an emotive approach. Furthermore, the constructive approach to design entails that work involves prototyping in real-life settings, fittingly as a transdisciplinary approach. These findings

guide us in identifying the essential elements for energy conservation and feedback design.

*The essential elements for feedback design:*

- Systemic – the approach should embrace complexity but also channel it: the human end must be simple but also as factually true as possible;
- Reflective – the interaction with the system should be responsive: the dialogue with the meanings and messages embodied in the artefact should be reflective and thought-provoking;
- Reliable – the information conveyed in the system must be factual and based on accessible knowledge. It should also be open and just for all stakeholders – the key here being transparency;
- Emotional – the meanings and messages embodied in the interaction should connect to several humanly important dimensions, such as 1) aesthetic and semantic, 2) social, 3) cultural and 4) ethical;
- Sensorial – the means of working, testing and prototyping should embrace sensorial interfaces, whether tangible, auditory or visual;
- Inter-professional – the factual knowledge, as well as the systems and the messages that it communicates would benefit if based on an expanded knowledge base;
- Transdisciplinary – the work has to be taken into a real-life context into the actual problem context, to be able to assess its true potential.



*Figure 3. The essential elements of design for energy and resource conservation*

The elements presented above (see Fig. 3) seem to be rather essential for design for resource conservation and feedback systems in general. Some of these elements

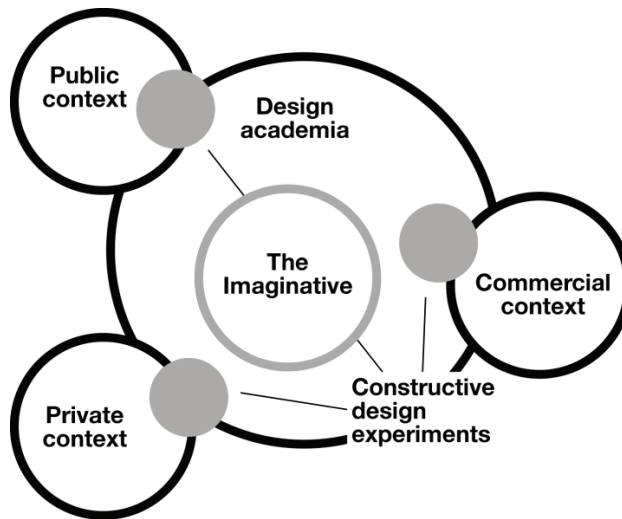
describe the mode of collaboration, while others are essential elements in building imaginative approach to the feedback system. Finally, transdisciplinarity refers not only to inter-professional approach but also to the need to take the testing and prototyping to the real-life context, to assess the feasibility of the system and iteratively continue to develop the prototypes at hand.

## **Implications to design education**

As explained throughout the text, there is a need to further the inquiry between energy use and emotions by providing a platform to diverse backgrounds to come and engage with the topic. This, together with the approach to design presented earlier, calls for a certain type of approach to design education as well. Such an approach would aim to bring in a network of interested students, artists, designers, academicians, researchers and scientists to explore and open the matter of energy and emotions to a wider engagement in a collaborative fashion. Thus for such an approach it is essential to intervene with the subject not just with art and design but also with members from other disciplines, technical and economical, inviting them to bring in their views and expertise. With such an engagement the approach highlights the interdependency of contemporary human existence and the matter of limited resources with a more perceivable and emotive manifestation as an eclectic transdisciplinary dialogue.

In energy and resource conservation the relation between factual and emotional needs to be explored with a similar framework, but from the perspectives of multiple sources from hard science, engineering and social science, and also from its manifestation in designed objects as artefacts. Our proposal for design education aims to make such attempts visible, with an emphasis on public engagement and artistic interplay. We propose that this gap can only be bridged through a series of constructive design research experiments (Koskinen et al. 2011) that aim to stimulate imagination and thinking. Constructive design research introduces a new type of iterative loop to the design process, in which – against the "basic structure of a communication-based model of design" that happens only through artefact and not in between designers and users (see Crilly et al. 2008) – the collaboration in design iteration extends to the use phase.

Participants of such design program would have to collaborate in highly reflective and multidisciplinary manner, entailing intensive teamwork through which students then create artefacts and systems to be tested in real-life settings. According to Koskinen et al. design tradition that arises from "art and design schools" has to, in many ways, "deal with the "halfway" between people and things (2011, 8). Through this testing activity, the knowledge is diffused into the surrounding system, whether in commercial, public or private location and context, or within the academia (see Fig. 4).



*Figure 4. Constructive design experimenting in different contexts*

Such an approach to design education thus aims to explore the matter by engaging it through a program/experiment dialectic (Redström 2011) and interplay between philosophy and practice, focusing on the imaginative to fill in between the factual and emotional seen in the energy usage and consumption in our contemporary society. The model we depict here also resembles the elaborated "integrated communication-based model of design" by Crilly et al., where there exists a network-based iterative development with producers, consumers, researchers and artefacts (2008). Such model should create platforms to encourage artists, designers and researchers to get together and tackle the matter as a collaborative network. It would also aim to formalise the network and bring this matter to the fore by generating and publishing events like exhibitions, experimental installations, workshops and seminars and also conventional publications like students' theses and scientific papers in a collaborative way.

## Discussion

As Koskinen et al. note, "[d]espite increasingly sophisticated methods aimed at handling complexity, human, social, and ecological problems prove to be "wicked" and unsolvable by rationalistic methods" (2011, 16). We wish to open a discussion for the design of more emotive interactions in the context of resource and energy conservation. Multidisciplinary reflection through art, science and sociological elements can help to identify feedback systems that are imaginative, sensible and able to be humanly perceived. This development does not necessarily mean that more energy-aware interaction with our material world requires only more energy-aware, or aesthetically positive technology. Rather it calls for a more conscious approach towards the design of products or systems, and critical awareness to help to connect these to our emotional selves.

Interesting design requires new ways to communicate with "imaginative use of design [...] to penetrate beyond the 'white noise'" (Fuad-Luke 2009, 88). The emergence of synthetic and imaginary trans-species awareness between participants

(Faste 2010, 171), or the approaches provoking questions on consumption (Marttila 2011), can be suggestions to be employed to allow people to challenge existing norms. Furthermore, the linkage to the people's social reality can help to make systems and their feedback more concise for their users. Sustainable design should not just aim to downscale consumption models by systems development, but also to approach it through artistic explorations, constructive and collaborative reflection in real problem context, and with several professional and personal perspectives. The effort must be also directed towards the aspects of interaction that can connect to human emotions with meaningful elements of the social and cultural dimensions. Initiatives for design education for conservation of energy should embrace and make own such settings.

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# Translations: Digital & Physical Interchanges

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**Abstract:** *This paper presents experiments in digital design teaching methodologies at the collegiate level within architectural education. The experiments manifested themselves in the form of three design workshops for students from different levels within the undergraduate architecture degree program at the University of Kentucky. Collectively titled “Translations”, these workshops speculated on strategies for the integration of analogue drawing and making with digital translations within the architectural design process. The events were organized around the concept of employing multiple modes of making, a diverse set of design techniques, and mixed media. The theme of the workshops grew from the belief that multiplication and hybridization of making ensures a cyclical design process in which concepts are translated from state to state, opening the possibility for interpretation, intuition, and innovation within the process of architectural design. The workshop series demonstrated the production of sophisticated architectural concepts and potent architectural design investigations through carefully considered blending of analogue techniques of drawing and making with complex digital design software and relevant digital fabrication resources. Materiality, pattern making, composition, architectural form, and digital craft were featured as primary points of departure and output within each workshop event.*

**Keywords:** *Architecture, Digital Design, Parametric Design*

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## Architectural Design Paradigms

After nearly two decades of investment in developing digital design as a new medium for architectural investigations in both education and practice, a confrontation between modes of making (technique) and cultural meaning (cognition) persists. The digital paradigm has begun to advance well beyond the merits of formal exploration and technical fetishization, extending now to make contact with deeply human aspirations of spatial sensation, calling on the digital to become increasingly pliant and the post-digital to be increasingly precise. However, even two decades afterward, contemporary architectural investigations in academics, digital or otherwise, remain misaligned from mainstream, professional practice invested in curating the cognitive experience through cultural narrative. Rather than continuing the post-modern paradigm of people as readers and buildings as texts to be read, new modes of architectural engagement may be found in potent combinations of pattern, color, texture, and form to induce wonderment through novel visual and spatial experiences enabled by new organizational and formal strategies unearthed through the clever combination of re-tooled analog and contained digital modes of making.

Primary to this critique is the recent re-birth of narrative as a means of describing cultural and spatial meaning. A recent issue in the series of Architectural Design (AD) Primers authored by Nigel Coates, titled Narrative Architecture discusses the role of narrative and its resurgence within the discipline. "In architecture, narrative prioritizes human experiences and the need to shape them into stories. It places the emphasis on a building's meaning rather than performance. To architects, the enduring attraction of narrative is that it offers a way of engaging with the way a city feels and works. Rather than reducing architecture to a mere style or an overt emphasis on technology, it foregrounds how buildings are experienced." This description of the agency of narrative and the lack of the agency found in other means of project conception (style and technology) is both incorrect and incomplete. Narratives do not construct feelings for architecture; rather they force references to elsewhere. They deny the immediate, non-cerebral sensation that truly potent architecture can produce for the individual viewer or user. Rather than attempting to embody meaning in our architecture or embarking on a search for that meaning, greater attention and respect can be paid to true mastery of composition of form and space, and the assembly of the ingredients native to the practice of architectural design – color, pattern, texture, and translucency.

The perceived superficiality of narrative and other forms of alibis for architecture, namely affect and sensation, has provided fuel for recent debates among the newest generation of progressive architectural design educators. Where narrative is largely the editorial of one author who wishes other to adopt his/her legislation, affect and sensation make no such claim. The pursuit of affect and sensation restores the ability of experience to be partially dictated by the individual through non-representational, unfamiliar forms of architecture. A conversation between Peter Zellner, Tom Wiscombe, Lisa Iwamoto, Heather Roberge, Elena Manferdini, and Kivi Sotamaa in *Log 17* (2009), discusses the role of affect and sensation in contemporary architecture and its viability as a device to ensure a wide range of success in architecture (public reception, technical performance, disciplinary relevance, etc.). The discussion centers on the perceived superficiality of some of their architectural investigations and the ways in which "the superficial" differs from "the serious". Peter Zellner defines serious architecture as the reenactment of standardized content and form (familiar architecture). This group of architectural designers is seeking to present their efforts as

serious architectural investigations that transcend reenactment. They are consciously seeking to make the seemingly superficial (novel, unfamiliar, and exotic) more serious. Heather Roberge understands the need to align the “superficial” and “the serious” stating “To put the superficial in opposition to the serious is a mistake that would leave us vulnerable to charges of incompetence and irresponsibility.” Sensibility fills this gap, allowing architecture to transcend pure functionality - to perform socially and contribute to culture. “The superficial is the embrace of the synthetic and the real, the technological and the natural, the fleeting and the permanent.”

Parallel to discussions surrounding “the superficial” in architecture, the topic of ornamentation has also found its way into a conversation on superficiality and has been another subject of recent debate concerning this topic. In a very classical way, or mannerist at best, the reintroduction or continuation of ornament as a design driver has been embraced by Neo-Postmodernists. Designers, educators, and design offices such as FAT (Fashion-Architecture-Taste) and NATO (Narrative Architecture Today) employ ornamentation as a device to stimulate narrative. In their projects, the constructed narrative becomes the alibi for the architectural resultant. In a project such as “The Villa” from FAT (in Hoogvliet), in addition to the narrative backing the resultant, it’s very easy to understand how ornament becomes the primary ambition of the architectural investigation. The architecture itself becomes a narrative to be read. In the words of the architect: “It is a decorated shed, using timber rain screen cladding to create an architecture of communication which evokes Hoogvliet’s industrial past, whilst the references to elements of nature in the entrance and in some of the cut-out features of the façade, recall the bucolic ideas on which the design of the New Town was originally based.” The ambition of projects such as “The Villa”, aside from the utility of providing enclosure and a space to host the desired functions of the structure, are to induce focus on something other than the architecture itself. Practitioners and educators such as Farshid Moussavi have provided additional proposals on the agency of ornamentation in contemporary architecture.

In the introduction to Moussavi’s book The Function of Ornament, she writes, “[Buildings] build expressions out of an internal order that overcome the need to “communicate” through a common language, the terms of which may no longer be available. It is paradoxically in this way that building expressions remain resilient in time.” In this publication, categorizations of ornamentation such as “spiral” or “fluted” do not discuss the affective (virtually functional) qualities of ornamentation, but rather are positioned or categorized in the realm of visual recognition through the lens of geometric repetition. In these instances, ornament is branded as a visually familiar device to be recognized. In the most current endeavors of redefining the role and agency of ornamentation in contemporary architectural practice and education, attention has been paid to the inherent qualities of the architecture itself. Material affect, the complexity of pattern, and the sensations of hybrid forms of making allow ornamentation to become a non-cognitive device to be consumed optically and haptically rather than cognitively. This form of ornamentation, with its ability to induce sensation through empty associations, becomes both performative and operative within the conceptual agenda of contemporary architectural education. The alibi for these investigations does not only lie in their inherent relevance to the education and practice of architecture, but also in their ability to avoid a discursive consumption of the product of architecture, allowing it to carelessly slip into other disciplines such as story telling or geometric codification.

## **The Agency of Materials, Patterns, and Hybrid Forms of Making**

Recently at the University of Kentucky a series of workshops were organized and curated by Kyle Miller, Assistant Professor of Architecture at the University of Kentucky College of Design to experiment with an oscillation between digital and physical production of architectural objects and to understand and promote the agency of color, pattern, texture, form, and translucency within contemporary architectural investigations. The workshops were organized around an ambition to test the viability of these items (color, pattern, texture, form, and translucency) to provide an alibi for these seemingly hermetic and self-serving investigations. The workshops were paired with series of lectures collectively titled "Translations." All events were organized around the concept of employing multiple modes of making, a diverse set of design techniques, and mixed media (digital and analog) within the architectural design process. Multiplication and hybridization of making were adopted to ensure a cyclical design process in which concepts would be translated from state to state, opening the possibility for interpretation, intuition, and innovation within the process of architectural design. Omnidirectional seams of invention and production were inserted into the process of making within each workshop event that stitched architectural concepts, design techniques, and production mediums together. The events reflected upon the possibilities associated with producing sophisticated architectural concepts and potent architectural design proposals through carefully considered blending of analog techniques of drawing and making with complex design software and relevant digital fabrication resources. Materiality, pattern making, architectural form, and digital craft were featured as primary points of departure and output within each workshop event.

In the first workshop, titled "Digital Materiallurgy", led by Adam Fure of Sift Studio and the University of Michigan, students participated in a design task seeking to celebrate inherent material eccentricities. This workshop expanded the discourse on materials and making with exotic and unwieldy materials. Students worked through material experimentation, digital fabrication, and full-scale prototyping. The material palette of foams, silicones, thatches, and paints were foreign and conventionally misaligned as complimentary materials, thus forcing students to develop novel potentials out of seemingly strange matter. Initial experimentation focused on the material's latent tendencies to aggregate (how it naturally bundled, bunched, bent, and folded for example). Students tested, recorded, and codified techniques of assembly—ultimately coercing the unwieldy matter into working systems of aggregation. Avoiding a fundamentalist attitude towards the use of these materials, they were burnt, painted, smothered or otherwise manipulated and then recombined in order to extend their possible qualitative effects and overall affect. There were no material essences sought, only evocative textures, colors, and forms that offered up new visual sensations.

In one project, the possibilities of material transformation and mixing are explored. The project is an exploration of material juxtapositions in pursuit of highlighting the inherent haptic qualities and potentials latent in a vast array of quotidian materials. Through individual material transformations (of fake moss, plastic, and wax) and aggregations of the transformed materials, this project seeks and embraces cross-contamination yielding a field of shifting colors and textures. Ultimately, the project is focused on creating an oscillation between solid states of singular materials and fluid, fibrous concentrations of multiple materials acting as one.



Figure 1. Material investigations, Source: J. Cavallo, A. Culler, B. Kolder, and L. Mattingly

A second workshop, titled “Patternism”, led by Brennan Buck of FreelandBuck and Yale University, sought to explore the agency of pattern as a device for making potent tectonic and volumetric proposals for architecture. This workshop investigated the potential of non-modular egg-crate or cellular structures to produce dynamic forms and spaces. The process was first focused on the development of irregular, differentiated pattern in two-dimensions and then through oblique and distorted extrusion of the two-dimensional pattern. The three-dimensional pattern, then a form, was carved from, introducing voids into the resulting semi-solid matrix. The ambition was to produce a volume of perceived shifting size, scale, proportion and orientation from a seemingly simple initial array of one-degree curves and orthogonal cells. The end result, a hollowed volume, retains a potent array of nuanced visual, spatial, and formal scenarios based upon the original planar development of pattern and the extruded, transformed array.

In one project completed during this workshop, the ability of a layered, semi-regular pattern to produce an irregular aggregation of both fragmented and continuous spaces was investigated. The diverse pattern, coupled with the variation in the size of planar cells, yielded a volume which gained the capability to construct, deny, and curate visual trajectories into and through the tectonic resultant. The overall construct both negated and reiterated its external boundary by presenting moments of cellular density through scalar shifts and cellular scattering, which masked the extents of the three-dimensional frame.

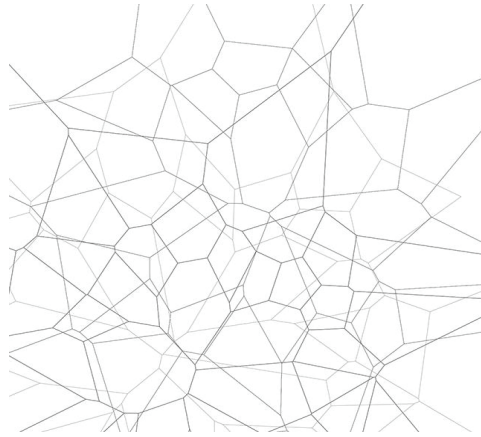


Figure 2. Pattern overlay, Source: M. Gannon and C. Wahl

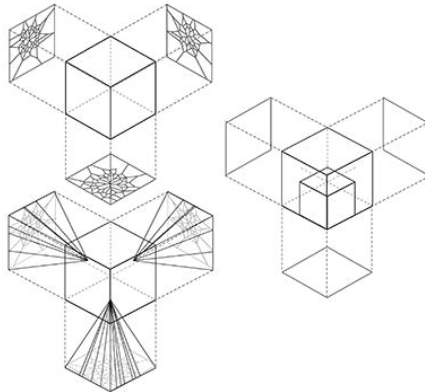


Figure 3. Pattern overlay, Source: M. Gannon and C. Wahl

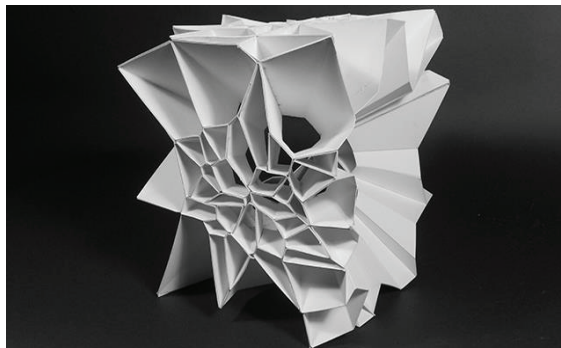


Figure 4. Physical construct, Source: M. Gannon and C. Wahl

The third and final workshop, titled “Parametric Topographies”, led by Clark Thenhaus of Endemic, sought to combine the tendencies, techniques, and sensibilities related to the themes of sensation through drawing processes syncing with digital



translations. Thenhaus deliberately terms the partnerships between emergent drawing techniques and digital protocols as ‘digital gardening’, or the act of growing something anew born of existing and emergent material conditions. This investigation, which proved to be most true to the ambition of “Translations” and is an expanded discussion herein, focused on the development of complex topological (and topographical) design techniques and the possibilities of seamless integration of object and field. The development relied on bridging tolerances among varied drawing and fabrication techniques at the scale of a three-dimensional physical architectural model and through analytical investigations conducted virtually on a two-dimensional plane. Overall, the workshop augmented the ability of the participants to extract multiple complex topographies from the variations and densities of color contained in an original abstract drawing that intuitively mixed pigments within a known boundary.

At its core, the workshop proposed drawing as material (in)formation, opposed to a post-produced representation to be evaluated through decipherability or applied narratives. Rather, the ‘alchemic’ drawing is better understood through behavior and organization, composition and field, and excess and accumulation resulting from material tendencies. Drawing in architectural practice and education is a foundational medium serving as a conceptual, analytical, and operative tool with a rich history in the discourse of architecture and education. However, the increased digitization in architecture has seen drawing largely reduced to the application of associated narratives of digital technique as opposed to tangible, dynamic, and material compositions in which relationships between organization, form, surface, material effects, and building technology emerge independent a priori or standard convention. The translation of material drawing to architectonic conditions enlists the digital yet reaffirms the importance of material energies within the expanding field of computation, parametric modeling, and digital craft. This assertion initiates the agency of drawing as having less to do with an imposition of an idealized or internal mental image unique to the author than it does with an external emergent formation in which sensing outweighs deciphering through embedded color, texture, behavioral tendencies, and inherited data. This feedback fosters technology that is more pliant and material drawings that are more fertile.

One project completed in this workshop best demonstrates the agency of these topological drawing and analytical techniques. This project has a particularly unique compositional and material sensitivity through which spatial indeterminacy, implicit and variable depth, and procedural tolerances hybridized analog and digital. The topographic qualities exhibited in the milled model are the composite effects of analog drawings mixed with a parametric abstraction using implicit splines and points intuitively mined from the drawings as multivalent tools capable of redefining scale, intensity, and density of soft topographic features and rigid networked abstractions alike. This variable capability in defining the surface echoed the shifting hierarchy latent in the drawings while reinforcing the notion that the drawings, as a fluid material composition, are better understood through sensing and interpretation rather than calculable measurement. It is this compression of physical behavior or material tendencies partnered with the acquisition of geometrical, topological, or organizational systems and schema in which new relationships between form, surface, performance, and sensation are curated.





Figure 5. Initial ink drawing, Source: B. Richter, A. Schwab, and D. Taylor

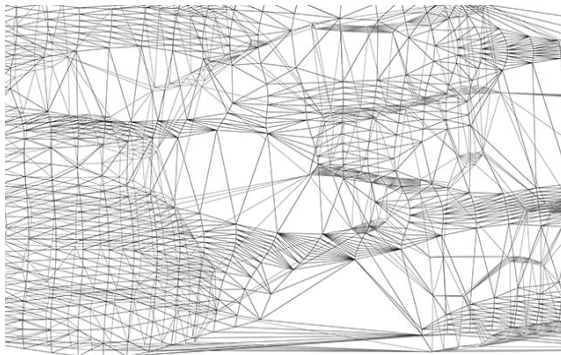


Figure 6. Fluid matrix translation, Source: B. Richter, A. Schwab, and D. Taylor

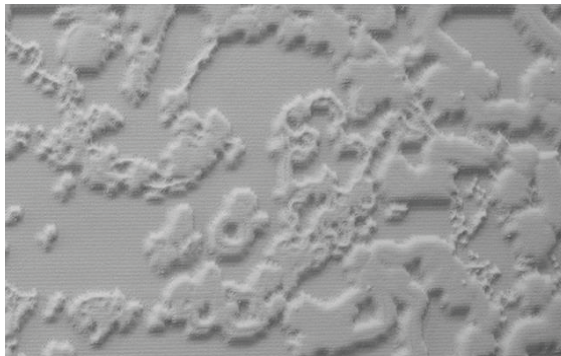


Figure 7. Physical translation, Source: B. Richter, A. Schwab, and D. Taylor

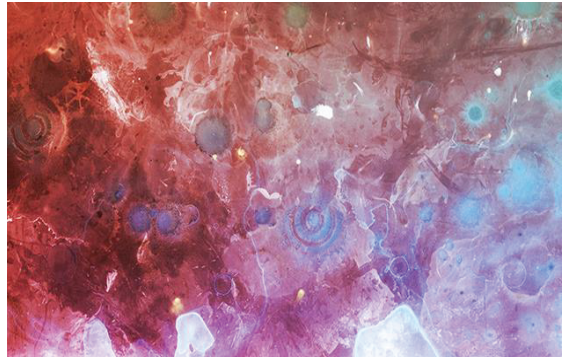


Figure 8. Digital hybrid synthesis drawing, Source: B. Richter, A. Schwab, and D. Taylor

#### The Relevance of “Translations” and Other Contemporary Architectural Investigations

As a series of educational lectures and workshops, “Translations” proved to be a tremendous success with respect to exploring the potentials of architecture’s native ingredients and seeking potent architectural proposals with empty associations. The series was also quite successful in aiding and promoting the ability for students in architectural design to explore and apply multiple modes of making, both analog and digital, within a variety of short design tasks. The projects exhibit great dexterity and a capacity to both mask and celebrate the means of conception and execution.

The topics of design concept development, fabrication techniques, aesthetic drivers, life cycles of design concepts, ornamentation, and architectural alibis were all investigated throughout the course of these design workshops. With regards to these topics, the overall ambitions of this event series, and the ability of its output to contribute to the discipline of architecture, much can be surmised. As was evident in both this event series and a broader survey of ongoing architectural investigations, technique is still very prominent and pivotal in architectural design. Both digital and analog techniques of making heavily govern the end result of contemporary architectural investigations, both in the aesthetics and the overall sensibility of the project. In these workshops, technique (and the strategic application of it) was a latent driver of the design tasks and aided the development of both the motivation and the novel feedbacks between idea and technique for the final products of each event. The techniques were used with precision and held as the control device in order to test the variations of output relative to material qualities or spatial capabilities of two-dimensional pattern making and subsequent three-dimensional translation. Design techniques are still very much at the forefront of contemporary architectural design and architectural design education and are helping to bridge the gap between architecture that bears a responsibility to its point of conception (inspiration) and architecture that is solely about performance and developing agency over its context and contents.

With respect to the development of the contemporary architectural aesthetic, many drivers can be identified - many of which find their point of conception in an academic environment before they make their way into professional practice. Parallel to the range of digital design techniques (surface modeling in Rhino, subdivision modeling in T-Splines and Maya, volumetric mesh modeling in Mudbox or Symvol, etc.) that drive architectural aesthetics, are the ingredients internal to the discipline of architecture

that help to differentiate those very techniques. Students and practitioners alike are transcending the immateriality of the virtual environment by calling on the capacity of color, pattern, texture, and translucency to enliven their digital constructs. With the duality of the virtual and the physical playing a role in project development, contemporary architecture seems to be nearing a healthy balance between celebrating the process (techniques) and the product (specific application of the ingredients for desired spatial and visual effects). In “Translations”, inherent material properties such as color, texture, and translucency (alongside other pertinent items that dictate the visual consumption of architecture such as pattern and form) were strategically combined as points of entrance, insertion, and departure. In each workshop the final results gained visual autonomy from the techniques that enabled their development and from external references and associations. As is the case with the work of many emerging architectural designers, the pieces were celebrations of themselves and the discussions focused on the products on hand and the architectural qualities that they exhibited rather than the ways in which they drew reference to external objects or constructed narratives to be read.

In support of the points of conception and desired output was the working toolset for these events. Simply for the expediency that it enabled, digital fabrication was paramount to the success of these workshops. Tools such as the CNC mill and the laser cutter not only enabled efficiency in production, but also served as analytical devices with which to quickly test possible trajectories for the design teams to pursue. In most instances, design was neither altered nor compromised by the inclusion of digital fabrication resources, but rather augmented by enabling the designer to swiftly generate ideas and test them directly through making. With this shared sensibility, the work was purposefully understood to be post-digital. Parallel to the employment of digital fabrication technology, the use of generative drawing and modeling tools and parametric data management software (in this case, Grasshopper for Rhino, Rhino Nest, and Processing), permitted and promoted efficiency in production and enabled intense iteration of plausible design proposals within each design event. Visualizing potential outcomes quickly allowed for objectivity within the iterative process. Criteria could be established and designs could be measured against themselves allowing for a truly inwardly focused, discipline specific process to be rigorously explored and celebrated. The avoidance of external alibis such as narrative was critical to the success of these events. The inwardly focused nature of these types of design investigations, ones that within each workshop focused on topics such as material eccentricity, patterning, and complex topographical landscapes, yielded visually and spatially autonomous outcomes. The commitment to autonomy is what allowed the themes of each workshop to be addressed directly. Overall, focused design tasks and instruction enabled a commendable level of knowledge transmission with respect to the conceptualization of architectural design concepts and employment of applicable techniques for development and realization. In parallel, an unprecedented level of production across multiple media and platforms for making was achieved.

The “Translations” workshops expose the companionship between digital and analogue as opening new possibilities within architectural and landscape design not through applied meaning, rather through sensate effects and intuitions. These possibilities now encompass notions of sensation, tactility, texture, ornament, and physical behaviors along with more central digital doctrines of fabrication, interactivity, and assembly. The partnerships between disciplinary palettes of color, texture, pattern, and organizational effects with advanced digital protocols is demonstrative of a new

breed of translations ‘from drawing to building’ as a contemporary model of practice and pedagogy that sync matter with digital paradigms at multiple scales with multiple interactions and feedbacks. It requires grafting otherwise opposed systems into coalescent mutations and weeding out of non-operable or standard techniques in an effort to cultivate anew from within disciplinary palettes.

In conclusion, this series of lectures and workshops proved to be very instrumental for the instructors and participants alike in further developing architectural design sensibilities that are both sophisticated and specific. Simultaneous to the development of design sensibilities, the augmentation of skill sets in design development (and project realization) was evident in the ways in which design was thoroughly explored and rigorously developed with quickness and confidence. The workshops, meant to serve as a sampling of what emerging architectural design practices are engaged in, successfully demonstrated the possibilities associated with a cyclical, inwardly focused design. Design concepts primarily focused on developing ideas and employing matter native to the discipline of architecture were translated across mediums to arrive at truly sophisticated and potent architectural design proposals.

Parallel to the ambition to have “Translations” contribute to this larger survey, the more nuanced agencies latent in material eccentricities, pattern making, and topographical design were explored and celebrated in this set of dynamic architectural events. The products of “Translations”, in conjunction with the products of professional architectural investigations, engage in and promote the capability of architecture to participate in and augment the visual and spatial experience of the built environment and the activities that take place within it. This engagement is the responsibility of the contemporary architectural project - to insert its influence over the built environment in a seductive and subconscious manner. With these ambitions, contemporary architectural investigations can successfully develop the conceptual and technical skill sets necessary to produce potent and provocative visual and spatial experiences.

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## Cultivating creativity: documenting the journey

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**Abstract:** *As a Master's of Education in Learning Sciences candidate at the University of Washington and a licensed architect, I co-taught the course Cultivating Creativity with Professor Iain Robertson, Winter Quarter 2012. This course is offered annually to a group of 15 Honors students at the University. Professor Robertson has taught this class for five years. Participating students were in 'non-creative' majors such as Biology, Chemistry, or Math. Two students were in Computer Science and Religious Studies. Most of the students arrived expecting to 'learn' how to be creative. Through exercises that Professor Robertson developed, the students gained confidence in their individual and collective creativity. They also began to experiment with materials and ideas as they discovered their creative confidence and voices. Students wrote weekly reflections after each week's exercises. I have created a Prezi presentation using excerpts from these reflections with images from the course work to demonstrate the power of a course designed to cultivate creative thinking. The students' voices, together with supporting literature, shows the importance of teaching design and creative thinking skills within the framework of "non-creative" curricula. This paper works in tandem with viewing the Prezi.*

**Keywords:** *Creativity, design thinking, innovation, creative thinking skills.*

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## **Overview**

Tell me and I forget, teach me and I may remember, involve me and I learn.  
(Benjamin Franklin)

Creative thinking skills are essential in today's world but are not typically fostered in the United States' education system. While basic art classes are taught in the elementary school years, most art courses are often pushed aside or left completely behind as requirements and assessments build up for math and science curriculum. As students advance in age and grade level, rote teaching in preparation for standardized testing becomes the norm. Because of the lack of art and design related coursework, a student's creative confidence is often lost. Yet as students mature and advance on to technical school, colleges, and advanced degrees, (and then ultimately into the job market), the demand for innovation and creativity increases but the muscles to do such work are weak.

During the winter quarter of 2012, at the University of Washington, I co-taught a course designed by Professor Iain Robertson entitled "Cultivating Creativity." Professor Robertson poses a challenging question that we as educators should ask ourselves: "Can we rekindle a sense of wonder?" Wonder, when used as a verb, is the desire to be curious or to know something. In rekindling wonder, students are apt to explore, make associations they might not have made, synthesize multiple ideas, and ultimately innovate.

Art and design courses help to foster a fluency in iterative thinking skills as well as a nimbleness in problem solving and adjusting to unexpected changes (Razzouk, p 345). In a course where cultivating creativity is a goal, students often participate in the design process unwittingly. Once through the design process a few times, students begin to realize they each possess the skill and imagination to create new things. Through active participation they begin to see themselves as being creative and innovative, and their confidence in their own imagination soars. In addition, they also recognize and respect the imaginativeness in their classmates, which helps to foster community, collaboration and ingenuity.

Professor Robertson states in his class syllabus, "One of the techniques is to try and transform the everyday, ordinary, familial and prosaic into the unusual, to step aside from our conventional ways of looking at the world and see the common place in a new light. And not just one new light, many different lights." The exercises he has created use simple everyday materials and objects for students to share, order, build with, and evaluate. They leave seeing the ordinary in a different way and this in turn becomes a basis for metacognition and adaptive transfer of knowledge. Many students commented that they entered their next courses with a new sense of problem solving and confidence in themselves. When asked in a post-course survey specifically if they could use these thinking tools in other areas of their life, the response was 100% positive.

As one of the students stated, "In some ways I feel entering this class is like going down the rabbit hole where only our imaginations lead the way." Please join me on a tour of their journey as I describe the course exercises through the students' own words.

## Journey introduction

To begin this journey, it is necessary to explain the title of the course: Cultivating Creativity. By definition cultivate means to apply oneself to improving or developing (one's mind or manners). It is derived from the Latin root *colere* which means "to honor or inhabit."

By definition, creativity is the ability to transcend traditional ideas, rules, patterns, and relationships, and to make meaningful new ideas, forms, methods, and interpretations. The root of this word is from the Latin verb *creare* meaning "to make."

In other words, cultivating creativity is literally to "honor making." The goal of the class is to awaken individual and collective creativity through hands on exercises and invigorating discussions. How often do students so pressured by exams and upholding high GPA's in chemistry, biology and math appreciate, respect and participate in the act of making?

The following is a description of each project together with images taken from a Prezi (a cloud-based presentation software) created to describe the course. The text included in the presentation is from the students' own words. As a requirement of the course, the students wrote weekly reflections for the previous week's exercises. I combined thoughtful excerpts from the students' written reflections with images from their course work. This was an effective way to illustrate the power of a course that taught creativity to students in non-design majors.

In addition to the reflections written by students and the images I've chosen, I have highlighted the verbiage Professor Robertson uses in his exercise prompts. Professor Robertson plays with the meanings of the words in ways that bring a deeper, clearer meaning to each exercise. As Vygotsky stated, "Meaning is what is lying between the thought and the word. Meaning is not equal to the word, not equal to the thought." (Vygotsky, p 133). Professor Robertson plays with that grey area between the thought and the word to entice creative adaptation of simple instructions, which results in a wider understanding of the task at hand.

### *Do you mind?*

The first exercise was entitled "Do You Mind?" From the project statement:

*Do you mind?*

*No one knows your mind better than you.*

*Think about it.*

*About what?*

*Your mind.*

The exercise prompt was to create a map of your mind's journey from there to here. Initial class discussions were centered around "Where was here? And where was there?" The students were encouraged to "embellish and elaborate their journey as an enthusiastic tour guide might do." Professor Robertson also states that creative minds see their life and their work in broad perspective as well as in the immediate moment.



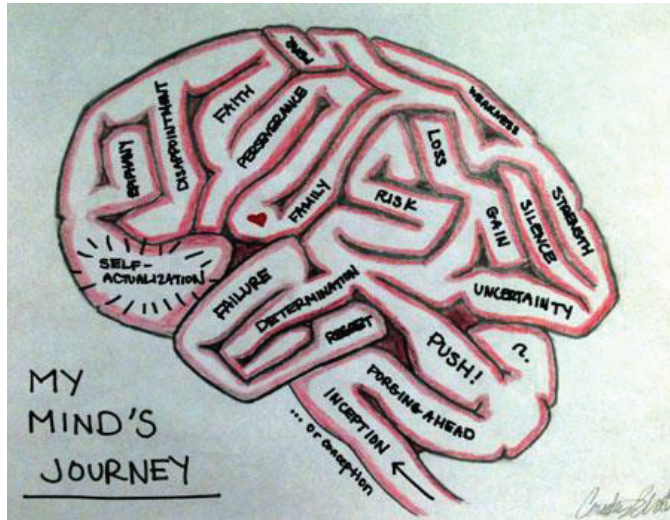


Figure 1. Mind map

The words from this reflection capture the initial questions the student had that this project statement encouraged. “What is the mind? Am I my mind? Does my mind’s journey differ from my own?” Through this simple project the students begin to question the ideas of thinking and knowing and doing. In other words this is direct question to the students own metacognition, how and what do I know what I know? Or, to borrow from the lyrics of the Talking Heads, “How did I get here?”

Student 3 draws a conceptual map of her brain. With her rudimentary drawing of the grey matter, she shows it as a maze with the inception (and conception) starting at the base of the head, in the spinal stem. As she progresses through the maze of her brain she encounters all aspects of life from failure to strength, from questioning to disappointment and ultimately to the forefront of her brain with prize being self-actualization. In one project solution this student was able to convey a myriad of concepts, from what she knows about herself to what she knows about the brain to what she knows about life’s twists and turns. (See Figure 1.)

Student 6 created a bridge with many of life’s choices represented on either side. He demonstrated himself walking across this bridge. He illustrated his path using light up fingers (with LED lights) crossing the bridge. As he took a step each ‘foot’ lit up, demonstrating his journey as one that is illuminated not at the beginning or end, but along the way.





Figure 2. Board game

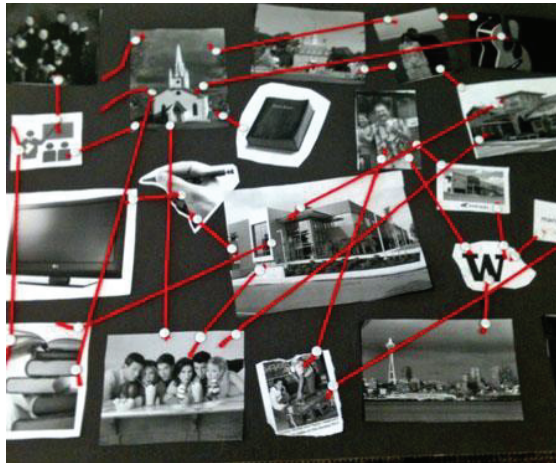


Figure 3. Web

Student 9 demonstrated her journey as a child's board game. She described her conceptual thoughts to show there was no direct path and sometimes there were set backs as well as advances. In her journey there have been rewards and places to avoid. (See Figure 2.)

Student 14 demonstrated his journey more as an interconnected web. Not only did he illustrate all the people, places and things who helped him get from here to there, but how interconnected they all are. (See Figure 3.)

Each of these students chose to tell their story and to take a risk. As one student stated in his reflection, "As I've gone through high school and college I've become progressively less willing to take risks. Being creative, when it's done right, is a little bit risky – it takes self-confidence to know that your ideas are worthwhile and that you'll be able to communicate them to people and be understood. "



Figure 4. Sorting caps



Figure 5. Sorting fossils



Figure 6. Sorting river stones

### *A Sortie into Sorting*

This exercise was simply to sort things. Yet, put in the context of a *sortie*, or mission, these random collections of everyday things become something worth studying and classifying. This process of looking at objects we so quickly gloss over encourages the students to think about the similarities and differences and the meanings between the two.

Students were asked, “In groups of 3 or 4, sort, classify, categorize or otherwise make sense of your collection of stuff. Make ‘sort’ work of it.” They were also asked to diagram their process and production. One of the most successful aspects of the class as a whole was the collaboration of students from entirely different fields to collaborate in short exercises to solve a problem.

Figure 4 shows a Chemistry major, a Biology major and a Computer Engineering major collaborating while sorting plastic caps. Using what they each know they begin to classify objects that have very minute differences. Collaboratively looking at objects as a granular level opens infinite possibilities for new discoveries.

Figure 5 shows a Biochemistry major, a Scandinavian studies major and a Environmental studies major sorting fossils. One of these students stated in her weekly reflection, “Categories can be dangerous, they can be useful and they can be simplistic, but I can now see how the spontaneous formation of categories can certainly be creative.”

Figure 6 includes a Psychology major, Biology major and a Biochemistry major collaborating and sorting very similar river stones. Each group came up with very detailed explanations of their sortings, but they quickly saw that by working together they arrived at larger and more detailed studies than they would have independently.

The transfer of knowledge from this exercise to real life was so poignantly explained by the student who says in his reflection, “I may be going off on a tangent here but the biggest lesson I got from the sorting exercise was to consider the ways I sort people I’ve never met.” Herein lies another wonderful aspect of cultivating creativity. Creative collaborative work cultivates empathy.



Figure 7. Student with rock “island” and storyboarding for future episodes of *Lost*

### *Lost at sea*

This exercise was to choose a rock from a pile on the table, and then use the rock as inspiration to create the next several episodes of the TV show *LOST*. (A television series aired on ABC from 2004-2012 about the survival of a group of people who have crash landed on an uninhabited but strange island. It is a show frequently mentioned in pop culture.) Professor Robertson states “In your hands you hold, if not the Aleph, then at least something of similar magnitude and grandeur, namely an exact miniature (down to the tiniest detail of the island) on which the next series of *Lost* is to be filmed.”

One of the students openly admitted to me that, as he was looking at his rock, in his hand he had absolutely no clue of how to begin. He was simply looking at a seemingly smooth rock. With a few gentle suggestions I was able to point out the tiny imperfections in the rock and shift his thinking to a different “scale” if you will. He then began to see the fissures as valleys and mountains and then the scenes for his show came forth. In the end, he was one of the last to finish because he had not exhausted his ideas. Later, in his reflection he commented that with a touch of inspiration he was not only able to construct a story but created illustrations to go along with the story. As an educator, I saw how a few simple shifts can make a mile of difference in the success of a student in their perception of a problem. (See Figure 7.)

### *As small as possible*

In this exercise the students were handed a sheet of paper with the prompt “Make the sheet of paper seem as small as possible.” Almost instantly the group of students were silent, each thinking of what the prompt meant and how to solve this task. The solutions they each came up with were extremely diverse, with only four described here.

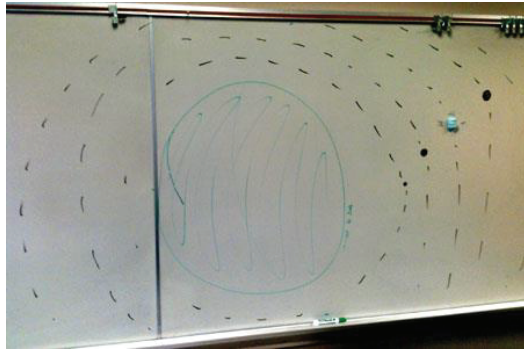


Figure 8. Paper in universe



Figure 9. Bullied Paper

One student sought to describe the paper in relation to the universe. (See Figure 8.) Another student sought to show his paper in terms of a subatomic particle.

Still another student said she thought of it as being bullied. She asked the rhetorical question how do you make someone feel small? She explained, “You kick it, you beat it, you crumple it up and you stuff it in a container. Then you put that container somewhere all alone.” (See Figure 9.)

A fourth student played with perception and scale in reality. This student ran out of the room, out of the building, across a courtyard and over to the University of Washington library. He taped up a small folded square in the window of the top floor. This action played with the visual scale of the paper by distance.

While sharing their solutions, it was the sharing of their process to their solutions that generated the most conversation. There were many similarities and differences to be found in each. Students frequently commented, “I thought of that too!” but gave reasons why they did or didn’t pursue that direction. This simple exercise clearly showed how there are various solutions to the same problem and that through discussion and critique students could begin to see why choices were made the way they were made.



Figure 10. Lines of bottles

### *That's small for now, folks*

A summary of the exercise is best described in one of the student's writing on the back of the postage stamp:

*These lines, capturing glass*

*That we made here in class*

*The one was made from a broken piece*

*The act of creating brought me peace.*

### *All present and correct*

One of the ways Professor Robertson cultivates creativity in this course is by having students speak out loud about the ideas they are generating. When students entered class on this class day, they found a pile of wrapped 'gifts' on the table. They were asked to participate in a game of improvisation by pretending they were at an anthropologists' conference. As they unwrapped an object (wrapped as a present) to the task was to explain this unusual object as if they were a world-renowned expert on that subject and this was their prize discovery.

Students were encouraged to speak colourfully about their object. Professor Robertson noted, "In as much as and in so far as it is possible, please refrain from excessive reliance on technical terms and 'jargon,' though we recognize that, in such a rarefied and specialized field, common English may well be insufficiently specific for your purpose and thus it make be absolutely necessary, on occasion, to employ highly technical terms to ensure exact explanatory precision. Speak up!"

This exercise was a conversational charrette of sorts. In the same sense as a design charrette is used to organize thoughts into a structured medium, this process of improvisation demonstrated an effective way of creating infinite possibilities of ideas and images though verbal description in a short amount of time.





Figure 11. Systematic parts and pieces

### *Systematic-ally*

Students were asked to collaborate with each other to create or reveal a system. The students were given a pile of plastic bits and pieces that Professor Robertson presented to them. (See Figure 11.) Initially there was hesitation but as the students formed groups the strengths of each group member started to show. Some jumped in immediately and others watched and offered suggestions. A few took others work apart while others built on ideas.

The process of collaboration, in building their finished pieces proved to be an effective way of creating a solution that individually they would not have made. As a group they were able to bring random pieces and multiple ideas together to form one cohesive project. As each group explained the project by explaining the process, it became clear to them that this was about the process, not the product. Cultivating creativity through collaborative design exercises is how design professionals foster quick and resourceful thinking. To quote from the exercise prompt, “to synthesize, to think synthetically, to see wholes where others see holes,” is a wonderful way of describing the act of collaboration.

### *Interstices*

This exercise was to talk about the in between and the variety that exist there. Students were asked to draw a  $\frac{1}{4}$ ” figure or person in two diagonally opposite corners on a piece of paper and then compose and illustrate the story of the two people meeting. They were asked to manipulate the sheet of paper so that the two corners, and the two figures, would eventually come together. They could crumple, fold, tear, or twist to make this happen.

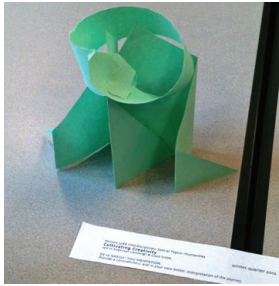


Figure 12. Meeting corners



Figure 13. Collaboration



Figure 14. Ordered nails

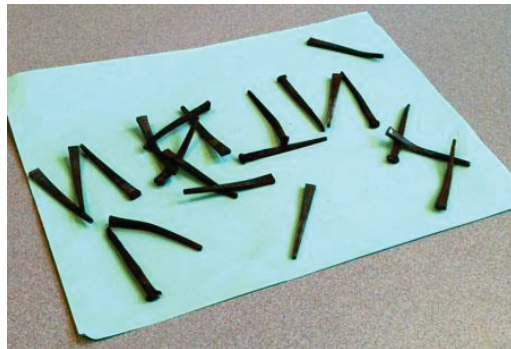


Figure 15. Random or Russian?

These two figures show a finished piece with the two corners together (see Figure 12) as well as two students reviewing and inventing a story for the second part of the exercise. (See Figure 13.) They were asked to pass their ‘story’ to the next pair, create and then finish the previous story. One student summed up the surprises in the second iteration by saying, “the group that recreated the story from our originally paper was attentive to certain folds and structures of the paper that even we hadn’t noted when we created it.”

### *Random mutations or design intelligence?*

In this project students were given 21 nails to organize or disorganize into a seemingly random pattern on a sheet of paper. Next, they were to move clockwise to the next table to try and discern how that team’s arrangement was not random and describe the relationship between the objects. This brought up many conversations about what is designed and what is random. They were then asked to rearrange the objects of the their table into a secret code. The next group was to crack the code.

One of the groups gave up and made something decidedly ordered. (See Figure 14.) This started a conversation as the students realized that what was ordered to some might be random others. Another group used their nails to create a Russian word that only they could see and understand. This word was never deciphered in the exercise. (See Figure 15.)



Figure 16. Dirt painting



Figure 17. Gallery walk

The students agreed it was difficult to create random order. With that observation in mind, they discussed design and what makes something designed. In addition, and in contrast, it was hard not to see images or patterns created in the seemingly random nails. Once someone saw the shape of a dog, or house, etc. it was difficult not to visualize whatever image was mentioned. This exercise proved to be more difficult than most but created a great deal of meaningful conversation.

### *A world of wonder*

Professor Robertson has an amazing collection of objects, and one of the most exciting class days occurred when he brought in part of his collection to class. The collection included boxes of natural elements; from shells to lichen to seedpods, to various colors and types of dirt. Students were given the opportunity to get their hands dirty and create “worlds of wonder” from these materials. In groups of two they sorted, organized, played and painted with these fabulous materials. (See Figures 16 and 17.)

Once the students were finished with their work a simple gallery walk was the method of presentation. The conversation varied from what the materials meant to each student to where the materials might be from (or what they might be). Lastly the discussions were very imaginative when they described what they hoped to represent in their creations.

### *Debatable*

As Professor Robertson states, “synthesis is, perhaps, the greatest art of creative minds – to make integrated wholes where before there were only unrelated pieces.” The first part of this task was to synthesize, on post-it notes, their experience or thoughts on the Cultivating Creativity class as an experienced whole. Then after doing so, and as homage to our current world where we all communicate via electronic means, students were to convey their ideas to each other using only email or texting.



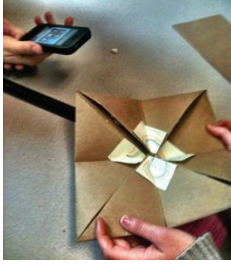


Figure 18. Phone

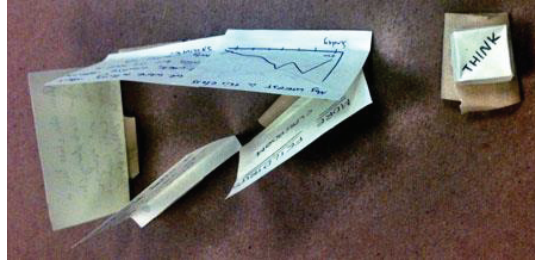


Figure 19. Think



Figure 20. Honesty in a bottle

All types of illustrations were used to describe their experiences, from the simple word THINK written on a small handmade origami box to larger drawings depicting music and graphs to explain the importance of this class. (See Figures 18 and 19.) In spite of my and Professor Robertson's assumptions the students were frustrated with the electronic rule of communication, and were surprisingly vocal about this limitation.

### *E-motional Intel-Ligence*

Professor Robertson started this exercise by stating, "Being (by way of explanation) an exploration of our values and emotions and how they influence decision-making. The students were tasked to space a large collection of various empty bottles, in terms of difference or closeness, along a straight line, according to their honesty. Honesty in a bottle? That was precisely the question.

This exercise was one of the projects that inspired the most conversation and collaborative decision making of the quarter. They had to decide what honesty in a bottle meant, and which bottles embodied that quality. The shape, the color, and material all played into the discussions. Students took turns placing bottles where they thought they belonged, then others moved the bottles around to other locations. After 1 hour in this exercise they did reach a decision although it was never a definitive solution. As time allowed a few of the students spoke up about why they disagreed with the final outcome, and then decided to make a few changes. (See Figure 20.)



Figure 21. Making mistakes

### *Know mistakes were made*

The final exercise of the class documented here is one where the students were asked specifically to make a mistake. They were handed paint and paper and spent the hour trying to make a mistake. Professor Robertson included a wonderful adage here in his project prompt:

*No mistakes = no learning*

*Know mistakes = learning*

The students found it impossible to make a mistake under these simple, playful circumstances. (Shouldn't all Honors students be given an hour to play with paint?) However, the exercise generated a discussion about the subject and the merits of avoiding and creating mistakes, and then of course, learning from them. (See Figure 21.) During the exercise, Professor Robertson cites Carol Dweck, a psychologist at Stanford, who states that praising students for innate intelligence (as opposed to trying hard) will usually backfire. This leads students away from understanding (and accepting) that mistakes are not signs of stupidity, but the building blocks of knowledge.

### **Parting thoughts**

Finding ways to foster creativity is essential in today's education. In a world that is expanding and changing as fast as ours we need to foster fluency in creative thinking skills and nimbleness in problem solving in all subjects taught. Creativity and innovation in classrooms should be the norm, not the exception.

In his book, *A Whole New Mind*, Daniel Pink describes six essential abilities students need to possess in order to navigate jobs of the future. *Design. Story. Symphony. Empathy. Play. Meaning.* Design is not just about creating something functional but also beautiful and emotionally engaging. Story is the ability to fashion a creative narrative. It is not all about data and facts anymore. Symphony is essentially synthesis, bringing disparate pieces into a complete whole. Empathy is the ability to understand someone else's needs and design or provide for those needs, which in turn forges

relationships and causes people to care. Play is necessary to provide freedom and room for creativity. Meaning is perhaps most important. Since we live in a world with so much, meaning is often lost. Today it is important to gain a sense of transcendence through meaningful work and meaning in our work. Practicing and cultivating creativity as demonstrated in these exercises addresses each one of these necessary abilities.

As educators, it is our job to help encourage and cultivate creativity from an early age through the college years. We are an influential part of our students' journey from "here to there." Our future doctors, lawyers, software engineers, analysts, politicians, and all the other professions we haven't even thought of yet depend on us to show them their own skills as creative and innovative citizens and as our future leaders. To emphasize this I end with a quote from one of the students, "I often tell myself that I have no creative vision and that my view of the world is rather analytical and narrow, but this class is helping me to see that there is more than one definition of creativity and that, to an extent we are all capable of it."

*"The encouragement of creativity from an early age is one of the best guarantees of growth in a healthy environment self-esteem and mutual respect – critical ingredients for building a culture of peace."*

(United Nations Educational, Scientific and Cultural Organization)

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## Craft education: authentic design constraints, embodied thinking, and craft making

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**Abstract:** *Craft education, as a form of design learning, has a special significance in inspiring human creativity, particularly when conceptual and material aspects of the process reciprocally support one another. This article underlines the relevance of craft and design education; 1) the importance of dealing with various constraints and professional design knowledge, 2) the role of the embodied thinking in design and making activities, and 3) the ability to foster students' awareness and competence in exploring, evaluating and improving their local environment and design culture. Two longitudinal elementary students' design projects will be described as examples of integrative and thematic school projects. In addition, implications and possible future for craft education will be described.*

**Keywords:** *Craft education, design constraints, embodied thinking, making, collaborative designing.*

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## **Introduction**

The creation and production of design ideas in concrete end products is considered to be the essence of craft education. The holistic craft process, i.e., ideation, testing and making, as well as reflective and evaluative aspects of craft education are strongly underlined in the Finnish National Curriculum for Basic Education (FNBE 2004, 242). Designing is essentially included into craft processes, and craft is seen as the way to materialize design thinking. However, in Finland, there is on-going debate related to what is the main role of craft education in the modern society, and how craft education can be better integrated with other school subjects. It is argued that the contemporary society does not need traditional craft education, and that it should shift towards technology education which more closely relates to students' everyday life. Further, Karpainen (2008) has criticized that school craft over emphasizes technical skills as compared with self-expression. Accordingly, in basic education, the construction of craft products is often perceived as the primary focus of learning activities, rather than as a way of supporting the rationale directing the design and making practices. In this article, we argue that craft education, as a form of design learning, has a lot of potential for promoting creativity and innovation in modern society.

Craft and design have a special significance in stimulating human creativity, particularly when conceptual and material aspects of the process reciprocally support one another. Design and making activities develop the ability to enhance and transform ideas through visualization; they involve testing the practicality of multiple solutions through sketching and prototyping. The goal of craft education has long been to create critical understanding of design practice both through action and reflection upon it (Schön 1983; Pöllänen 2009). These practices include production of design artefacts, such as sketches, models and final products, which provide mediating entry into design and craft discourse (Rowell 2004). The core curriculum for craft education highlights values and aims that relate to creativity and problem solving, technical and aesthetic skills, independent working skills and promotion of self-expression (FNBE 2004, p. 242). The understanding of everyday technological phenomena, critical thinking, and responsibilities related to selection of materials are also seen very important. The appreciation of quality of materials and end products is considered to educate students towards becoming critical consumers. Furthermore, the curriculum of the craft education emphasizes the integrated projects and thematic entities (FNBE 2004). However, the curriculum does not give any detailed guidelines how the craft education should be taught, or detailed content to be covered, or materials and techniques to be used in school craft.

Craft designing and making is a complex process, including extensive visual or artistic and technical skills, as well as intensive domain specific knowledge (Goel 1995; Cross 2004). Production of visual and material artefacts is a crucial element of success in the design field, which depends on the management of the whole design process in all its components, from idea generation to the mastery of techniques (Murphy and Hennessy 2001; Rowell 2004). Thus, in design learning the unique qualities of holistic craft process relies on the ability to solve complex problems. Students need to manage the procedures of planning and making, integrating representations of mind to surrounding material/physical and societal conditions, reflecting possibilities, and testing the boundaries of self-fulfilment. Learning through designing and making arguably has an essential role in human development by facilitating the development of cognitive, spatial, motor, social, and aesthetic skills. However, the students should be

provided opportunities to recognize, create, and reflect on their own ways of participating in the design culture. The design tasks or projects should be centred in the problems of our daily lives and the places in which we live. Conversely, the challenge for the craft education is that the origins of the design problem too often come only from the student's personal context (Seitamaa-Hakkarainen 2010).

In the following, we will first highlight the value of design and making activities by focusing on the nature of authentic design problems, as well as embodied and material aspects of designing and craft making. The central idea of this article is to introduce two longitudinal elementary students' design projects, collaborative lamp designing and architectural designing, as examples of integrative school projects. Through describing these projects, we underline the relevance of design learning; 1) the importance of dealing with various constraints and design knowledge, 2) the meaning of embodied dimensions of design thinking and making activities, and 3) the capacities to foster children's awareness and competence in exploring, evaluating, and improving their local environment and design culture. In the end of the article, we will discuss implications and possible future for craft education.

### *Challenging problems and collaboration*

Bereiter (2002) argued that innovation society creates novel challenges for education; it requires competencies that develop through participation in the practices of working with knowledge and solving authentic problems. Further, Bereiter and Scardamalia (2003) emphasized the importance of design mode in student learning. In design mode, students are concerned with the usefulness, adequacy, improvability, and developmental potential of ideas. According to Pöllänen (2009), the teaching of craft should attempt towards a holistic craft process from the very beginning. Further, according to Carroll et al. (2010) designing and making provides a powerful method by challenging students to find answers to complex and difficult design problems by promoting students' capacity to act as change agents. For that reason, young students need both the experiences and the tools to participate and solve design challenges. Likewise, students' experiences of collaborative working promote practices of collective elaboration of design ideas as well as the implementation of these ideas in the actual design of artefacts (Drain 2011; Murphy and Hennessy 2001).

Designing puts emphasis on conceiving something new and clarifying as yet unknown details. This requires active knowledge creation and meaning making -- aspects which make craft education and D&T settings potentially rich environments for successful learning. Design thinking has the potential to promote, for example, constructive thinking, creative problem-solving, collaboration, and multimodality (Cross 2006). Designing and making has been characterized as problem solving oriented towards the construction of an artefact for specific purposes (Hennessy and Murphy 1999). Designing is a complex process, including intensive visual or artistic and technical skills, as well as extensive domain specific knowledge (Goel 1995; Cross 2004). As an inherently interdisciplinary activity, design addresses the social, economic, cultural, cognitive, physical, and technological dimensions of a design situation. The cyclical design processes begins with the identification of a problem, and it might engage exploring and the ranking of design priorities that might appear to be in competition within each other. The design context, design problems and design constraints guide the way how these aspects are relevant for problem solving and how they are dealt with. The complexity of the design process emerges from its cyclical and iterative

nature and thus the possible solutions arise from a complex interaction between parallel refinement of the design challenge and the design ideas (Lawson 2006).

The use of collaborative learning settings in the areas of Design and Technology education has increased recently (Murphy and Hennessy 2001). The Learning by Collaborative Designing model (LCD) emphasizes collaborative interaction within and between peers or teams; between students and teacher and/or external domain experts of the design field (see Seitamaa-Hakkarainen et al. 2010). Collaboration refers to the situation where students actively communicate and work together in order to create a shared view of their design ideas, make joint design decisions, construct and modify their design solutions as well as evaluate their outcomes through discourse (Hennessy and Murphy 1999). In collaborative settings, the design context and the design task are defined through joint analysis; all participants have to learn to understand the external and internal constraints related to the problem or solution. During the outlining of the design constraints and sometimes conflicting issues that have an effect on the design process and its requirements need to be taken into consideration. Through collaborative design projects, students learn to view the same information from many viewpoints, and to represent various solutions and alternative forms of presentation. This entails evaluation of the solutions as well as reflection of the design process itself.

The basic requirement for collaborative construction of the design object is that students' solve the authentic and challenging design tasks. The successful collaboration is based on authentic design tasks that allow students to confront the multidisciplinary or user-centred characters of design practice (Murphy and Hennessy 2001). Moreover, in collaborative design activity, students share a task around an actual, concrete artefact, which becomes an object of their shared cognition (Medway 1996). Design discourse, including sketching, modelling, and interactions with objects, has the unique potential to support shared thinking processes (Murphy and Hennessy 2001).

### *Embodied thinking and development of awareness*

In recent years, the embodied dimension of designers' and artisans' work has gained increasing attention (Keller and Keller 1996; Patel 2008). Research on embodied cognition questions the traditional dualism of body and mind, and emphasizes the role of the body, handling of tools and materials, use of space, and interaction with others in the thinking processes (for review, see Hall and Nemirowsky 2011). The designing and making of the product highlight the inter-relationship of conceptual and procedural knowledge. Designing cannot be reduced to mere play with ideas; in order to understand and improve the ideas in question, they have to be given a material form by means of practical exploration, prototyping, and making.

The role of materials and artefacts in the design process is crucial (Keller and Keller 1996; Murphy and Hennessy 2001). Consequently, in craft education the physical context, interaction with tools, concrete objects and materials mediate the learning processes (Hennessy and Murphy 1999; Johansson, 2006). Students think with different materials during the design activity, they formulate thoughts with the help of tools and machines, which mediate the meaning (Johansson 2006; Johansson and Illum 2009). In the design process, the interaction with two- and three-dimensional models (sketches, prototypes) allows students direct possibilities to explore and evaluate a proposed solution's form and function directly (Hennessy and Murphy 1999). The various representations (graphical and physical) provide different kinds of prompts to test the design ideas (Henderson, 1999; Hope 2005). Through the externalization ideas

become visible and improvable and support the development of ideas by adding the material aspect to the conceptual ideas, enabling their collaborative advancement.

As stated earlier, the curriculum of craft education in Finland, emphasize that the understanding of the daily technological phenomena as well as the appreciation and responsibilities of selection quality of materials and end products, foster students towards competent consumers and critical thinkers. The competence has been seen to consist of three main aspects; 1) personal awareness and attitudes, 2) knowledge, and 3) practical skills. The personal awareness and attitudes embrace interest and knowledge about one's environment along with the ability to perceive the environment accurately. Pedersen (1999) defined the environmental competence as a capacity to deal with one's environment in effective manner. The awareness of environments refers to the people experiences of the places and buildings they encounter in their daily life whereas the environmental competence refers to learning about the environment. There are convincing arguments that for example the participation on the environmental projects prepares children for active citizenship, teach useful design skills, and increase environmental competence and awareness (Horelli and Kaaja, 2002). However, very little research has been done to assess how children's competence and awareness increase during these kinds of projects.

In the following, we introduce two design learning projects, where professional designing, multimodality, environmental competence, and critical understanding of the design practice were deliberately fostered.

## **Two design learning projects**

"The Artefact Project: Past, Present and Future" and "Architecture Project: City Plan, Home and Users -- Children as Architects" engaged elementary students in longitudinal collaborative inquiry and designing. Both projects were designed together with the class teacher and took place in her classroom in Laajasalo Elementary School, Helsinki, Finland. The Artefact project started at the beginning of their second term of fourth grade, and continued across 13 months until the end of their fifth grade (139 lessons in total). This project was followed with the Architecture project, which took approximately 45 lessons (about 2-3 hours a week) during five months. During both projects, the leadership was provided by a professional designer together with class teacher. In addition, a technology enhanced learning environment, Knowledge Forum, was used throughout the projects.

Both integrative projects based on the following ideas: 1) intensive collaboration between the teacher, the designer, and the researchers, 2) integration of many school subjects, such as history, mathematics, mother tongue, biology, geography, visual arts, craft education, and design & technology education, and 3) integrating conceptually-driven (minds on) inquiry with a materially embodied one (hands on), for solving a real-world problem.

We collected extensive video data (approximately 56 hours) from the Artefact project. In addition, we collected textual data from the Knowledge Forum database, as well as students' visual representations, models, and pictures from both projects. All data has been analysed previously using qualitative content analysis; also systematic analysis of the video data has been conducted. From the databases, mainly the contents of students' notes have been analysed (Kangas et al. 2007; Seitamaa-Hakkarainen et al. 2012a; 2012b); the analysis of the video data has focused on contents of discussions, use of design artefacts, and embodied design activities (Kangas



et al. 2011a; 2011b; in press). In this article, we will provide some excerpts of the data, highlighting the essential aspects of design thinking and making.

### *The Artefact Project*

In the first longitudinal school project “Artefact project: Past, Present and Future”, the aim was to study the role and diversity of artefacts as part of Finnish culture. 32 students, aged 10-11, participated in the project. Each student team was asked to choose one artefact for deeper investigation. The item had to 1) be used daily, 2) have a long history, 3) be originally made by hand and 4) be used by hand. Students chose items which most of them had used and which they found interesting: a clock, a spoon, money, a lock and a key, a jewel, a ball, and a lamp. They studied the historical evolution of these items; explored the physical phenomena (such as electricity) related to them; as well as designed present-day lamps and future artefacts.

In the present paper, we focus on the lamp designing phase, which was the second to last phase of the project. It lasted 11 sessions (each session was 45–135 minutes, depending on the class schedule) during a period of two months. The design process was carried through in 13 teams of two to four students, by sketching, drawing, and building prototypes or models. The students also regularly presented their designs to the whole class. The expert, a professional interior designer was present in the classroom; there were extensive, varied interactions between him and the students. These included face-to-face discussions with the whole class, small team conversations, and sharing of comments through the Knowledge Forum. The investigation of the lamp design led the students towards the last stage of the project focused on projecting, in terms of design, how their chosen artefacts would look in the year 2020.

### *The Architecture Project*

The aim of the Architecture project was to develop elementary students’ environmental competence about architectural design principles, as well as to learn architectural concepts and design practises. The same students (N=29) were now 6th graders, 12 years old, and their task was to design seven different apartment buildings for an actual building site planned by the City of Helsinki.

Before starting the actual architectural designing phase, the students studied how living conditions (i.e. housing) have changed in different historical phases. They worked in teams (four to five students in a team) to produce knowledge for each teams’ views of KF as well as for shared views of the whole class. The project aimed to develop students’ understanding of various design constraints related to building requirements, utilities of the space, users’ needs and effects of traffic etc. Further, various aspects of designing houses or apartment and associated design constraints were discussed. The building site was divided into seven parts and each team was asked to design its’ own particular apartment building. Consequently, the students were guided to develop shared design ideas and solutions, create and test prototypes, as well as jointly plan advancement of their process. The city plan model, calculation of gross floor volume, scale drawings and scale models were constructed and loaded to KF’s database as pictures and texts. Expert-like working familiarized the students with planning regulations, requirements of building site, and different kinds of scale models that architects are working with.

## Results

The aim of the present article was to underline the relevance of design learning by introducing the two design projects. In the following, using data from both projects, we highlight certain crucial aspects of design knowledge, embodiment and competences fostered during the projects.

### Design constraints and professional design knowledge

It is crucial to understand the important constraints and specific features determining the product to be designed, in order to improve, for example, the functionality of the end product. During the lamp designing phase of the Artefact project, the designer described his own design process and drew students' attention to the essential points of lamp designing. Later during the process, one of the most important constraints was to consider the needs of the user as the starting point of designing. While the designer was introducing the design task, he focused the students' attention to these needs by asking students to consider questions about usage of the lamp, such as where and what for. The designer's questions were also written down in a KF note by the teacher. The note was visible through the shared view (i.e., the teacher's computer screen shared through the data projector) while the students started developing their design ideas, helping them to focus their attention on the constraints related to the use of their lamp.

Furthermore, part of design expertise is its own language, the expressions and discursive practices that are distinctive within that world. During the lamp designing process, the students became accustomed to the language of designing and associated conceptual artefacts in their continuous interaction with the designer. He used authentic, professional design terminology that was in many cases naturally adopted by the students in the course of their designing. For example, 'swan neck' (a flexible shaft used in lamps) was a new term for the students. The designer introduced the term in his first presentation:

#### Excerpt 1a.

Designer: (*showing design sketches on transparencies*) The same idea evolves so that here is a swan neck. Do you know what it is?

Theo: It's this thing that can be kind of, bent at any point.

Designer: Yea, like that. So it's a simpler solution than these joints

(*Session 1. Designer's presentation. Video data*)

After this the term was, for the first time, used by a student in a KF note (Figure 1). The designer continued using the term in his interaction with the students. Gradually, the new term was taken up by the students; they started using it frequently in the discussions with the designer, in their KF notes, and in their presentations:

#### Excerpt 1c.

David: How long is the swan neck?

Dane: I'm not too sure yet, but it is pretty long as if it was short it couldn't hold up the light.

Designer: You need to design it with that fact in mind, so keep in mind if you actually need a swan neck and what kind of leg your lamp will have.

(*Session 6. Team presentation. Video data*)

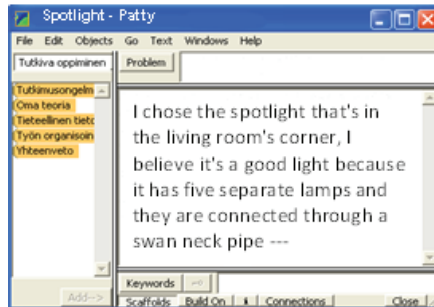


Figure 1. Excerpt 1b: Student's KF note

In addition to providing professional terms, the designer also supplied the students with tools and materials for visualizing their ideas, and demonstrated how to use sketches to support envisioning of the object being designed. The students produced many sketches during designing and each team also drew blueprints of their final lamps.

Similarly, in the Architecture Project the design task was a very complicated, authentic problem: to design apartment buildings for various user groups at a building site planned by the City of Helsinki. The quantity of external design information was needed at the beginning of the design process: The students were given an aerial map of the local area as well as basic information regarding city planning, such as City Plan, permitted building volume, gross-floor area, and so on. Thus, the architectural design process started with all students performing a joint analysis of the design context, and reflection on what issues need to be taken into consideration in the construction design: soil, map, the size and location of the building site, pile work, traffic, water plumbing and electric wiring, strength calculation, and budget. Various aspects of designing houses or apartments, and associated design constraints were also discussed in the classroom. This way the students were able to portray a holistic view of all aspects related to architectural design and their design context.

During massing and composition students needed to consider different kinds of specific design constraints related to the building site: traffic, effects of sun, permitted building volume etc. All of them were real and important aspects related to architectural design context and requirements for permitted buildings. Central concepts, such as maximum permitted building volume, the height of eave (i.e., height of roofs), and massing, became familiar. Similarly to lamp designing, the students adopted architectural vocabulary, which became evident in their KF notes and on reflections of the process:

#### Excerpt 2.

When starting the planning of the construction, you have to keep in mind is the building site near the sea, what kind of land it's on and whether it's on flat land or on an hill. Because during the design phase it's important to know which side has the best view (a view towards the sea is obviously the best). The land the house is important because if it's on a ridge a part of the building has to be built under the ground. Electrical wiring and water pipes also need to be dragged to the house. Access to the house is also important as usually they are important if the owner plans to move at some point. The yard has to be well taken care of and there should

be plenty of trees and brushes so there are places for children to play. The most important element is of course who lives in the area and whom the house is made for as a house made for a grandmother and a family moves in, the family may not enjoy it nearly as much. (*Community House -team's KF note*)

### *Collaboration and embodied thinking*

When we analysed one team's interaction (Nina, Leila, Emma) during the lamp designing more closely, the significance of collaborative handling of various materials and tools, as well as visualizing and model making became apparent. The team generated many design ideas; altogether they produced 17 different ideas for a pendant lamp. At some point, Nina presented an idea of a hanging pendant lamp where the light would come from both the bottom and above of the shade. Although the idea was still very sketchy, Leila immediately showed her interest by asking clarifying questions and building on the idea. Nina was not so interested in her own idea, and she moved on to the next, but Leila continued developing and sketching the idea of the hanging pendant. She was eager to reach the decision about the final idea and kept pushing Nina and Emma to make the decision with her by asking repeatedly where and what the lamp would be used for. Finally Leila's attempts succeeded and the team made a decision that the lamp would be used over a dining table, in a kitchen or dining room. Through Nina's sketching, Leila's clarifying questions and repeated requests to consider the needs for the lamp, and Emma's idea to include squares on the shade (an idea presented previously), the team gradually approached their final idea. After reaching the decision on the final idea, the team's activities matured towards more successful collaboration. Their attention was jointly focused, the object of activity was mutually shared, and they were also organizing their activities collaboratively (Barron 2000).

Later, the technical aspects of designing were in the focus of discussion; the same team carefully considered the dimensions of parts of their lamp. This sub-task of determining the measurements was difficult for the team to concretize; therefore, externalization and objectification were needed.

The role of embodied thinking, i.e., handling of tools and use of space, became more evident in this design phase. At first, the designer showed the girls how they can hold a measuring tape towards the ceiling to help them in visualizing the lamp's size (Figure 2, left). This prompted the team to begin consideration of how high up the lamp should be so that nobody's head would bump into it. They went back to their drawing desk, and used also a light bulb for designing and sketching the measurements of their lamp (Figure 2, middle). They climbed over another desk, in order to envision the dimensions more accurately. One of the students held a telescopic pointer, the second a sketch of the shade, and the third one was assessing the whole from a distance (Figure 2, right). Throughout the event, the team moved back and forth between the two desks, measuring, drawing, and gradually adjusting the measurements until satisfactory and mutual decisions were reached.



Figure 2. Employing tools and dimensions of body and space for designing measurements of the lamp

### *Developing design competence and awareness*

The aim of the Architecture project was to develop students' understanding of architectural design principles and domain specific concepts. To provide students with an authentic experience of architectural designing, we created a learning environment that simulated architectural practices. Thus, the project included the use of KF software, hands-on drawing, and modelling activities to support students' design inquiries. Toward that end, elementary-school students were engaged in an architectural project involving a variety of knowledge practices, working with conceptual and material tools and artefacts. The designer had an important role in familiarizing the students with planning regulations, requirements of the building site, and different kinds of scale models used by architects. At the end of the project, each student described his or her design process, and we considered those KF notes as reflecting their "learning outcome". We analysed how the students were using the correct architectural concepts in general, and how the main design concepts and aspects were connected to each other.

According to Pedersen (1999) environmental competence means a capacity to deal with one's environment in effective manner; the development of environmental competence is an informal process that continues the whole life span but educational settings, especially those that involve active participation, the competences can also be facilitated. During the project the students developed environmental competence related to architectural appreciation; they had some knowledge about space utilization, and they were able to assess, analytically, their surroundings. As stated earlier, during the project, they considered the effects of traffic (roads) and light for the location of the buildings. Further, at the end of the project, all students were able to provide accurate descriptions of the architectural design phases; they realized, in varying degrees, the importance of the size and location of the building site, the requirements for building site and planning regulations (city plan). The developed competence involved elaborated architectural concepts and furthermore, explicated, for example, the importance of space planning (i.e., interior spaces), utility or function of the designed spaces and reflected the users' needs of the building. Moreover, these concepts were related to each other as the following example shows:

#### **Excerpt 3.**

You need to take into the consideration building permits and gross-floor area. You need to consider what kind of people (families, elderly people, adolescent) and what will be devoted in the design. We decided to make community house, so we

thought about all the suitable spaces that will be common in the house. We decided to design for the young athletic adolescents.... (*Gemma's KF note*)

To summarize, the results revealed that students clearly learned to use accurate architectural vocabulary; they learned to name various architectural design phases, and moreover, they had acquired practical environmental skills to designing the environment during the project.

## Discussion

The projects described in this article aimed at improving quality of elementary-level education by engaging very young students in design and making practices. An engagement in such activities involves working with complex problems; these arise in authentic situations often ones never before encountered; thus addressing them fosters the development of competencies for knowledge creation (Bereiter 2002). Further, the purpose of the projects was to examine how collaborative designing may be used to facilitate learning in the process of developing and elaborating shared design artefacts. The projects showed that with the expert support very young students are able to solve multifaceted, complex design tasks. We argue that the value of craft education in the modern society is to be found in the knowledge creation and creativity.

The challenge for the craft education in Finland is that the origins of design problems too often come only from the student's personal context and are narrowed to student's personal needs; the repertoire of different kind of design problems and tasks have neglected. The essential notion for the teachers is that design tasks should also reside outside; tasks with origins and priorities (aesthetical, functional) from certain situation or from "client", are educationally significant. In designing their local environment and products, very young students learn how to exercise creativity within challenging constraints, communicate visually, and work in teams.

The holistic craft process is emphasized in the Finnish National Curriculum for Basic Education. The holistic craft process includes the ideation, testing and making, evaluation as well as reflection. Designing is not only limited to the ideation phase, but also includes careful analysis of the design context and definition of design constraints. In the project cases presented earlier, the student teams learnt, with the help of the expert, to reflect on what issues need to be taken into consideration when designing certain object or environment. Expert-like working familiarized them with specific functionalities of the ordinary lamps, planning regulations, and requirements of building site that designers and architects are usually working with. These projects helped inculcate useful, design skills for students as well as enhanced their "cultural" awareness and competence.

The craft education provides a rich environment for collaborative learning (Hennessy and Murphy 1999; Murphy and Hennessy 2001). It provides direct experience for students with materials and technologies. Design activities develop the ability to enhance and transform ideas through the visualization and students learn to view the same information from many viewpoints, and to represent various solutions and alternative forms of presentation. The mediation of the different material artefacts, materials and tools is the heart of craft education.

We argued that craft education, including designing and making, offers enormous potential for integrated and inclusive curriculum, especially in elementary level

education. Design learning relates to the solving of authentic problems in our daily lives, and challenges the teachers to provide more authentic learning context and to create activities that go beyond the traditional curriculum. It also provides a very promising learning environment for expert-student partnerships. The Finnish National Curriculum for Basic Education introduces several thematic entities, that should be covered and taught in integrative way; the curriculum also provides a lot of possibilities to connect all the thematic entities with craft education, and to conduct longitudinal design projects. Students' access to integrative authentic learning environment enable them to 1) intervene creatively to model, adapt and develop ideas as an interactive process, 2) become creative problem solvers and designers and 3) participate in tomorrow's rapidly changing technologies in some level. The teachers should take this opportunity and build-up collaborative community in their schools. We argue that emphasising longitudinal, authentic design projects provides new value for craft education and will help to prevent it to fall in marginalization of the school subjects.

In general, the purpose of craft education and design learning is to provide a framework for teaching students to become actively involved in shaping their environment. The findings of our studies indicate that in order for learning by designing to be effective, it is best founded on projects based on real-world problems and projects eliciting processes that resemble the multimodal ways of thinking and acting that professional designers engage in their everyday working life. Taking part in the collaborative design process provides opportunities for learning the foundational design skills by engaging the students in carrying out various concrete and material, as well as epistemic and conceptual activities. In the course of these activities (i.e., drawing, writing, measuring, and model making) they learn to conceptualize, reflect, and communicate their design ideas. Furthermore, design learning provides unique opportunities to develop students' awareness of material culture and built environment. Sawyer (2012) argues that the cultural model of teaching and learning designing (i.e., studio model) has implications beyond art and design education. It may help learning scientists to resolve longstanding tensions faced in, for example, educational reforms in STEM disciplines. Our results support these arguments; the multifaceted design tasks integrate skills which are also needed in science, technology, engineering and mathematics.

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# Music iconography used as video montage guide – Conception, development and validation of a teaching module in Communication Design

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**Abstract:** *The article proposed describes the findings retrieved from the researched carried out in the PHD in Design. The experience, combining sound, video and drawing, had as purpose design a learning experiment on Video montage in the scope of Communication Design. The drawing was used as music translation and provided guidance in conducting different paces in the moving image sequence. The use of drawing enabled the creation of a graphical score used in video montage as well as an implicit method to record the experience. The work can be described as a border line research making contact with distinct areas such as; drawing, moving image, sound and Technologies of Education. The research included dramaturgical and expressive amplitude, dramaturgical within the sequence of learning amplifying each phase of the Learning sequence, trough relations with historical references. Those relations worked as scenarios relating the different areas close to the project, the experiment stimulated in the students the construction of relations between different areas and exercised trans codification practices through the expressive amplitude of drawing. The Learning module related the drawing of sound with video montage designing a transcodification tool for further learning activities.*

**Keywords:** *Video montage, drawing, graphic score, transcodification.*

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## Introduction

This paper presents the research in Visual Communication Design developed in learning settings in high degree education level. The Learning module introduced visual communication students to the issues of relating sound and moving image by the use of drawing, sketching and video montage. The students did not have previous contact neither with the thematic of sound or the moving image. In this Learning module the drawing and sketching, functioned as new tools, for reinforcing, and create associations with new concepts related to sound, and video montage. The study took place between 2008 and 2011 in the Superior School of Arts – Polytechnic Institute of Castelo Branco - Portugal.

Due to the length of the study this paper presents a brief version of the research sequence in the following chapters; the concept motivations in the Theoretical Context section, the goals of the research experience in the Objectives, the activities sequence carried out in the research experience in Main Quasi Experiment. The proposed Learning sequence is the last contribution of this study, and the Findings presents the results and ideas sparked by the research.

## Theoretical context

The audiovisual synchrony is a subject of great interest due to the recent expansion of audiovisual production in the area of Visual Communication Design, specifically in music videos and video promos. In many of these cases, the message from sound leads the image interpretation; the soundtrack can change the movement perception within the animated sequence of frames. The visual narrative sometimes is not continuous, giving several interpretations that change, according to the deviations of both the attention focus, from the soundtrack to the video and vice versa.

Music Videos influence the modern cognitive perception between sound and the image (Fahlenbrach, 2002). These products are widespread and easily assimilated by everyone. Such audiovisual messages exercises and stimulates the ability to relate sound to image. The music video videos establish certain cognitive behaviours, visible in the visual image expression.

It's crucial for students of Visual communication Design to establish an approach with these relations when producing audiovisual contents. Because often the student's don't have musical training is fundamental to explore another approach when accessing the music comprehension and expression. When conceiving an exercise using the drawing as mean to express rhythmic values retrieved from the sound, the hand gesture helps translating the music sensorial elements to drawing allowing a link with the unknown message.

The space in which the gesture intervenes, is a metric space where a pattern generated by a mental image built upon a sound recording, creates a musical iconography (Martin, 2006) or more complex graphic compositions (Tan & Kelly, 2004) developing rhythm perception using graphic symbols like points and lines, this symbols are simple representations of rhythm (Bamberger, 1982). These typologies used in low-level mapping, produce excellent relations between graphic elements and music (Solis, 2006). The audiovisual montage in the synchronisation tasks can use these graphic elements, to communicate the connecting elements, pauses and ruptures creating a iconographic composition.

In the video montage, within the animated sequence of frames the pauses and ruptures in the connected elements deal with the subject of continuity.

Continuity is abreast to discontinuity; the continuity, and discontinuity can characterise a moving sequence of frames on the motion perception in continuous time. An animated sequence of picture frames builds in the viewer a time duration illusion, managing to gather in one experience the concept of continuity from the fluidity till the complete fragmentation (Graça, 2006, p. 135).

When addressing in the moving picture frames the continuity and discontinuity is raised the question of succession of image frames and its rhythm value. To define the concept of pace is necessary to refer Plato definition, on the grounds of "ordering the time duration" as a metaphor, possible to represent in the regular motion of ocean waves upon their advent to the beach (Graça, 2006, p. 156). We can contemplate the Rhythm as an organisation and a language of continuous as an umbilical link to the human essence, where the metric foundation got lost to the poetic flow (Meschonnic, 1982). The variations of intensities can also delineate the rhythmic flow, emanating in it the expressions of various forms of language.

Norman McNorma McLaren addressed the theme of relating sound and image in his work. In his movie *Mosaic* (1965), McLaren created the soundtrack using a drawing technique, erasing the upper layer of the 35mm film. The author erased the black colour emulsion with the aid of a small knife, to leave small marks, then, used a optical reader in a Moviola machine (a projector machine) to read those marks and produce percussion sounds.

McLaren explored concepts of animation and synchronism between sound and image. The variations in size and shape in the graphic marks affected the sound, tone, volume, and the sound quality. Using this method Norman Mc Laren produced an extensive variety of sounds.

The attempt to create a parallelism between the rhythmic nature of a sound recording and the moving sequence of image, is visible in the work of filmmaker Sergei Eisenstein. In it we can find another stimulus for this research project, in his theory of vertical melodic montage, specifically in the relations made at descriptive graphical structures of rhythm present in the image frame and in the musical score.

Synesthesia, the mixing the senses of perception fascinated Eisenstein throughout his life (Bordwell, 1993). During the 1930s, Sergei Eisenstein rebuilt his concept of montage, as responsible for an organic unity in the language of film. His interest in synesthesia and the wish to include sound, in his organisational theory, made him develop the theory of vertical montage. For Eisenstein there was a guiding principle common to both models of senses, vision and audition, allowing the development of several montage techniques and audiovisual messages. To Eisenstein, this principle was the movement, this element within several physical manifestations, would be the basis of the vertical mounting (Bordwell, 1993). Eisenstein suggested four types of vertical montage; metric, rhythmic, melodic and tonal, described in his book "Film Form and The Film Sense."

In the example of the battle scene on the film *Ice Nevsky*, a harmonic series of image frames cuts coexist with the musical pace and musical points of emphasis (Fig. 1).

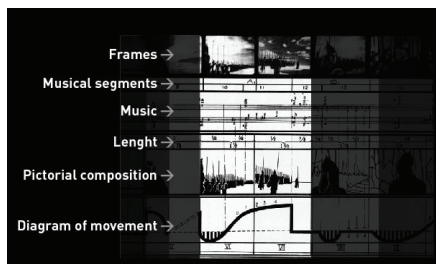


Figure 42. Segment of Nevsky graphical score.

In this research the musical iconography is used when relating the rhythm values between sound and image through the expression and interpretation of drawing. The term Iconography (from Gr. Eikón, image + *graph* r. from *graphein* describe) s. f. relates to the work dedicated to the study and explained description of images from different genres (Porto Editora, 2011). In this research the Musical Iconography related to the concept of representing or illustrate associated values to music through the use of images (Heck, 1999, p. 91).

The author Erwin Panovsky in the pictorial analysis defines, in first place the iconography as the study of the object and the art work significance, and in second place the study of signs and symbols in Art. When applied in the context of Music History, the reading and iconographic comprehension is patent in the visual characteristics seen in the monophonic and polyphonic graphical scores. In the musical history there's a rediscovery of the graphic annotation originated in the XX Century, documented in some publications such as Music of the avant-garde (Heck, 1999, p. 91). The musical iconography is also related to the Visual Art description, applied in elucidating the musical thinking (Knighton, 1997).

In this project the musical thinking relates to intensity, rhythm values interpretation. Originated from audition and translated using the expression produced trough drawing. In this project the musical iconography reference, is in the scope of the contemporary context related to the graphic score definition. The philosopher and critic Christoph Nox refers how new graphic elements, replaced the traditional Musical annotation symbols, stimulating a large spectrum of interpretative performances, conducting to a indeterminacy far beyond the compositions itself, reaching the performance area. In the Vanguard Artistic Movement, authors as Morton Feldman, John Cage, Cornelius Cardew and Anthony Braxton, developed the visual aspects of sound compositions.

Using as reference paintings from the constructivist movement, the lines, angles and circles recalled from the painter Kasimir Malevich, Corneliu Cardew created the Treatise score (1963-67) the design elements "produce in the reader, without any sound, something analogous to the musical experience." (Christopher & Warner, 2004, p. 187). Relating a overall picture in the frame of the musical expression interconnects with reading a musical score.

In a personal conversation with Maestro José Filomeno Raimundo on June 24 the author stated that Juan Sebastian Bach read a music score using visual criteria by which he corrected the score as a visual composition, correcting its graphical structure. The musical note is a sign that expresses the tone pitch and duration. The reading of notes

arranged in a musical score follows a linear or overlapping sequence. It is possible to interpret a melody visually as if it was a line or a rocky mass.

The musician does not recognise the notes individually listed in the score, but the overall sound, the sound image. There's a compression of space and volume in polyphonic compositions, because volume is not just a line, the volume contains tonal variations. Bach read the pieces as intertwined networks such as pictures, graphics and related with fields and not as singular elements, the musician read the graphical score as a landscape.

These notions of sound and image relations were very important in the teaching/learning experience carried out in this PhD research, putting in evidence two types of visual shapes; the visual shape of the frame and the "sound" shapes in the graphical score. In the context of our research the use of drawing as intermediary of sound and image in settings of movement enhances the relation between the two media. The drawing may record the various music rhythmic variations. In the drawing the points and lines cadence, suggest a rhythmic record used to produce different juxtapositions of image frames in the video montage.

In the experimental context of the research the students represented the music by graphic means. The graphical score has predominately qualitative information used then by the students as a reflection about the rhythmic qualities suggested by the lines and points sequence.

This perspective is relevant in contrast with the traditional approach where students develop the process of video editing through several trials and errors, assembling the sound layer with the image layer previously edited, or simultaneously editing the video, trying to get a match with specific points of the sound layer. The traditional process although playful is less engaging for students not accustomed to the synchrony between sound rhythmic information and the movie frame continuity.

These are elements of great relevance in learning practices when introducing the video montage, is however necessary to find new forms, to unite these two worlds, the video montage and the sound in a model compatible with the practices of visual communication design.

In the context of creating a learning module, the framework in the context of teaching bLearning (Blended Learning) is extremely important, when searching for references in more traditional attitudes and postures, moreover, assimilating them in a modern context of teaching / learning.

In this study the sound leads the visual experience, in the movie frame the information retrieved from the sound may manipulate the image, occurring then a "control" of sound over image.

## **Objectives**

The aim, of this work was to create an experimental module dedicated to the processes on interpretation of musical rhythm as video montage conductor. Based upon a new context for teaching and learning and exploring strategies for implementing online, this study explored two goals:

- a) Conceive an experimental Learning module, where drawing functions as interpretative record of musical rhythm as guide of the video montage task and:
- b) Validate in bLearning context, through comparison the experimental teaching module and the traditional teaching module

The test of the Learning module used a contrast experiment between the experimental module with drawing as an interpreter and the traditional module without the use of drawing. The Learning module tested in the Main Quasi Experiment and after validated by the opinion panel served as reference for the Learning Module described in this paper (Fig. 2).

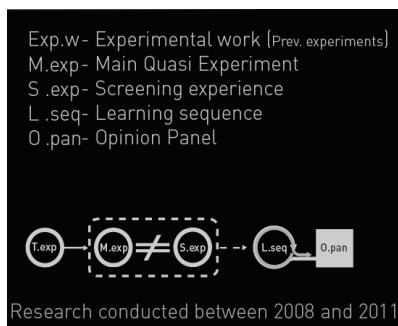


Figure 43: Research design conducted between 2008 and 2011.

## Main quasi experiment

In this research two previous experiments preceded the Main Quasi Experiment. The first experiment with the sum of 25 students, comprise a test where the students related intensity variations in a musical segment with different kind of imagery. The second experiment in the scope of an inquiry involved 49 interviews. The previous experiments meant to ascertain what would be the experimental hypothesis to apply in the main quasi experiment.

The Main Quasi Experiment organised in two weeks, had five classroom sessions, involving the total of 24 students. The sessions included the theoretical references, practice, and results. The experiment distribution in the experimental and in the traditional module, followed different strategies but both used bLearning settings. The experimental learning module, tested the hypothesis of an auxiliary method to video montage, the drawing of sound rhythm as interpretation of the rhythmic information (rhythmic variations of the musical piece) as an annotation tool, using the sequence; listening, drawing, and video montage. The traditional module applied the sequence; listening and montage, without the drawing as rhythmic interpreter. The experimental module followed a D.E.S (Dramaturgic E-Learning Strategy) to create a field of symbolic relations between tools and techniques related with expressive values. The two modules used the same videos and musical segments distributed in the eLearning platform adopted by the school.

In the Main Quasi experiment the two study groups worked with the same videos (Fig. 3) And the same sound segment; however, only the study group A, the group testing the experimental learning module, used the score, and the drawing technique.



Figure 44: Images frames from the different videos distributed to students. Videos from the Prelinger Archive, the public domains from this archive allow the free download and reuse.

The musical segment used belonged to the piece by Wolfgang Amadeus Mozart - Clarinet Quintet In A, K 581, "Stadler" - 4. Allegretto Con Variazioni (Fig. 4).

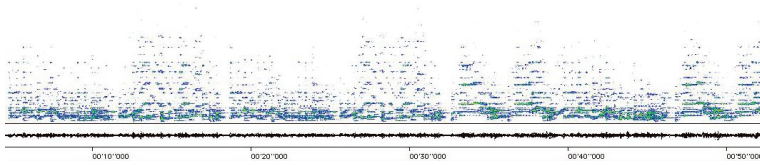


Figure 45: Sonogram retrieved from the music segment applied in the drawing exercise: Wolfgang Amadeus Mozart - Clarinet Quintet In A, K 581, "Stadler" - 4. Allegretto Con Variazioni. Position of segment and interval – 4:00s - 4:55s.

After listening the musical segment, played three times, the students performed a musical representation, using as drawing representative elements: lines and dots. The students drew their representations on a spread sheet divided into six sections, representing 60 seconds (Fig. 5).

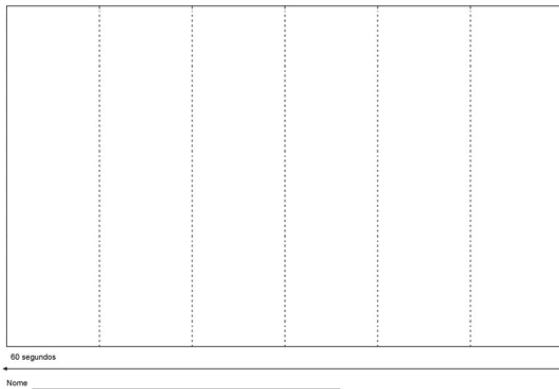


Figure 46: Graphical score used in the sound interpretation exercise.

Afterwards the students used the graphical score as an editing guide and carried out the video montage, producing a 60 seconds video. After gathering the students final work, the teacher analysed the drawings by comparing, the several representations of sound intensity, with the video segment composition in the digital tool timeline (Fig. 6).



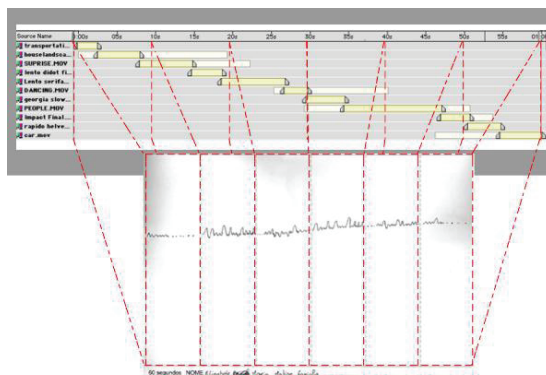


Figure 47: Relation between the graphic score and the video montage using the Adobe After Effects video timeline.

The activities related to the monitoring of the experiment were carried during two weeks, divided into three phases; introduction and motivation, development of exercise, and finalisation. Simultaneously there were activities for sharing auxiliary materials and support.

Although, the LMS (Learning Management System) platform used by the school, was not compatible with the latest programming language standards, not allowing the import of XML data. Was a concern the learning module organisation as a tool with possibilities to export to a contemporary system, therefore the learning sequence followed the IMS-LD standard. IMS-LD is an acronym for Instructional Management System - Learning Design a standardised system resulting from a research project with the aim of building a semantic system, an Educational Modelling Language - EML able to represent learning units used in e-learning.

## Learning sequence

The organisation and strategy for designing the experimental learning module, resulted from associating boundaries of distinct areas of study, as well building a Learning route able to motivate and engage the student's attention and positive feedback. It is vital to stress the test sequence importance and the chain of learning materials and task, which are the core issue in the learning sequence. The base materials used in the exercise of video montage, videos and sounds may differ from one exercise to the other, because that is a non controllable variable of the quasi-experimental procedure applied in this research.

The strategy proposed in the learning sequence (Fig. 2) resulting from the research carried out in the experiment, uses an exercise of expression of sound through drawing. There is however, a pragmatic perception of its implementation, delimited in an introductory stage in learning the relations between sound and video montage. The expressive values produced by the drawings are expressions of personal level with expressive qualities, valid only for the author of the drawing.

The module has, as limitations, the inability to create settings for direct synchronisation between sound and image, but it allows a deeper reflection about the rhythm perception and how it influences the apprehension, of movement in the pace of the animated sequence of images.

From the study resulted a learning sequence proposal feasible to implement in introductory studies in video montage. The learning sequence involves four stages. In the first stage “Origins” the students consult and discuss theoretical references, (authors relevant to synchrony between sound and image), in the “Listening” stage the students listen the musical segment and then in the “Drawing” they express their sound memory in a graphical score, afterwards, they create the “Video montage”, using video segments earlier distributed to the class. The cryptic element created by drawing and the link with different subjects creates a continuity between listening and montage, that access although cryptic allows a future application of a transcodification technic (Fig. 7).

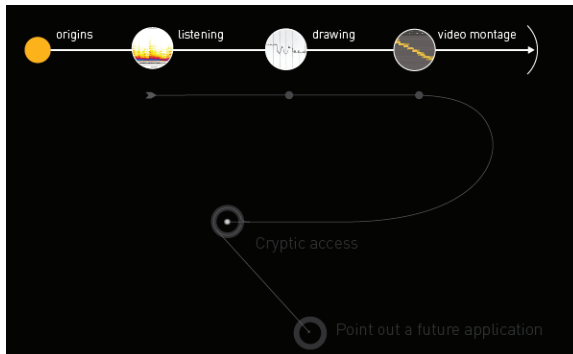


Figure 48: Learning sequence, proposed model.

The drawing is a part of the dramaturgy strategy, inserting a cryptic element in the Learning path, in analogy; constructing a continuity, a narrative organised by lines and points, a personal interpretation, a story built on the emotional experience acquired from listening to the sound segment (Fig. 8).

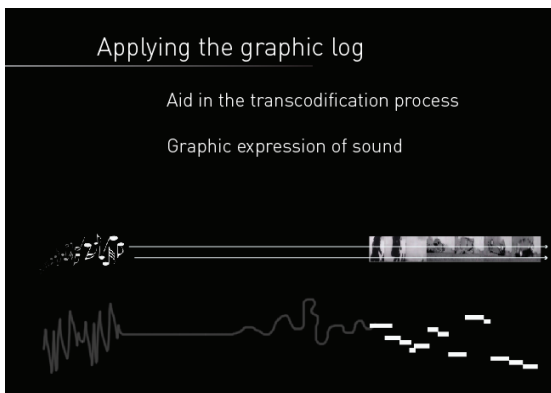


Figure 49: Transcodification process and the graphic expression of sound.

The Learning module applies the drawing incorporated in a D.E.S. (Dramaturgy's Elearning Strategy) approach, in a directive that could improve the emotional experience retained by the student. The D.E.S. method follows assumptions that dramaturgy contexts are more engaging; facilitates intrinsic motivation and results in

positive emotion during learning (Burmester et al. 2005). When referring this method the Learning module design builds a relation between memory allocation and his relation with the experiment amplitude. Far greater the symbolic task more intense will be the experience retained from the learning sequence.

The transcodification skill developed in the experimental Learning module is crucial for future applications, if developed in other Learning perspectives it may offer new strategies in coping with new Learning challenges in training or in professional settings (Fig. 9).

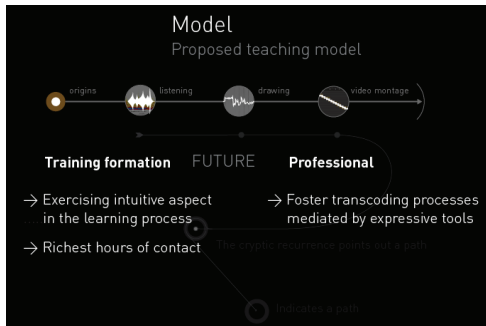


Figure 50: Proposed learning model.

The development on an information architecture perspective is one of the module underlying ideas, the teacher can expose to the students in the end of the Learning module the mechanisms triggered by the transcodification exercise (Fig.10).

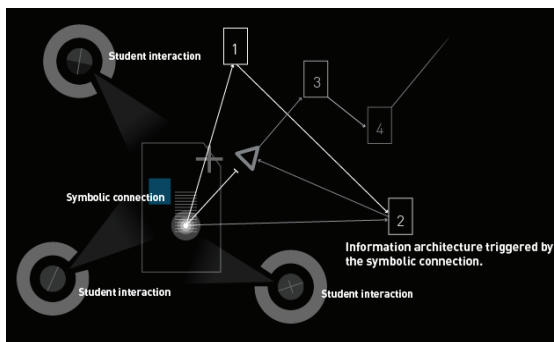


Figure 51: Mechanisms triggered by the transcodification exercise.

## Findings

Within the limits of the study, on the hypothesis developed and applied in blarning learning environment, the exercise of expression by drawing used in context of the experimental module of learning allowed an easier relation to the fullest and took advantage of the map of relations sparked throughout the module. When conducted in a blarning environment, the method allowed the student an easier construction of relations by the use of familiar metaphors. The practice of the experimental model also

allowed parallel paths, where the students went through another type of relations and perspectives instead of the traditional model characterised by a linear sequence of learning without the use of transcodification practices of expression.

The experimental practice makes an indirect approach procedure, the final video montage at the end of the editing exercise is not the only objective to accomplish, the path and strategy applied are crucial because they allow the student to discover new paths for other Learning subjects. Within the experience scope, in the specific context of the exercise, occurs a crossing of two resources, one based on a personal interpretation from the graphical score produced by the student, and the other constituted by relations built from the drawing exercise and other theoretical references, felt, but still not understood by the student.

The adventure of discover is an appended value when using one dramaturgy's model of learning as the D.E.S. model, the symbolic value added by the drawing can be instrumental in driving the experience, accomplished through the intersections of qualitative information (about sound, and rhythmic sequences of images) and the relation to tools and concepts.

In the outcome of the research, in the proposed Learning module the symbolic element represented by the graphical score, was prominent and unifier of intuitive listening and montage, accepting the drawn rhythmic annotations without the need of a metric system.

The rhythmic score created with the drawn annotations allows the record extrapolation into a video montage, a guide in editing an animated sequence of image frames. Offering a new way to understand the process and foster in a near future other transcodification processes mediated by expressive tools. In the experiment the experimental module has successfully produced better results, compared to a traditional approach, without the use of transcodification technics, based on a linear and sequential strategy without symbolic marks.

The proposed Learning module, when embracing a more captivating process, allows a greater adhesion by the students to the few hours of contact available by the teacher. This research is a contribution for future developments in new educational practices, applied to the area of visual communication design.

The use and intersection of drawing and the learning interaction by the students shapes a map similar to a patchwork, the experience path functions as "mood board", collecting and uniting all the perspectives developed during the learning experience. The graphic expression relates the intensity values obtained from each phase of learning and the memory and summary of the experience. The "mood board" allows the student to create a story. Through the holistic gathering of information the students applies contemporaneous practices, widely used in web social tools. The storytelling perspective results from the student interaction with different learning subject's trough the module using different types of information obtained from distinct kinds of visualisation. Rarely in a traditional approach, does the teacher call the student, to map his Learning experience, let alone visualise through a mosaic of experiences the priorities and time expended in the tasks. Foster this practice is relevant with a transcodification process, helping the student to manage motivation in future learning experiences.

There is a relation effect between the scope developed in this research and the recent "google effect" when allocating memory to places (Sparrow et al. 2011), observed when the students assign information retrieved from the drawing exercise. Each time the student draws his own symbols there's an improved chance of future

associations to the present learning experience, because he is allocating information of related subjects such as the sound rhythm and intensity to the symbols of his graphical score.

Although the limited sample of students and material makes more difficult to generalise the results, we find, the experimental module, applied in the proposed Learning Module the outcome of this research, as more captivating in contrast with other traditional approaches, it allows a greater adhesion by the students to the few hours of contact available by the teacher. Further in the future we will continue the research with a larger group of students, media and sample variety.

This research is a contribution for future developments in new educational practices, applied to the area of visual communication design, specifically in relating different media as sound and image through the use of transcodification practices.

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## Multidisciplinary design for intercultural learning. Crafting digital services for a multicultural society

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**Abstract:** *Several literatures acknowledge that design education has been shifting from the mere training of young students to be skilled professionals to a more profound understanding of the social context in which the future designs will emerge (Norman, 2010) (Findeli, 2001)(Frascara, 2007). This comes from the increased understanding that in order to craft sustainable and viable products, being material or virtual, students have to refer in the first place to their living environment and feed their creativity with the challenges experienced in real life. For educators this starts firstly an investigation on how to guide their students in the exploration of the well-known and therefore unquestioned events they experience, and secondly on how these experiences can be articulated into design projects. The particularity of the case study reported in this paper, comes from the multidisciplinary team of professors, from communication design and computer engineering, and the novelty of the project brief dealing with the intricate topic of intercultural communication and social integration on the Italian and Milanese territory (Granata, 2011) (Pedersen, 1995, 2004).*

**Keywords:** *higher education, pedagogy, interdisciplinary collaboration, communication design, ICT, intercultural learning*

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## Introduction

### *The Italian social context and its diversity*

The Italian society has traditionally been perceived as a homogeneous one, carrying a richness of cultural heritage and the weight of an old, gregarious bureaucratic system. Less known and still disregarded is the transformation that the Italian demographics have seen in the last decade and the importance that this change has at all levels of the social and cultural life of the country. This transformation is due to several factors such as the ageing population, the decreasing birth rates, and in the same time the increasing flow of immigration.

This final issue is perhaps the most visible at street level and therefore causes concern both in political circles and in mass media. In particular in Lombardy the presence of foreign population increased in the last decade by 11 % by year with peeks between 19-23% in the period from 2003 to 2005 (ISMU-ORIM, 2012), changing the picture of the Italian demographics and creating a constant pressure at the administrative level. Although immigration in Italy is largely seen by international experts as an invaluable and still unexploited resource the public opinion is still reluctant to accept diversity in a historical homogeneous social context.

## Bringing real social issues into the academic realm

Rather than avoiding a critical situation that will impact on the future of the young generation, the academia has the duty to bring forward the social discourse and transform it into an educational opportunity for creative professionals in the design field. Moving away from the “master – apprentice “ model criticized by Frascara (2007), in which a well skilled teacher encourages students to learn by imitation of craft, the pedagogical experience reported in the following pages aims to re-direct the attention of higher education teachers towards a different kind of student-teacher dynamic. This implies a change in the structure of pedagogical activities, and the radical re-considering of the role of the teachers in the design education. In this concern Donald Norman (2010) underlined the need to establish new design courses that bridge the gap between the outside world and the academic one in a conscious, responsible manner, and make place for authentic scientific knowledge in the project based design courses.

The following paper describes a master level course that deals with the presence of foreigners in Milan and aims to communicate the potential of service and communication design to draft and simulate valid strategies that raise the awareness about immigration as a social and psychological phenomenon, which has to be mitigated by both the host society and the incoming foreigners.

This type of actions are placed in an already established academic content dealing with social innovation and sustainability (DESIS P&C Clusters, 2012) and aims to focus the attention of the teaching staff and students on the most relevant issues present in the city they live in.

Although primarily concerned with the pedagogical content, the course is informed by social identity theory and puts in contrast the perception of the students’ group as a structured and cohesive entity with the stereotype of foreigners’ group.

By acknowledging the two different groups, the aim of the course was to challenge the in-group bias of the stereotype of “us” and “them” (Tajfel, 1978, Castano, 2002 ) and put students in the condition to design services that will enable intercultural

contact and communication.

### *Theoretical framework*

The concept of “social identity” concerns the cognitive and perceptive aspects that make individuals seeing themselves as part of a specific social group (Tajfel, 1972). As Turner explains, the group members are not initially linked by affective ties, but rather share the same behavioral patterns and perspective on the surrounding context (1981). Furthermore, Gergen (1971) sets up an important distinction between self-concept as a set of psychological attributes and self-concept as cognitive structure. The two identity sets, can change according to the context in which the individual operates and the situation in which she founds herself; in other words rather than seeing the self identity as a compact system, the social identity theory presents the multifaceted and dynamic self as a mediator between social structure and individual behavior (Hogg et al., 1995). If the social identity theory, gives the possibility to acknowledge the differences between various cultural groups, the communication issues are outlined by the intercultural dialog approach, in which foreigners manage to adapt to the host culture gaining cross-cultural communication skills without losing the original identity (Ward, et al., 2001).

Taking into account the insights from the social identity theory, and intercultural learning, the course accompanied the students into an introspective journey, from acknowledging their group identity, to being aware of their personal self, in this way preparing them to confront diversity without preconceived judgments. By decomposing the in-group values and dynamics, the students were more prepared to conduct a rigorous fieldwork and relate to the problems of the foreigners in Italy. This led to a thorough evaluation of the critical issues encountered in the real life and to the finding of relevant design solutions.

### *Multidisciplinary teaching team and course organization*

Given the complexity of the brief, the course organization accommodated an important number of external guests and partners, who gave their contribution to the theoretical lectures and feedback on the students’ work. In this sense the organizing team of professors had to be seen as mediators of the different disciplinary inputs, molding them into a coherent pedagogical content. The class had a total of 93 students organized in groups of three or four persons. All students had a mixed background coming from industrial design, communication design, interior and fashion.

An important feature of the course was the presence of a multidisciplinary team of professors and tutors, coming from communication and product design and computer sciences, which carried on the course preparations and followed the class activities. In this sense the preliminary activities began more than three months in advance and enabled the adjustments of the lectures and content and the familiarization with the different work methods of the various members. The communication design approach based on the close examination of the users and problem identification to generate the design solutions, was supported by technical lectures regarding digital content management, and the creation of mash up hybrid applications.

The course structure combined the theoretical stream coming from the lectures on social organization and behavior, cultural issues and communication with a practical stream regarding exercises and project revisions, and was organized in different phases (fig.1)



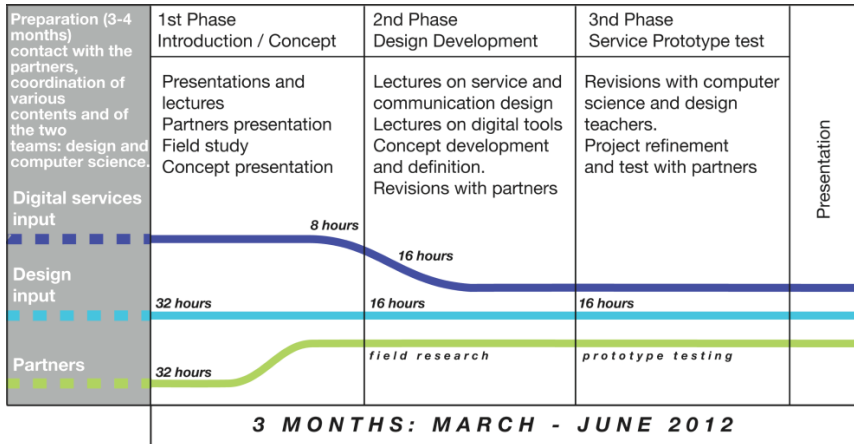


Fig.1 Class schedule and overall activities with the no. of input lectures in each phase.

The **first phase** introduced the students to the brief and the intricacy of the intercultural dialog. In this phase several external lecturers presented examples from real life services dedicated to the foreigners and to the concept of multiculturalism. To consolidate the theoretical lectures, the students were given small assignments that emphasized the notion of personal identity.

In the **second phase** students had to establish the area of interest and contact possible partners that are presently offering services for foreign citizens and (legal or illegal) immigrants. In this phase the class had to draft their concepts and discuss their ideas with the teachers and partners.

At the end of the second phase the students had a fairly good grasp of the theme and were prepared to investigate the possibilities of service design. In the **third phase** service design revisions were alternated with digital technology revisions. Here the projects were further developed and students had to prepare the mock-up digital platform and test it in a simulation.

### Partners

In order to accommodate the multifaceted phenomenon of immigration and the problems that foreign citizens encounter upon their arrival in a new country the partners involved were associations and private agencies, which responded to different needs of the foreigners in Milan. The **Asnada** school, is one of the few associations with a consolidated tradition of offering free Italian language classes to foreigners present in Milan and Rome. **Naga** association is a non profit organization providing medical care and legal help to illegal immigrants in Milan. **Fondazione Intercultura** is another non-profit organization whose mission is to promote the intercultural dialog and cultural exchanges for high school students in Italy. Along with the above mentioned associations, the students were introduced to the **Intese project**, an online platform developed by Metid center and dedicated to foreign students at Politecnico di Milano.

## **Intercultural communication and service design**

Service design concerns intangible processes and activities and are intended to improve the user experience through the study of behavioral patterns and to create new service solutions (Mager, 2008 ). Service design has an important social dimension that has been explored in-depth in the last years and several literatures have been focusing on the services as a change factor for social innovation and sustainability. Previous research projects have tested the relevance of service design approaches in observing collaborative dynamics in communities all over the world (Jegou, Manzini, 2008) or as a connecting link in cross cultural workshops, where the pedagogical content of a service design course in Italy was transferred and tested in the Chinese context (Gong, et.al, 2009). Moreover, working on poor communities in India, Rao (2009) suggested the application of the service design framework as a practical tool that enables the small artisans to access different forms of capital, in this way advancing towards a systematic organization and sustainable development.

In the case presented in this paper service design is not used as an imposed framework but as a way to establish an intercultural communication between the local residents in Milan and an increasing foreign population. The students had to use methods specific to service design to create strategies that will enable both parts to participate in an intercultural dialog. In this sense the service design projects are used as mediation tools between the local and foreign communities present on the same territory.

### ***From personal identity to cultural identity***

One of the most intricate and difficult to explain concepts is the nature of diversity and how to accept the differences without cultural biases. In the beginning of the course activities the main challenge was to confront an already constructed image of the other and decompose the stereotype of foreigner. For this reason we proposed a short class exercise entitled “who I am”. The main objective of the exercise was to establish an introspective situation in which each student thinks of him/herself as an unique individual discovering the treats of his/her cultural heritage and acknowledging the differences and common points with the rest of the class. The exercise was coordinated by one of the partners (Asnada) and took one hour and a half. In this time the students had to make a collage of colored pieces of paper on a black background expressing the most important elements that formed their identity (fig.2). Along with the images they also had to explain in a few words the image represented.



Fig.2 Who I am collage exercise. from left: "I don't know yet who I am but I like to find out day after day"; "Afternoon walking in Venice"; "The garden city.' I believe the stories, the old ones and the new ones, could contribute to educate the mind' Gianni Rodari".

### Intercultural dialog reflected in the design projects

As mentioned before in the introductory phase the lectures and exercises concerned mainly the theoretic knowledge and were intended to sensitize the students bringing them closer to the concept of diversity, preparing them to confront with the partners. In result the projects tackled the issues discovered on the field research and were relevant to the specific problems underlined by the partners.

Some of the most interesting projects related to the free time of the immigrants away from home and acknowledged the lack of services to encourage the outdoors activities and sports. *Game mate* is a project that proposes the organization of multicultural sport events, in this way encouraging the creation of social ties between people from different cultures, who share the same passion for sport. The team designed a digital platform that combines the functionalities of a social networking service with information about the story, origins and traditions of the sport practices in different cultures. The project has been tested in a simulated event and received a positive feedback from the involved associations and participants.



Fig.3 GameMate project: onsite event simulation and digital platform interface.

*Play with mi* is an online and offline game aiming to invite the local residents of Milan to discover the multicultural events and interesting locations. Working as a touristic guide, the project is intended both for Italians and foreigners and proposes the collaborative creation of an alternative map that signals the presence of positive multicultural places. The places are mapped with a series of markers, small boxes that contain a piece of information or a keepsake related to the place. The location of the "markers" is posted on a Google map and has to be discovered through a series of hints. The students developed a complete digital platform ready for use and simulated several steps in completing the tasks. The use of the game metaphor to explain the presence of cultural diversity was an interesting and viable choice, however the main critique of the project is the lack of an initial communication strategy. Without a critical

mass of participants willing to engage in the game, the service fails to accomplish its main objective.



Fig.4 Play with MI digital service interface

*ABC diario* is an online vocabulary that links the words in the Italian vocabulary with the stories of the participants. The website allows users to upload pictures and drawings to describe the significance of the Italian letters and words in their own language. The target users are the students at Asnada language school. The project recognized very well the character of the pedagogical activities carried by the partner. The simple and functional interactions of the digital platform, made the service very easy to use even for a foreigner with a discrete knowledge of the Italian language, moreover the way in which the service is structured and presented emphasizes the language as work in progress and shows the effort and willingness to communicate in a foreign culture.



Fig. 5 ABCDiario digital service interface

*Snap and swap* is a service that helps organizing shared meals and it is intended for the international students. The service works as a social network that transforms the fusion cuisine meals into a multicultural experience. Playing with the metaphor of the shared table, the participants can create their own half of paper table mat with a recipe and place it together with the chosen other half. The service is intended for foreign students participating in the Intese project launched by the Metid Center at Politecnico di Milano. The team developed a straight forward communication strategy, taking advantage of the already established social networking platform and adding an

enhanced value to it. By proposing a digital service that has as the final objective a convivial experience, the project bridges the gap between virtual and real social interaction.



Fig. 5 Snap & Swap table mat with recipes and facebook page

## Discussion

Cultural differences have been present in the Italian society for many years now, however until the foreigners arriving in Italy are only mentioned in the daily paper, the immigration phenomenon is not a reality. The encounter with a different culture is not necessary seen as a pleasant one and most of the time triggers strong hostile reactions from the local residents. If the foreigner arrived in a new country encounters a culture shock, in a certain way a similar phenomenon could be seen in the host population, which has to adapt to the changes of its very structure passing from a heterogeneous society to a multicultural one. The course aimed at bringing forward precisely this phenomenon of transformation from within the society, and channel the imminent disorientation of the students into a creative experience. By having to focus on a critical issue and find a solution that can address it, the students made a step forward in understanding the larger scale dynamic of the cultural adaptation that enables the intercultural contact (Ward et al.,2001). In this case, the ones who had to adapt through field research and close observation of the user behavior, were the Italian students.

The design teachers, throughout all the phases of the pedagogical activities, had to mitigate several important issues. Firstly in the preliminary phase the main challenge was to explain the objectives of the course and its relevance to the computer science team. In this sense the main lesson learned was to try to construct together the course content rather than dislocating the different inputs. The highly technological input acquires in this way a meaning shared by both teams. Secondly the role and involvement of the designers and the application of their skills in highly sensitive social issues wasn't clear for the partners contacted. The first reaction in all the cases was the confusion on how their activities can inform design students' work and how the final projects might be relevant to the intercultural dialog. A general idea about the design discipline as being concerned primarily (if not only) with craft and materials, is still the main trend. Thirdly, perhaps the most important issue was the acknowledgement of the contrasting views that students expressed with respect to immigration. One of the main insights coming through from the experience is that not all participants in the course were convinced by the benefits of the intercultural dialog. Especially in this case it was extremely important to leave space for personal expression even though it might contradict the main credo of the didactical activity.

## Conclusion

In the current situation of deep economic, environmental crisis the university cannot continue to exist being disconnected from the social environment. Rather than enclosing itself into the “ivory tower” status, the academic environment has to prepare the students for the changes that already occur. This in the case of the design education implies a shift in the attitude towards the aim of design project and therefore a transition in the role of the designers from that of mere professionals to agents of change (Manzini, 2011). This transforms universities in social resources, which are integrated into the society, transferring its problems into educational content and empowering the students to have the courage to make a difference. An extremely important factor in this change stays in understanding the society and the academia as two different, and sometimes contrasting contexts. The process of bringing relevant social issues in the midst of academia is therefore characterized by frictions, which have to be understood and mediated. In the case reported we concentrated on the relation between the students and teaching staff, without considering the extended design community. Future work could inquire the importance of social issues in the professional design, investigating the relevance of the cultural context in the design practice.

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# A Polydisciplinary Journey: From Coffee to Prototype

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**Abstract:** *Multidisciplinary research and access to multidisciplinary learning experiences are recognized as critical to our time. However, most universities are not structured to accommodate co-teaching, cross-linking of courses between majors or colleges, or other curricular methods of bringing people of dissimilar backgrounds together. While faculty are pushing these limitations around the world, it is often done outside of institutional structures, and may require an act of magnanimity. In addition to infrastructural hurdles, disciplinary specificity can make communication and collaboration as challenging as speaking different languages. This paper presents an approach to overcoming these difficulties from a social beginning resulting in extracurricular research teams with leaders and members from various disciplines, including architecture, architectural engineering, mechanical engineering, environmental engineering, computer science, industrial manufacturing engineering, and landscape architecture. Teams may consist of professors with Ph.D.'s down to undergraduate students. An example socialization-to-multidisciplinary research process is demonstrated by an architectural research and design project. The example project will also illustrate the use of analog simulation and computation as a communication tool between various disciplines, allowing verification of design ideas through the simple fundamentals of science.*

**Keywords:** *multidisciplinary, indoor air quality, undergraduate research, interdisciplinary, professional learning community*

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## Finding Synergies

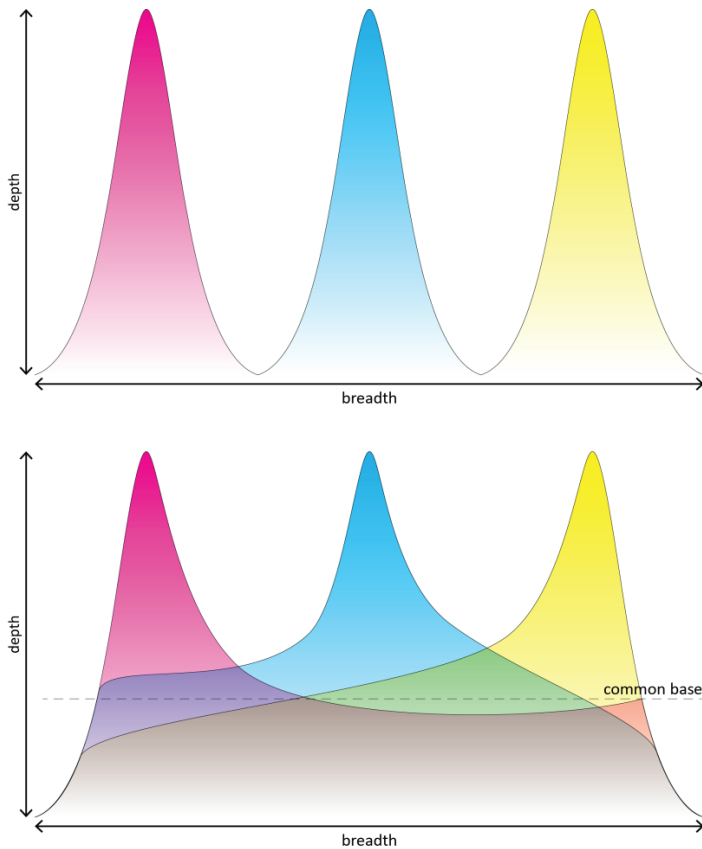
As an architect and professor of architecture, I am interested in the design of buildings, or building sub-components that improve performance in regard to energy, comfort, and human health. This interest extends beyond speculative design proposals, to the extension of these ideas into testable full-scale prototypes, and eventually into building applications. The prototypes are not just meant to demonstrate the aesthetic qualities of the system, nor the material qualities. The prototypes are meant as learning tools and verification machines. Each prototype is put to test to validate theoretical models. From my own experience as a licensed architect, I'd argue that a background in architecture does not provide adequate qualifications or the experience needed to generate theoretical models and physical experiments. Architects are trained to collaborate. This makes us reliant on those in the engineering and sciences who are fully equipped to calculate performance expectations and to test hypothesis. Those in the engineering and sciences benefit from collaboration with designers as they sometimes lack new applications to test in the classroom. Under the right circumstances, a perfect blend of designer meets scientist can be mutually beneficially and incredibly productive. David Edwards eloquently elaborates upon this theme in his book *The Lab: Creativity and Culture*:

We dream, and realize dreams, through a creative process that mixes two ways of thinking—aesthetic and analytical—which we often encourage and exploit in very different settings. Through aesthetic thinking, we embrace uncertainty and complexity, we induce, follow intuition, and draw inspiration from images and sounds. This process especially thrives in artistic environments, like theatre companies or design studios. Through analytical thinking, we simplify a complex world, reduce its challenges to resolvable problems, and pursue the logic of equations. This process thrives in scientific environments, like a pharmaceutical company or a bank. The aesthetic process is the substance of hypothesis generation, while the analytical process is the substance of hypothesis testing. (Edwards 2010, p 4)

The question is no longer whether or not we should break disciplinary boundaries in order to more comprehensively address the endemic questions of our decade relating to environment, resources, health, and sustainability. The question has shifted from why to how. This question is not easily answered due to obstacles at every turn. Through my desire to co-teach with faculty from other departments within my university, or even to co-teach with colleagues from within my same department, I have found institutional barriers in terms of compensation, space, and enrolment. Time and time again when I come across successful models of co-teaching, I soon learn that the faculty members are essentially donating their time, and in rarer cases the students are not receiving academic credit in the most deserving way. Both faculty and students recognize the value of these collaborative experiences, and are hungry for them to the point where compensation and credit are moot. If the universities are slow to adapt to the needs of faculty and students, and inevitably, to the needs of the job market, how then can we still have viable multidisciplinary experiences? How can faculty be adequately compensated for their time? How can multidisciplinary research move-forward in a timely manner without holistic support?

I have found one possible way forward in this labyrinth of closed doors. This solution is within the university, and even within the university do's-and-don'ts, yet is

also a distinct co-curricular mode of working. The long-term hope is still that classes can be taught with experts from various disciplines to a student population equally as diverse, and that this co-mingling would result in a sum-greater-than-the-parts education. The aspiration is still that faculty are gainfully employed without an unreasonable extra workload in order to pursue a dream, in the sense that David Edwards described in the previous quote. The aspiration is also that students are able to leverage their multidisciplinary experiences into viable senior projects, projects that receive academic credit, and eventually into jobs. The aspiration would extend beyond the university to the business and industrial world where youthful minds raised in a collaborative process would guide decision-making through their inherently wide lens.



*Figure 52: The top diagram represents the current educational model where individuals increase in depth of knowledge in a particular topic, yet remain isolated from other knowledge areas. The bottom diagram represents a model where individuals or teams would have both breadth and depth and would share a common base of knowledge that spanned across disciplines. This common base could include mathematics and language (which general education courses already address) but it could also include the arts, music and food (with a greater potential for a social foundation). Diagram developed in collaboration with Clare Olsen.*

Until universities can develop a financially sustainable method to bring people together, an approach that takes both faculty and students beyond the classroom structure has proven effective. The Center for Architecture, Science, and Ecology (CASE) will be used as an example of an innovative new model of education that successfully erodes disciplinary silos. I would put CASE under the arts/science laboratory umbrella defined by David Edwards that “improve the dialog between creators and the public around the creative process while erasing conventional boundaries between art and science (Edwards 2010, p.7-8).”

### *The Center for Architecture, Science, and Ecology (CASE)*



*Figure 53: The Integrated Concentrating Solar Façade (ICSF) system designed by researchers at CASE with support of NYSERDA, NYSTAR, and U.S. DOE. Source: [www.case.rpi.edu](http://www.case.rpi.edu)*

As a graduate student at the Center for Architecture, Science, and Ecology (CASE) in New York City, my fellow classmates and I would often ruminate that the greatest innovation to come from CASE is CASE itself. This comment is not meant to degrade the significance of the research being conducted at CASE. Notable research projects include the Integrated Concentrating Solar Façade shown in Figure 2 and the Biological Active Modular Phytoremediation System (BI-AMPS). Instead, the comment is meant to acknowledge the brilliance of CASE as an institutional construct. First, CASE is a joint venture between Rensselaer Polytechnic Institute (RPI) located in Troy, New York, and the Manhattan based architecture, engineering, and urban design super firm Skidmore, Owings, & Merrill (SOM). In their own words, CASE’s mission reads:

A new academic-industrial alliance is required to accelerate a more aggressively experimental process that leads to development of new systems that produce a paradigm shift in the way that our future cities metabolize energy, water, and resources. The Center for Architecture Science and Ecology (CASE) is addressing the need for accelerated innovation of Built Ecologies through the development of next-generation building systems. A multi-institutional and professional research collaboration co-hosted by Rensselaer Polytechnic Institute and Skidmore, Owings & Merrill LLP, CASE is pushing the boundaries of environmental performance in urban building systems on a global scale, through actual building projects as research test beds.

Buildings account for over a third of the total energy consumption in the United States, and nearly 40% of U.S. carbon production. As new construction projects increase exponentially in emerging global economies, it becomes urgent to

accelerate the pace of architectural innovation, and to press the implementation of sustainable material and energy technology.

This progress cannot be accomplished solely within any traditional discipline of architecture, engineering, or environmental science, but requires collaborative solutions that meet social and environmental needs head on. By providing a setting that supports the immediate need for innovation, CASE is able to incorporate next-generation architectural technologies into new building projects (<http://www.case.rpi.edu/CASE.html>).

The first significant CASE innovation is that CASE is an educational laboratory, yet is co-sponsored by an educational institution and a private corporation. In these challenging economic times, it is admirable that both sides of this partnership are continually willing to take the fiscal risk necessary to pursue a co-dependent endeavour. Their innovation is based on trust, transparent communication and the shared belief in a common mission. In addition to shared ethics and common desires to use resources more effectively, RPI and SOM share the belief that both education and practice are enriched through blending. SOM keeps the graduate students and research endeavours rooted in practicalities such as budget, schedules, and manufacturability, while RPI keeps SOM innovative and critical.

The second innovation is that employees of the firm work directly with the students, and the students work directly on SOM projects for short intense periods of time. SOM key experts in buildings sciences coexist in a common workspace with both undergraduate and graduate design and built-ecologies students. These are experts in computer programming and energy performance and simulation who would engage in constant dialog and friendship with the students. Conversely, many students choose to participate in a semester or yearlong practicum, in which they work full-time for SOM yet act as a liaison between the practice and the research team. While it may seem to be a minor point, friendship will repeatedly be put forth as vital to the success of these otherwise unnatural collaborations. One should not gloss over the significance of friendship due to its' apparent academic irrelevance. We are here to discuss serious research, are we not? Exactly, and in a world and institutional system full of limitations, boundaries, and hurdles, what we have as our primary tool for progress is each other. The best way to get people to take a risk and invest in you is if they care about you. It's not just about the work. Care for the work is not sufficient. Care for the person is essential.

When Alexis de Tocqueville was asked to determine the reasons for the success of democracy in the United States, he concluded that the American social capital—"the ways our lives are made more productive by social ties" (Putnam 2000, p. 19)—resulted in healthy local associations that lead to supportive and productive communities (Cox 2004, p. 5). While this is a gross simplification of a confluence of a multitude of factors, it is worth noting that the coffeehouse, the front stoop, and the weekend group picnic are historically recognized social structures that lead to success. From these informal networks come more structured intellectual networks, such as societies or salons, yet they still have a foot firmly planted in the social. In the case of CASE, experts and novices sat together, ate together, drank together, and all members of this community were students of each other. In particular projects, one individual would take leadership, but then another task would allow the roles to reverse creating a harmonious nurturing in both depth and breadth.

The final CASE innovation to evaluate is community diversity. The faculty and students are chosen from a variety of disciplines and experience backgrounds. The director of CASE, Anna Dyson, has a background in art history, while the Assistant Director, Jason Vollen, is an architect with extensive experience in ceramics. Professor Peter Randolph Hazard Stark, who has an undergraduate degree in aeronautical engineering, and a Ph.D. in theoretical physics, teaches the building technology and prototyping courses. An SOM environmental engineer teaches energy modelling workshops. Students have undergraduate degrees in architecture, structural engineering, mechanical engineering, music, and ecology. This diverse population leads to rich discussions and unique approaches to problem solving. CASE is a model of education that produces students prepared to face, and perhaps author the next 20 years of design methodologies, and design pedagogy.

Over CASE's short life of approximately six years, graduates have already gone-on to tenure-track teaching positions at universities around the United States including Cal State Berkeley, California Polytechnic State University, University of Florida in Miami, and Auburn University. CASE's profound educational model is disseminating as their graduates spread out and become curriculum makers. It is only a matter of time before we see this type of educational model emulated in architecture programs around the country.

## The Social Laboratory

Assuming that you agree with me that friendship is fundamental to successful interdisciplinary research, and to the progress of research, then the next question would be how to develop these relationships within a university structure. Teaching can be quite isolating. Unless you happen to meet someone at a university event or through a point-of-contact, it can be extremely difficult to reach beyond disciplinary silos even for the simple act of making a friend, let alone the act of building a committed research team. The following two sections will demonstrate two means by which ideas and collaborations are born from a social structure. The first example uses historical England and America to show how drunken conversation and open minds and mouths lead to many of the most profound inventions of all time. The second example, a much more humble one at that, will document a multidisciplinary professional learning community convened at California Polytechnic State University.

### *The Club of Honest Whigs*

In Steven Johnson's book titled *The Invention of Air* the importance of the English coffeehouse in bolstering academic dialog is remembered and praised. Every two weeks a group of male thinkers would gather at the London Coffee House located rather ironically in St. Paul's churchyard—a bustling urban space anchored by religion and challenged by the sometimes-heretical ideas of the coffeehouse debaters known as The Club of Honest Whigs. This type of lively, sometimes substance induced, exchange of scientific, political, religious and philosophical thoughts does not have a direct parallel in modern society. In Johnson's words, "The late-night bender at an industry conference probably comes the closest: the sharing of essential, potentially lucrative information while stimulated by the chemical cocktail of caffeine, alcohol, and nicotine" (Johnson, 2008, pp.17-18). (Johnson 2008)

The protagonist of Johnson's biography, Joseph Priestley, approaches the Honest Whigs in December of 1965 to pitch a book idea (p.18). Priestley wants to write a book

documenting all of the scientific discoveries and subsequent gadgetry related to electricity. He wants to write this book in lay language as a tome for the curious masses, not as a highbrow esoteric scholarly work. In short, "Priestley wanted to tell them a story" (p.29). That night at the London Coffee House Priestly met Benjamin Franklin, John Canton (member of the Royal Society and leading Electrician), and Richard Price (Welsh moral philosopher and mathematician), who became life-long friends. The "Electricians" as they were called, opened up their libraries, notebooks, and letters to Priestly within days of their first encounter. Over the next year, Priestly worked fastidiously researching these documents and generating his own original work, which was shared back-and-forth between the Honest Whigs. I suppose you could say this work was peer-reviewed as the Electricians read and commented on drafts.

*The History and Present State of Electricity, with Original Experiments* was published in 1767 and further solidified Priestley's standing with the Electricians from the coffeehouse. Over the next few years, the book sold "well enough to support five English editions, and was subsequently translated into both French and German" (p.34). Priestley's book was the principle text on electricity for the next hundred years. The book included two sections geared specifically toward young aspiring science minded individuals: "Practical maxims for the use of young electricians" and "A description of the most entertaining experiments performed by electricity" (p.35). Priestley encouraged people to join in the sciences instead of creating a schism between the experts whose stories are told in the book, and the readers. In Priestley's own words, "...[T]he interests of science have suffered by the excessive admiration and wonder with which several first rate philosophers are considered; and...an opinion of the greater equality of mankind in point of genius would be of real service in the present age" (p.36).

*The Invention of Air* follows its' own advice. After studying the likes of Benjamin Franklin and Joseph Priestley in great detail, Steven Johnson may have been transformed in his approach to knowledge and knowledge dissemination. In the Author's Note, Johnson writes:

So this is a history book about the Enlightenment and the American Revolution that travels from the carbon cycle of the planet itself, to the chemistry of gunpowder, to the emergence of the coffeehouse in European culture, to the emotional dynamics of two friends compelled by history to betray each other. To answer the question of why some ideas change the world, you have to borrow tools from chemistry, social history, media theory, ecosystem science, geology. The connective sensibility runs against the grain of our specialized intellectual culture, but it would have been the second nature to Priestley, Franklin, Jefferson, Adams, and their peers. Those are our [American] roots. This book is an attempt to return to them. (p.xx)

Steven Johnson and Joseph Priestley are given as examples of successes derived from a place that betrays the specializations and isolating structures often found in modern universities. This paper is calling for a shirking of what is recognized as "scholarly" in order to create supportive and nurturing environments for progressive research.

## *The Material Innovations Laboratory*

As an architect and a graduate of CASE, I carry with me a research agenda that has collaboration imbedded in its' nature. I used to believe this was novel or abnormal in modern academic practices, but as many know, it is actually historic and primal. Before there were silos, there were richly layered people with expertise in a number of fields. Moving away from this thickness in both depth and breadth may have contributed to our current economic and climate troubles. Collaborative cross-disciplinary sustainable relationships are essential to my success as a professor and scholar who is not stymied by the institutional hurdles discussed in the introduction. Through California Polytechnic State University's Center for Teaching and Learning (CTL), I was introduced to professional learning communities (PLCs) as a networking method. While a professional learning community is not the same as an English coffeehouse, I would challenge Johnson, and say that this may be the closest thing we have, at least within the institution. The CTL defines PLCs as:

A faculty and/or professional staff group who engage in an active, extended program of study that is defined either by the needs of a particular group or by the imperatives of a particular topic. In addition to study, group members commit to self-reflection and peer feedback in an effort to improve teaching and learning. A PLC typically consists of 6-10 participants with either one or two additional facilitators (Call for Proposals: Professional Learning Communities, CTL).

Learning communities have been shown to benefit both students and faculty. The difference between a classroom full of students and a learning community is the focus on relationships. The difference between a research team and a faculty learning community is the focus on a multidisciplinary composition and on creating community—the social aspects that allow time for hanging-out off campus, including family and guests, and looking for opportunities to have fun together. While learning communities do have guidelines, such as meeting over at least a 6-month period, a membership of six to fifteen, and a common cohort-based or topic-based theme; there is also a lot of room for generating content and activities on-the-fly. There is room for the random agenda that would have surely emerged in the Coffee House.

Mark Cabrinha, Ph.D., is a professor of architecture at Cal Poly with expertise in digital fabrication and material assemblies. He established a loose structure that he called the Material Innovations Laboratory (MIL) and was in the process of defining the scope of this laboratory when our paths intersected. I was ruminating about the value of a PLC, and how much a group of faculty with similar interests would benefit our collective research, when Dr. Cabrinha introduced me to the MIL. It turned out that we needed each other. I needed Dr. Cabrinha to articulate the nature of a collective group that could fit within newly established curricular and pedagogical goals of the architecture department. Mark needed me to organize an agenda and give this group structure and funds. Together with professor Clare Olsen, we successfully responded to the CTL call and launched the MIL PLC with five architecture professors, an architectural engineering professor, a landscape architecture professor, a computer science professor, and an environmental engineering professor.

How did we find these willing participants to join the MIL PLC? Well, in the tradition of our ancestors, we had coffee. The process of creating this PLC proved both challenging and extremely effective at what I will call flash networking. The three founding members of the MIL PLC sat-down and generated a list of architecture



friendlies. First, identify people with an interest and dedication to similar research agendas. This may be easier said than done. As new faculty at an institution, knowing whom to look for, how to look for them, and what to look for can all be unknowns. We started locally. Start with coffee with the department chair and other faculty in your own department. Ask them who they've worked with, who they know, and how to approach those people. This is the first tier of coffee dates.

In my experience, the first tier did not become members of the professional learning community. As one can imagine, many of these individuals were already working collaboratively across the campus, and were already well established in a trajectory. The first-tier was still incredibly valuable to meet, socialize with, and as a resource for the second-tier. From each coffee date, names were recommended as people on campus with similar interests. Several names came-up multiple times. These people were the next to receive a cold-email or cold-call inviting them to a 30 minute coffee date at the library café. At one of the early coffee dates, five members of the architecture faculty joined with one professor from materials engineering. She recommended to us to reduce the number of people at the coffee date so that she didn't feel like she was on trial. Even this critical feedback was a valuable part of the learning process and we restructured the coffee meetings to be more casual with only 3 to 4 people meeting at a time. The lesson was to keep it informal, keep it social, and allow the general conversation to take precedence over the request to join the learning community. Even if our guest decided not to join the group now, having them as an advisor and ally in the future should not be squandered. In this case, we asked for the short-game, but we ultimately were playing the long-game.

It is important to pause here and note that the method for introducing ourselves and pitching this learning community was coffee meetings at the library. The library was specifically chosen as neutral territory, but also because it's a hub of student, faculty, and staff activity. The second floor café is surrounded by various study spaces that are rarely vacant. Here we had informal conversations about aspirations and shared interests, and the format allowed people to easily walk away having only invested the price of a cup of coffee. The format also allowed people to be energized by the surroundings and agree to take a time-intensive risk with a group of loosely connected individuals. The risk turned out to be worthwhile.

Three of the five initiating members of this working group were new professors and we are eager to get to know other faculty and contribute to the scholarship of the University. Having taught and studied at premiere institutions throughout the country, each of the three new faculty were drawn to Cal Poly in part because of the institutional access to synergistic disciplines that could foster cross-disciplinary collaboration. The PLC helped us to forge relationships and solidify our collective scholarship and pedagogical goals, which directly aligned to Cal Poly's Strategic Plan and Vision to "develop and inspire whole-system thinkers to serve California and help solve global challenges". Clare Olsen and myself described the MIL PLC with the following paragraph:

Developing our research as a team implementing whole systems thinking will elevate the investigations and allow us to crosscheck the objectives and outcomes of our research against the values and limitations of our respective fields. With work that aspires to address climate responsiveness and efficiency, and aims to progress toward high-performance ecological design, it is difficult, if not impossible to tackle this research effectively without partnerships. As a result, this



collaboration is fundamental to our teaching and scholarship goals. Without collaboration, our work will remain generative in concept and not application. As part of Cal Poly's learn-by-doing agenda, students become skilled at both contributing ideas and testing them. This pedagogical agenda is critical in preparing students to make meaningful contributions to the profession (MIL PLC grant application).

The agenda for the MIL PLC included facility tours of respective labs and shops owned by each department represented, pecha kucha presentations by each member indicating their research interests and general curiosities, readings, meals together, and even making things. The two readings were from *Cradle to Cradle: Remaking the Way we Make Things* by William McDonough and Michael Braungart, and *The Lab: Creativity and Culture* by David Edwards. Incidentally, McDonough and Braungart met at a party, decided almost immediately to collaborate, and subsequently wrote a book, created an organization, and have made a considerable global impact. The members of the MIL PLC had brown-bag lunch discussion where we each brought our passions and biases to the table. Members of the group had differing thoughts and opinions leading to a healthy academic dialog that is not always possible in the classroom.

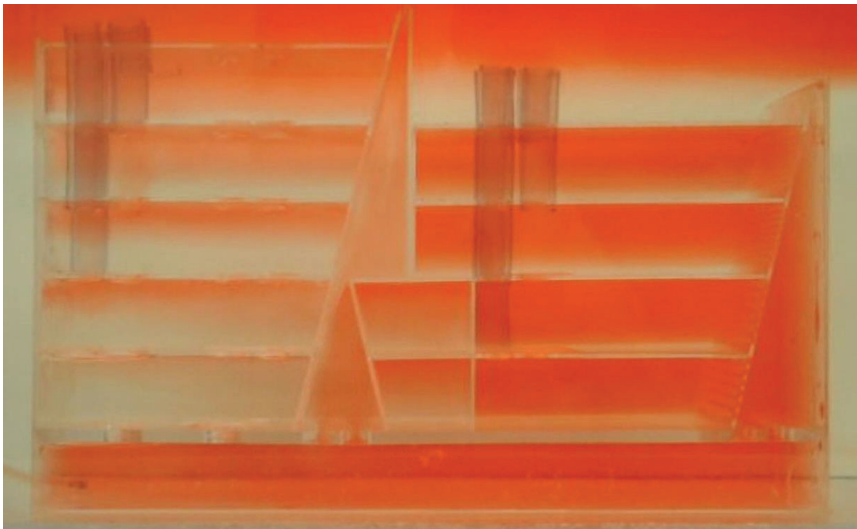


Figure 54: MIL PLC reading discussion books. The *Cradle to Cradle* conversation focused on the role of materials in resource consumption (McDonough and Braungart 2002), and *The Lab* looked at the collaboration between the arts and sciences as a productive collaboration for innovation and public engagement (Edwards 2010).

The most significant outcome of the learning community was friendship. In a world of overwhelmingly busy schedules, and unrealistic expectations for faculty performance, these friendships became invaluable. There are two reasons why the social aspects of the PLC were important. First, we were able to stretch our minds in a hospitable environment knowing that the others cared about us and supported us, and that the dialog was in no way confrontational. Second, a group of people who care for each other are more likely to agree to help with collective research even if it means delaying a personal project. Friendship allowed the group to prioritize the collective over the individual.

## *Make Things*

It is my research philosophy that one must make things—prototypes, simulations, and experiments—to fully understand his or her own thinking. Making allows the teachers to become the students. Having a group of friends with various expertise will allow the making of ever more sophisticated and didactic prototypes. My own research into air quality and the related design implications for improving human health has led to a number of analog simulations and experiments conducted collaboratively in order to demonstrate assumptions and design performance. Returning briefly to Joseph Priestley, one of the significant outcomes of his meeting with the Honest Whigs was the encouragement to conduct his own experiments (Johnson 2008, p.29). As a result, Priestley “launched himself into a rapid and turbulent river of experiments, developing a style of investigation that would shape the rest of his career—more exploratory than systematic, shuffling through countless variations of materials and equipment test subjects” (p.31). In his naïve and chaotic approach, Priestley was able to make a substantial contribution to the world of knowledge in a number of significant ways. As I have done along my own research path, Priestley went from the coffeehouse to the workbench, from making friends to making things.



*Figure 55: An analog fluid dynamics simulation illustrating the stack effect, nicknamed ALVS (analog liquid ventilation simulation). The red water represents buoyant air (warm air) moving through the building section and exiting through chimneys to the exterior.*

In 2009-10, I worked with a small team of undergraduate students from Rensselaer Polytechnic Institute (RPI) to design a family of wall modules that pre-filter outdoor air before it is brought inside. We established performance goals for our walls, but as our team was made-up of only architecture students, our abilities to verify our hypothesis were limited by our lack of exposure to fluid dynamics and experimental frameworks. While we couldn't, without considerable effort, self-teach fluid dynamics in our short timeframe, we could make models. We could make videos and drawings, and we could use these tools to explain our concepts through analog simulations. The image shown

in Figure 55 is a photograph of one of these simulations. An acrylic tank was built and an acrylic section model of a portion of our building was built to fit within the tank. The tank was filled with salt water, and red-dyed tap water was filled into the bottom chamber of the sectional model. Time-lapse photography and video were used to capture the vertical movement of the less dense fluid as it moved through the building eventually escaping through chimneys into the tank. This model simulated the stack effect that would be induced by solar chimneys and create ventilation in the building.



*Figure 56: Experiment testing particle removal efficiency of an 3D printed module. The collaborative research team consists of faculty and students from environmental engineering, mechanical engineering, and architecture.*

In 2012-13, I was able to build off the MIL PLC relationships to create an undergraduate student research team. This team followed the same basic working methods as the architecture team did two years earlier. We made prototypes, theoretical models, and analog simulations to demonstrate behaviour as shown in Figure 56. The team consisted of students from architecture, environmental engineering, and mechanical engineering. Together we have successfully proved a design idea as a viable building system and are moving forward with industry partnerships, and further grants.

In just one short year, I have been able to move my research far beyond the expectations for this duration. It all started with coffee in the library, and through a generous grant to create a social group that bantered about our common interests. As a result of these fortuitous events, I have a wonderful and productive team of undergraduate student researchers who will soon have patents under their names and will have hands-on research experience to aid them in their future endeavours beyond the university. This type of experience is rare for an undergraduate architecture student to leave the university with. The engineering students tell me it's rare for them too.

## **Seriously Less Serious**

“In the artsience lab model, art and design ideas would move from education on the one side to social and cultural change on the other, with public dialog taking place in between, through cultural exhibition instead of academic publication” (Edwards

2010, p.11). The method of highly educated scholars operating in locked laboratories struggling to protect their intellectual property cannot be our only method of researching at academic institutions. This paper proposes a social method of developing research teams that freely share information and criticism in pursuit of new knowledge. Both methods have the same goal. One is just a lot friendlier, and frankly much less isolating to both the researchers and the larger community. Architects are often criticized for not properly protecting our innovations. We go straight from idea to public presentation and often directly to the Internet. The images spread quickly. In this way, the designer has very little chance to protect their ideas and retain sole authorship of them. Some may argue that designers should behave more like scientists or engineers in carefully protecting their work until the legal system can protect it for them. And while I understand the financial and institutional need to be original, I think the sciences and engineering fields could learn a lot from the ways of the designers.

While the promise of this paper, to provide a model of successfully working with multidisciplinary teams within the university is still a work-in-progress. There are a number of conclusions that can be made from the experiences explored above. First, be open. Be open to relationships, open to expertise, and open to novice energy. Second, be giving. Until the universities devise adequate compensation for working beyond disciplinary boundaries with teams that don't properly fit into a high-efficiency lecture hall, it is up to the professors and students to develop these situations. This will take generosity, but the returns are likely worth the investment. Third, when in doubt, physically try it. With uninhibited shameless determination, make something and document it. Without a doubt you will learn something. I always do. Even if it was not the thing I expected to learn. The last conclusion I would make is to publish for the academy and for your peers, but publish for the public too. Exhibit, blog, tweet, write, and do it in an inclusive way that invites others to the table. Buck the arrogance that believes only those with Ph.D's and Post-Docs can innovate. Collectively we can be better.

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# **Challenges in design education methods**

## Who is the Designer?: An Experience of Collectivism in Basic Design Course

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**Abstract:** *This study focuses on a specific Basic Design exercise, which has been conducted for four following semesters in the Department of Industrial Product Design at Istanbul Technical University (ITU), Turkey in 2010-2011. In this exercise, students were expected to design a Jury Invitation (card) collectively specialized for the specific semester. The exercise has four main phases to which students followed: Generating ideas in the form of models individually, voting, redesigning the top four or five collectively, and finalizing and reproducing. In this study, we aim to discuss the process of this exercise and the outcomes of it in the light of collective design. So, it can be considered as an endeavor to experiment collectivity rather than conventional individualistic approach in basic design education.*

**Keywords:** *Basic design, Collective design, Design education.*

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## Introduction

Over the past decade, there have been changes in the conception of the designer's role. The popular understanding of designer is closely linked with the designer's signature on the product. The name of the designer might even affect the perception of the product itself, considered and used as a tool in marketing. This can be regarded as the continuation of the general understanding of the position of the artist in society as celebrity similar to any other profession related with creativity and originality. Classical example is the names of designers like Ross Lovegrove or Philippe Starck, who have become inseparable from their products. Therefore, the products are often marketed with their name, which is an entity contributing on their symbolic value in the market (Figure 1.).



Figure 1. Products of Ross Lovegrove (<http://www.rosslovegrove.com>)

We are now in the era of the name and individual style of designer being disappeared. Especially designers working in R&D departments together with the other disciplines are working with teams in which individual dominancy in design process decreases. The new concepts of co-creation, co-design and participatory design affect this disappearance where even consumers/users engage in the design process as a part of the team.

Design education in classical sense; however, generally supports the individualistic approach due to some practical limitations such as difficulty in assessing and forming a team in design project fairly, also because of the aforementioned general culture based on the designer's role similar to that of a celebrity. This situation sometimes leads to a selfish and isolated process of design, contradicting to the designer's role as designing for the others not for him/herself which creates an ironic scene.

In the context of this study, a new process of design to the first year design students is introduced to increase their awareness about collective designing and responsibilities of designer in the early phase of design education.

## Basic Design

Basic Design is a fundamental introductory course in the first year of the curriculum in art and design education. The scope of this course is on visual perception, principles of basic structures, form-function relationship, and color perception-these principles are found in the early sources of Rudolf Arnheim (1971).



It is regarded as 'indispensable' by many educators, and acknowledged as the most significant course of the first year of design education (Özer, 2004). The formation of the Basic Design concept is highly related to the perception theories of Gestalt, which shaped the curriculum of Bauhaus school (Denel, 1981).

However, in recent studies on Basic Design education, the validation of Basic Design principles is questioned in contemporary design education (see Boucharenc, 2006 and Blachnitzky, 2011). According to Boucharenc (2006), Basic Design education is still a very significant element in design education curriculum in most of the countries. More specifically, Blachnitzky (2011) explores whether there is agreement in first year design educators regarding basic design principles (two- and three-dimensional basics, shape, colour and experimentation with materials) especially in European Universities. Since human sensation remains the same, in today's design education it is still valid to teach students these principles to improve a common visual language, to practise their perception, and to develop a specific way of learning.

As a support the approach presented in the paper, some of the educators believe that teaching design basics in general is not sufficient and propose that real-world design projects should also be engaged in Basic Design (Blachnitzky, 2011).

Basic Design can be regarded as a lonely path for young designer candidates, because one has to find the "right" solution without any intervention or extra guidance from the tutors, such as bringing examples to class, because it is defined as a "problem solving" process. Also one has to forget what s/he already knows and fight with his/her prejudices. Mostly short exercises and problems are given for discussion on the principles of design.

To overcome this cliché and to train students to work in teams, we conducted an exercise to introduce a so-called real-world project to Basic Design students. In this study, we aim to discuss the process of this exercise and the outcomes of it in the light of the term collective design.

## **The issues of co-design and teamwork**

Co-design and co-production are affluently discussed in today's marketing research and design research. Both are used for engaging user/consumer into value creation. Kleinsmann (2006) describes co-design as "the process in which actors from different disciplines share their knowledge about both the design process and the design content." By the help of different perspectives of different actors, co-design is an effective tool to generate especially conceptual ideas. In these design processes, designers both contribute to and benefit from the design process itself. Therefore, the designer has a critical role in this team as a researcher, creator and moderator.

Even if co-design is related to the role of designer in interdisciplinary teams, this study aims to carry the issue of co-design to design education with different agents and ideas in the classroom abstracted from interdisciplinarity per-se.

One of the most important differences between individual designers and teamwork is on understanding the problem. Whereas the former is able to shape his/her "idiosyncratic" understanding, the latter one must find "shared" understanding (Cross N. and Cross A.C. 1995). This difference both causes some barriers and also offers some potential in terms of creativity.

Goldschmidt (1995) conducts a comparative study based on process of a single designer and a team; and summarizes his study as in the following:

He [single designer] oscillates between overviews and technical details, between functional aspects of the design product and issues related to human factors. He thinks of features, product identity and aesthetics along with stiffness, strength and ease of production. Team members do the same, but they can let a colleague answer a question they raise, or pick up someone else's line of thought and build on it. The single designer has only him/herself to rely on, and he/she must act as a team and give all the answers while also asking all the questions... (Goldschmidt 1995, p. 208).

When the number of members in a team is increased -as this study discusses-, these differences become more dramatic and observable. This is significant from the design education perspective to be aware of all possible aspects of design process and parameters and discuss and elaborate them in the class.

## An experience of collectivism in Basic Design course

In collaboration with the final project of the Basic Design I and II courses, students were asked to design an invitation (card) for the visiting jury members of the final jury to be put into their post boxes in the university. The students were highly motivated because it was going to be their first 'products' that would meet with somebody else's needs apart from the studio tutors as a mimic of end-users.

### *Description of the exercise*

This study focuses on a specific Basic Design exercise, which has been conducted for five following semesters, in 2010, 2011 and 2012 in Basic Design I and Basic Design II in the Department of Industrial Product Design at Istanbul Technical University (ITU), Turkey.<sup>1</sup> 45-50 students took part in each exercise. Students were expected to design a Jury Invitation (card) customized for the visiting tutors, specialized for the specific semester.

The requirements of the exercise can be summarized as:

1. *Concept*: The invitation should be appealing enough for a call. It should reflect the idea that this is an outcome of the learning of Basic Design course.
2. *Functions*: It should have basically three functions: transmitting a message (date, place, name of the course, inviting expression), being put in a postbox (collapsibility/adjustability) and being kept as a desktop object (appeal).
3. *Dimension*: It should be suitable for the dimensions of postboxes of the jury members.
4. *Graphic design and typography*: The message should be clear enough to read and understand.
5. *Basic Design principles*: Harmony, rhythm, unity, variety, repetition, balance, order and color choice should be considered.
6. *Reproduction*: The invitation should be easy to reproduce. According to a guideline, each student should be able to make a copy.

Therefore, the invitation includes mainly following information:

- Call text such as "We would like to see you in our Final Jury."
- Date and place
- The name of the course Basic Design I/Basic Design II

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<sup>1</sup> The authors of this paper are also the tutors in the project.

### *Phases of the exercise*

The exercise has four main phases to which students followed: Generating ideas in the form of models individually, class voting, redesigning the selected top four or five collectively, finalization and reproduction (each student in the class produce one copy).

In the first phase, the students were expected to develop ideas considering the requirements that were explained in the previous section.

In the second phase, all developed ideas were presented on a table where all students and tutors had three stickers to attach on their favorite projects. They were allowed to attach more than one sticker to one idea, which allowed dramatizing and ease rating the results (Figure 2).

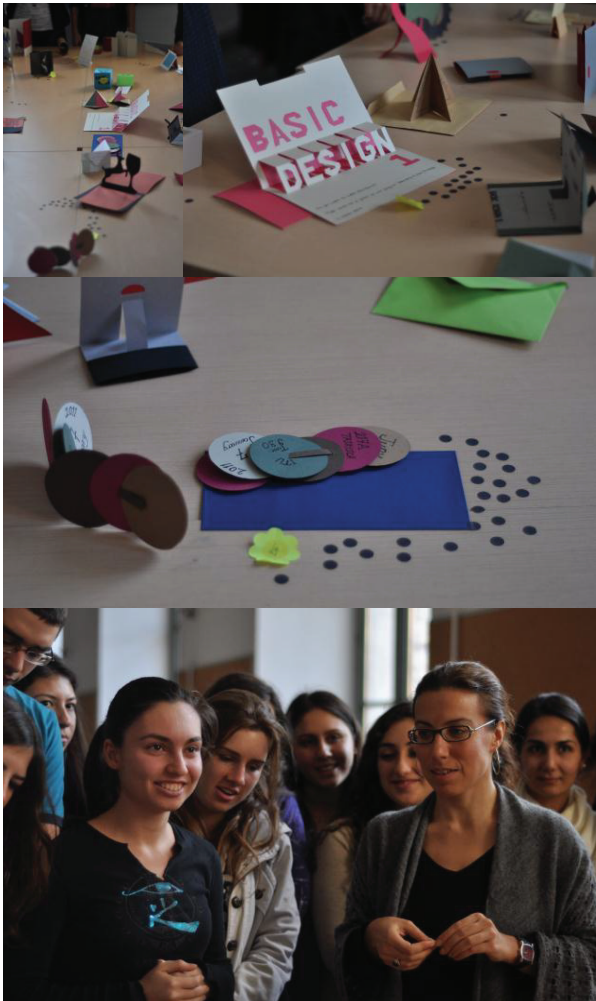


Figure 2. Pictures from voting, 2010 Fall Semester

After determining the top four or five projects and having a class discussion on them, in the third phase students had to work on them and improve the most popular

ones by considering the requirements and critiques again. They were expected to work in groups of 4-5 and come up with three alternatives by reconsidering the principles in the class discussion. After the alternatives were voted in the class again, the project to be produced was selected.

Third phase is the most important one, where the real designer of the project disappeared and different points of views find its place in the project. Therefore, the designer of the project became anonymous and from then on it becomes the “property” of the class. This made the students to cooperate and to feel connected to the object they are developing. By the help of this process, they perceived the project as a reflection of their class. The end of the phase was where the tutors withdrew their critics gradually and left the class alone to develop their own invitations (Figure 3).



Figure 3. A group of student working on invitations, 2011 Fall Semester

In the last phase, a volunteer group of 5 to 6 prepared a guideline for their classmates to finalize the invitation and make it standardized. They used social networks such as Facebook as a platform and an accelerator to communicate. The comments on Facebook were in ordinary language<sup>2</sup> and were included in this study to reflect some of the details and insider motivation of this phase. In the Facebook group, comments can be classified as in the following:

**Proposing and selecting alternatives:** While they were discussing on Facebook, at certain points the members were proposing alternatives. Moreover, they had to select and discuss on these alternatives. They were mostly about colors, materials, and fonts of the invitation. Briefly, the decision making process was like proposing, discussing and eliminating alternative design solutions. Some students' comments on proposing and selecting alternatives can be seen below:

“Shall I color the triangles? What about using our previous thin black material?”  
“We can decide on which is easier”

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<sup>2</sup> Facebook comments are translated from Turkish to English.

“Instead of sticking black cardboard, let’s find black sticker.”

“Using sticker is more practical but how can we do this?”

“I prefer it parallel to the base.”

**Discussing on timing, dimensions, production places and cost:** In Facebook group, the students also discussed on realization process of the invitation. They often asked when they should finish the invitation, how its dimensions should be, where they would print it and how much it would cost. Here are some related students’ comments:

“I can go and ask to the place in Beşiktaş. Maybe they are printing cheaper.”

“If it doesn’t cost a bomb, we can handle it.”

“Let’s get a price. Then we can decide.”

“The cheaper it is, the better it is.”

“Is there a possibility that it will cost more than 1 TL? If so, then let’s forget about.”

**Reflecting emotions:** Since the group was responsible for the finalization, they shared their feelings in this group. They feel pressure because of the deadline pressure, the lack of tutor’s critiques and the idea of collective work. These emotions can be observed from their comments below:

“I have stomachache because of depression”

“Why our tutors don’t think about this?”

“Don’t you sometimes sit and cry?”

**Discussing work distribution among members:** Every group project has its drawbacks especially in terms of work distribution. Likewise, Cross N. and Cross A.C. (1995) states that “Working as a member of a team introduces different problems and possibilities for the designer, in comparison with working alone.” In this particular case, volunteer group taking part in finalization phase experienced some problems regarding this issue. The issue of work distribution can easily be understood from the comments:

“All of the stuff is left to you. Nobody cares. You are a group on your own.”

“I am getting crazy because of this unresponsiveness. I expect some sensibility.”

“Nobody is making comments.”

In the end, each student had to submit exactly the same invitation by following the instruction in the guideline. This phase was also crucial since the students firstly experience the terms such as standardization and mass-production that are highly related to the field of industrial design.

In one of the processes, a template is prepared and shared with the class so that students produce the invitation card accordingly. One of the main considerations in the design of the invitation is that it was based on the A4 format strictly, so that almost no parts are disposed (Figure 4).

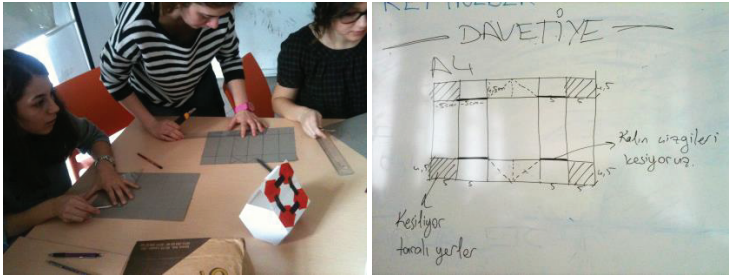


Figure 4. A group of student working on invitations and the template, 2012 Fall Semester

### Outcomes of the exercise

After analysing the outcomes of the exercises in different semesters this project is assigned, it is seen that interestingly almost all share some similar characteristics, some of which were sought in the design brief (Figure 5-6-7-8).

**Form:** Classes in different semesters prefer similar basic forms such as cubes and prisms, as they are easy to work with and suitable to the principle of collapsibility and adaptability. This may be because of the directions and considerations about easy-to-define forms during the semester.

**Playfulness:** Students from different years take playfulness as the core concept of the invitation. They usually like the idea that the invitation card can also be played with instinctively. Therefore, the target group (jury members) can spend time while they are discovering the invitation. That's why; all invitations can get into at least 2 different positions by folding or rotating. These positions also provide to fit into jury members' post boxes and to stand on their desks.

**Material choice:** Each invitation has the same materials like paper or cardboard. The students prefer to write on it, use stickers or print. It may be partly because of the material use during the semester.

**Graphical understanding, typography:** The students use basic sans-serif typefaces. They conduct these typefaces by considering the surfaces of the invitation. We tried to direct student to use an existing type to apply on the invitation rather than create a new type from scratch for the quality of the finished item.

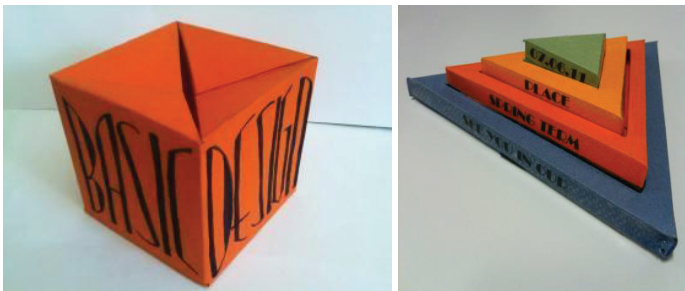


Figure 5. 2010 Fall Semester (left) - 2011 Spring Semester (right)





Figure 6. First project (top) - After designing collectively (bottom), 2011 Fall Semester



Figure 7. 2012 Spring Semester

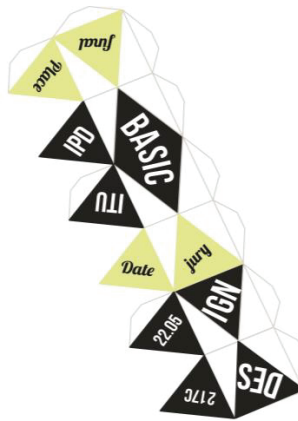


Figure 8. Template for invitation in 2012 Spring Semester

## Discussion

The problem of authorship in design has always become a problematic issue. It has its historical basis depending on the motive of artistic creativity. Some examples like R. Lovegrove, P. Starck etc. in that sense affect and motivate young designers to decide to select this very profession. Creativity and originality becomes a means and end in itself and students sometimes tend to forget that design is about “problem solving” in its classical definition.

This exercise is an attempt to crack this selfishness from the early phase of design education by erasing the issue of authorship in a certain point of the process and to remind design is not something only about creativity and originality, not something you create for yourself but for the social good.

In this exercise, design is handled not as a selfish, but as a goal oriented process. So, this study can be considered as important since similar processes in corporate companies are conducted. By the help of this study, students can learn about the real world practices of design in the early phase of their design education. As it happens in corporate level, also in this exercise, competitiveness and goal oriented-ness necessitate erasing the owner of design and dominates the success of the product and company (in this context, class) itself.



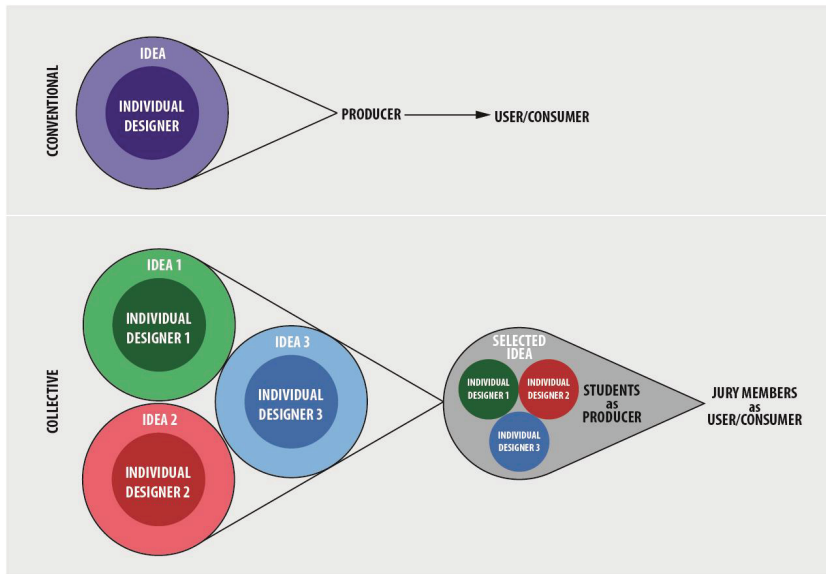


Figure 9. Distribution of roles

In conventional process of design, we can say that there is a simple direction from designer to user/consumer. Designer's decisions are transferred to producers and after production, marketed to users/consumers.

In the process of this exercise, the role of designer and producer is combined. That is, design students taking part in the project act as both designer and producer. In the first part of the process, student acts as an individual designer, when developing the first invitation for voting. In the second phase, the top choices among other alternatives are developed collectively. After the completion of the collective processes of designing and producing, invitations are presented/marketed to jury members considered as user/consumer. In this project, tutors also act as organizer, moderator and controller of the process. (Figure 9).

Moreover, this study can be considered as an empathetical effort for today's design students, most of whom will work in teams rather than alone in their professional life (Tzeng 2011). The study on strategies of teaching industrial design to the (inter)net generation suggests that "Collaboration enables their 'collective intelligence' to emerge through the pooling of knowledge, research, arguments, and insights from diverse groups of people." (Tzeng 2011, p. 40). In this sense, this paper reveals a Basic Design exercise that cares for today's design students' characteristics and also makes use of it in a positive manner.

Such exercises are also helpful to give an insight about the importance of contextual information for the purpose of design education. The classical approach of basic design course usually coming up with abstracted and idealized problems and solutions is cracked with a contextual perspective in this exercise. The invitation card for the jury is an exercise students feel close and warm and adopted very easily as it is an event which they feel and actually they do belong to.

Erasure of the real personality who initiated the design idea and other personalities who work on an idea that they have not generated is significant in this exercise. The

elements of co-creation or co-design is also applicable in different methods based on drama techniques, persona building, ethnographic approaches in different levels and styles. All these methods could and should be wisely transformed and transferred to the context of basic education with a good reading and analysis of the “contextual” data.

All the processes and methodologies in the project are developed to serve to reach “better” design solutions. However, “better” here does not refer to an objective but a collective and contextual quality to be reached. In this sense, in the early phase of design education the quality of the collective process completed in a democratic and harmonious way is more significant than the final product itself.

**Acknowledgements:** Thanks to our students who took Basic Design I and Basic Design II courses in 2010 and 2011. We would like to thank to our student Suhendan Eroglu for providing us Facebook group comments. Dr. Pinar Yalcin also contributed as a tutor in Basic Design courses in 2010.

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## Making, using and interpreting design probes: how subjective is participation?

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**Abstract:** *The wealth of participatory methods in human-centred design adheres to the notion of a democratic process and solutions that respond to the experiences and needs of users and stakeholders. However, as human-centred design philosophies permeate the landscape of design education and research, the designer's role as both an objective facilitator and creative decision-maker suggests their impact upon stages of data collection and analysis. This paper advocates tools and techniques to support design students in initiating user engagement and insight-gathering whilst simultaneously recognising and utilising their own subjective experiences and knowledge. Drawing comparisons between our practice-led masters and PhD research, we discuss how an interactive activity pack is used to gather community members' perceptions of fear and safety in the urban environment before examining how observational illustrations are employed to examine the multiple functions of an art school. In this, we consider how the designer's creation, use and interpretation of design probes can establish an empathic and intersubjective dialogue in participatory design exploration. We propose that the application of a reflexive methodology can strengthen students' critical awareness of sociocultural issues and promote authenticity and rigour in human-centred design.*

*Keywords: human-centred design, participation, probes, dialogue, reflexivity*

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### Navigating complexity in human-centred design

The landscape of design is in a constant state of flux. Through the *Designing for the 21st century* initiative, Inns (2010, p. 17–22) explores design's shift in focus from the development of products, spaces, images and their surrounding technologies to an interdisciplinary inquiry that tackles complex sociocultural problems. Norman and Verganti (2012, p. 2) maintain that such human-centred design (HCD) processes operate through iterative stages and encompass methods to support exploration, idea generating and the proposing and testing of solutions. To accompany this repositioning of the field, a multitude of roles and responsibilities are revealed. The designer operates as a negotiator of value, facilitator of thinking, visualiser of the intangible, navigator of complexity, mediator of stakeholders and coordinator of exploration (Inns 2010, p. 24–26). At the same time, customers, users and other stakeholders are encouraged to actively contribute to the design process as research participants and collaborative partners (2010, p. 13). In advocating a participatory design methodology, Sanders and Stappers (2008) recommend that shared ideas and collective creativity enable the conception of solutions that respond to first-hand insights. As such, a recent influx of resources prescribe the (apparent) optimum criteria for design researchers to employ innovative data collection and analysis methods (Aldersey-Williams et al. 1999; IDEO 2002; Tassi 2009; The Design Council 2012; Helen Hamlyn Centre for Design 2012; HCD Connect 2012; Hanington and Martin 2012).

As postgraduate students and aspiring HCD researchers, our consultations with such resources oscillate between initial inspirations and mid-project confusions. We strive to devise innovative ways to engage with participants yet our desire to elicit their insights is often at odds with our own subjective experiences and how they are embodied in the techniques we choose and the tools we design. In this paper, we interrogate recent debates surrounding HCD's increased focus on participatory methods. We critique and redefine perceptions of the designer as both a creative auteur and facilitator of participants' ideas by drawing insights from our own practice-led case studies.

We begin by providing an overview of the literature surrounding HCD processes, relationships and methods before presenting an account of the two case studies undertaken, respectively, in our masters and PhD design research. Set against the contexts of urban and organisational community place-making in the city of Edinburgh and the Glasgow School of Art, we concentrate firstly on our use of observation and visual documentation to externalise our initial encounters. We then explain how these images inspired our creation of an interactive activity pack and an observational logbook as participatory insight-gathering tools. Unpacking established conceptions of design probes, we discuss how these tools promoted participation remotely and in workshop and interview settings (Gaver et al. 1999, 2004; Mattelmäki 2006). We go on to suggest that by translating our subjective experiences into images and creating participatory tools, design students can reflexively negotiate their own positions in the field. This self-reflection can instigate engagement, dialogue and empathy to uncover qualitative intersubjective insights and inform an authentic HCD process.

### HUMAN-CENTRED DESIGN PROBLEMS: PEOPLE, PARTICIPATION, POSITIONS AND PROBES

The premises of an iterative HCD process are embodied in the UK Design Council's concepts of *transformation design*. Burns et al. (2006) assert that transformation design values interdisciplinary collaboration and stakeholder and user participation to address sociocultural, economic and political issues such as healthcare, environmental

sustainability, infrastructure, crime and education. However, these developments have been subject to much controversy in the design world itself, as Bedell points out:

We used to know what designers did. They understood the relationships between form and function, aesthetics and usefulness. And they produced stuff. People who do something rather different are now being hailed as the coming thing. The new stars of design work on rather nebulous, intangible things such as services and business models. They collaborate, so it's difficult to see where their authorship begins and ends. And their arrival has caused toxic shock to the design world, resulting in an awful lot of bad feeling. (2005)

Bedell underlines that the proliferation of HCD has been met with a degree of suspicion. She counters The Design Council's defence of a creative problem solving profession with concerns that such distinctions negatively skew perceptions of designers from creative experts who marry form and function to "organisational impresarios, or design catalysts" (Burns et al. 2006, p. 25–26; Bedell 2005). Furthermore, Steen interrogates confusions over the designer's role as both a practitioner and analyst and suggests that by acknowledging their impact in the field, designers can render access and communication with others more transparent:

I present HCD as fragile: I think that it can be beautiful and that it can break easily. Furthermore, I recommend that practitioners bear this in mind when they organise or conduct HCD. I recommend reflexive practice as a way for practitioners to be (more) aware of and (more) articulate about their own role and agency in their HCD practices. This would help practitioners to align their practice more closely with their intentions and with what HCD can be about. (2008, p. 17)

Bedell and Steen's comments are pertinent to our discussions of disciplinary definitions and interdisciplinary relationships. Writing with Manschot and De Koning, Steen (2011, p. 53) draws from Sanders and Stappers' premises of *co-design* to investigate how services are reconsidered from the perspective of users' experiences and stakeholders' logistical knowledge. In 1989, architects King, Conley, Latimer and Ferrari (1989, p. 7–8) utilised *co-design* to describe their environmental community consultation workshops. Stressing how the designer operates as a visual conductor, they discuss interpreting and sketching figurative visions of residents' insights and needs. As the following passage highlights, creative exercises can externalise residents' local knowledge and elicit design-led dialogue in an accessible way:

The point of the drawing exercise is to lessen participants' fear of plans, maps, and other drawings normally found in an architect's office. In addition, the participants then feel less inhibited to comment on each other's drawings and to evaluate the different lifestyles the maps portray. This emphasis on visualisation by drawing is user-friendly and encourages participation. (1989, p. 163–164)

Despite their recontextualisation of drawing practice in design, the architects' examples of urban regeneration through community participation serve to somewhat suppress the interdisciplinary adaptation of creative and visual methods. Hanington and Martin (2012, p. 54) have reassessed the growing landscape of HCD research and emphasised the benefits of using observation, brainstorming, personas, scenarios and prototyping in distinct stages of the design process. In their textbook directory of methods, they also advocate the *cultural probe's* agency as an innately subjective and projective tool that supports participatory exploration and innovation.

In 1999, Gaver et al. (p. 22) first described the sets of activity packages that they created and implemented in a series of community engagement sessions as cultural probes. Once provided with postcards, maps, diaries and disposable cameras,

participants were encouraged to interactively record aspects of their daily lives. This enabled the designers to collect a wealth of qualitative data to underpin their proposals for technological devices and systems (p. 27). Elaborating on his extensive applications of cultural probes, Gaver et al. (2004, p. 53–56) have since critiqued the method's adaptation by a multitude of research disciplines. Consequently, the designers express their concerns that the cultural probe has evolved from an exploratory device applied to apprehend participants' subjective experiences (defined as *probology*) to a specific tool deemed capable of answering the researcher's questions. In considering the interpretation of probe responses and their contribution to design solutions, Lucero et al. (2007) point towards some general misgivings and concede that "the large amount of data resulting from the probes may be perceived as fragmented, too detailed, or even sometimes irrelevant" (p. 383). Yet in evaluating participants' responses collected in their investigation of bathroom lighting systems, the design researchers recognise the probe's capacity to evoke participants' experiences, emotions and desires, thus suggesting requirements for the HCD process (p. 389).

We are inspired by the notion that probes foster relations between designers and participants whilst collecting experiential data through creative hands-on activities. However, reflecting on these debates, we propose that the designer's process of probe creation is underplayed due to an overarching concern that designers must remain objective facilitators to focus fully on users' needs (Burns et al. 2006, p. 26; Inns 2010, p. 25). To the contrary, we develop Mattelmäki's view (2006, p. 34) that as human-centred designers are actively involved in user engagement, their own subjective experiences cannot be divorced from the participatory process. We therefore suggest that elements of designers' personal and professional identities are inherent in the probes' visual and material formats and that these qualities can actively enhance social relations and insight-gathering.

In the following sections we describe the creative decision-making process that prompted our production of participatory tools. Design researcher 1 (DR1) outlines her use of observational documentation to subjectively examine her own perceptions of fear and safety in the city of Edinburgh. These encounters inspired an interactive activity pack made to explore the experiences of young people living in the city. Design researcher 2 (DR2) details how her sketches and notes made whilst participating in public tours of the Glasgow School of Art's Mackintosh building are deconstructed. Reflective drawing forms the basis of a logbook interview prompt used to examine visitors' behaviour and problems underlying the tour service. We go on to evaluate the nature of the insights and the level of information afforded by the tools.

#### FEAR AND SAFETY IN THE CITY: A DESIGN-LED EXPLORATION OF THE TEENAGE PERSPECTIVE

After initial background reading on social and cultural theories, area specific socioeconomic case studies, and crime and victimisation distribution case studies, DR1 began a series of observational routes around the city of Edinburgh. Through immersion in the research context, she aimed to gain an appreciation of the dynamics of a diverse range of neighbourhoods. By placing herself in a position of a *user* (the word user in this context describing a city resident), she wanted to highlight and challenge her own emotional and behavioural reactions and perceptions to semiotic cues in the external environment. All the observational routes were carried out by bus, enabling the design researcher to travel and observe safely, document through the use of photography and filming (where/when appropriate), and listen and interact with users. Appropriating the Lothian Bus route map (Lothian Buses 2012) to record her

journeys (See Figure 1), observation took place over four days, completing thirteen routes. DR1 designed an observational matrix tool (See Figure 2) through the use of music manuscript, providing a framework which documented:

- Start and end time
- Neighbourhoods travelled through
- Signals and cues (including sensual awareness of sight, sound and smell)
- Users
- Emotional responses at key points

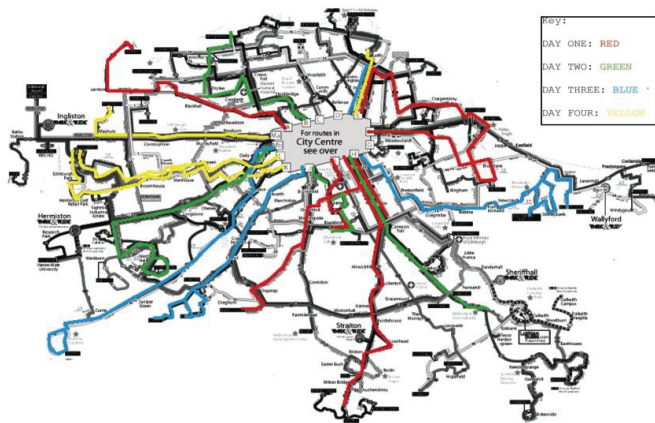


Figure 1. Lothian Bus Map. Used to document observational routes. Source: McAra 2012.



Figure 2. Notes from the Observational Matrix Tool. Source: McAra 2012.

After observation, DR1 identified two significant themes which informed the next stage of the investigation. A series of artefacts were designed as means of engagement with the chosen sample of participants. She created a pack of activities (See Figure 3)



which were given to ten participants (Group A) to be completed in their own time and environment. A similar pack (See Figure 4) was created to be used during insight-gathering workshops with two different participant groups (Group B and Group C). The activities were a collection of visual instruments and whilst her aim was to uncover insights into fear and safety, both packs had holistic qualities inviting participants to explore their sense and experience of community and home life.

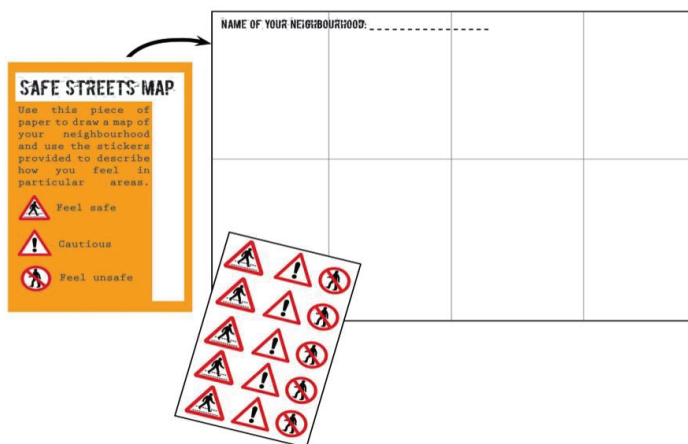


**Figure 3.** Pack of activities given to Group A. Source: McAra 2012.



**Figure 4.** Pack of activities used in workshops with Groups B and C. Source: McAra 2012.

The first observational theme was titled *Place and Person*. Here, DR1 had observed how user identity was projected, perceived and reflected in the physical environment. This inspired the activity of asking all participant groups to explore their physical *neighbourhood-scape*. Drawing a map and annotating with designed icon stickers highlighted areas where feelings of fear and safety were experienced (See Figure 5).



**Figure 5.** Neighbourhood-scape mapping. Source: McAra 2012.



During the workshops with Groups B and C, participants were encouraged to include objects, people, buildings, where they lived, local businesses, public spaces and street names. Modelling clay was provided for participants to build three-dimensional structures onto their maps. This process not only informed DR1 of how safe or fearful they felt in their neighbourhoods but also displayed cultural and social values and representations of their identity and personality. Group A was also asked to draw a map of their neighbourhood and annotate with stickers. Taken away and completed in the participant's home environment, this activity was supplemented with the use of a disposable camera and concept booklet (See Figure 6), asking participants to take photographs of:

- Where you feel safe in your neighbourhood
- Where you feel unsafe in your neighbourhood
- What does *community* look like
- The view from your bedroom window
- The front of your house
- A view of your street
- Your prized possession
- Your favourite place in your neighbourhood
- Your least favourite place in your neighbourhood
- The person you most trust in your neighbourhood



Figure 6. Camera Concept Booklet. Source: McAra 2012.

The second observational theme came under the heading of *Cues and Clues*. Throughout the routes, DR1 had marked on the matrix moments where she had felt a shift in emotions and attempted to reason this change through pinpointing particular phenomena observed at the time and interrogate their meaning. DR1 was interested to include the concept of stereotyping in the research packs, as a means of uncovering how and why participant's perceptions of fear and safety were formed. She created a set of *perception prompt cards* (See Figure 7) – a series of small cards with images from photographs she had taken during observation. Through digitally editing the photographs, DR1 created stylised representations of, what could be argued as, stereotypes including: objects, personas, transport, and other aspects of youth culture. This activity, which was completed by Groups B and C during the workshops, facilitated

discussions on what, where, how and particularly why, stereotyping informed their perceptions, affecting behaviour and emotions.



Figure 7. Perception Prompt Cards. Source: McAra 2012.

A final activity completed by all three participant groups was a dictionary style profile booklet (See Figure 8), designed to gain an understanding of how the participants interpreted the key words (*fear, safety, community and wellbeing*) that framed the project's brief. Words can mean different things to different people, having personal connotations and associations. Enquiring about participants' experiences and knowledge, DR1 created a platform for them to set the interpretative framework for their stories, experiences and opinions to be viewed through.

<b>SAFE STREETS DICTIONARY</b>	Name:	SAFETY:
	Age:	
	Words can have different meanings to different people.	FEAR:
	Please write or draw your definitions of the following words and what they mean to you:	COMMUNITY:
		WELL-BEING:

Figure 8. Dictionary Tool. Source: McAra 2012.

The overall holistic nature of both engagement packs, inspired by observational reflection, was a conscious effort to encourage participants to explore aspects of their lives where fear and safety could be experienced, as DR1 had experienced first-hand during observation and as a user herself.

### *Project Outcome: giving young people a voice*

Whilst the overarching focus of the project was on fear and safety, DR1 identified an underlying issue surrounding participants' frustration and resentment caused by a lack of representation. The insights described illustrated that these young people

encounter many adversities in their community and neighbourhoods but felt powerless to voice their experiences and concerns. As a result, the participants had sought their own means of embracing adversities, through either a developed *make do and mend* tolerance (particularly prevalent with the youngest participants), or through displaying resistant rebellious behaviours (more so with the older participants). Through further research into young people's political representation in Scotland, DR1 discovered that whilst the age of criminal responsibility is eight years old, young people, particularly those under the age of sixteen, are not offered engaging platforms to inform decision-making on both a local and a national political level. Insights on participants' negative relationship with authority figures such as the Police revealed a further dimension which influenced DR1's final design outcome. DR1 recognised an opportunity to design a tool and service for young people that would facilitate a dialogue between them and policy-makers (and other stakeholders) and promote insight into the real cultural experiences of young people today. This opportunity took the form of a designed alternative campaigning device aimed at giving this underrepresented group in society a voice.

Having set out the stages of observation, tool creation, use and interpretation in DR1's study, we now account for how this methodology is adapted DR2's investigation.

Building on Observations: visualising, reflecting and constructing the GSA user experience

Built in 1909 by Modernist architect Charles Rennie Mackintosh, The Glasgow School of Art's (GSA) main building (*the Mack*) remains an architectural icon housing fine art students and academic and support staff. The buildings adjacent to the Mack were demolished in 2011 to make way for a new School of Design. In the meantime, staff and students have relocated to *Skypark* – a commercial building situated one mile west of GSA's main campus. Promoting visitor access amidst the construction work, *GSA Enterprises* train students as guides whilst conserving the fabric of the Mack and sustaining its primary use as a working art school (The Glasgow School of Art 2012). These varying functions and associated users inspired DR2's selection of GSA as a context to examine design-led approaches to organisational place-making. Here she aimed to better understand how the designer's creation and use of participatory tools can inform insight-gathering, dialogue, roles and relationships.

To begin to investigate the daily experiences of the Mack's multiple user groups, DR2 adopted the position of a participant observer on five public building tours. Her objective was to experience the tours first-hand whilst absorbing the Mack environment and the visitors' behaviour. Through making drawn and written field-notes, she documented the guides' spoken commentary, visitor demographics, movements, questions, comments and interactions. Figure 9 shows an example page of notes to demonstrate her divergent investigation and intuitive assembly of text and sketches.



Figure 9. Observational field-notes: tour three, stage six. Source: Broadley 2011.

DR2 recognised patterns and themes emerging from her observations through a stage of experiential and reflective drawing. In making ten collages, she depicted the stages of the tour and the information presented by the guides. These multi-layered visualisations connected the sensory spectacle of the Mack to the visitors' movements (Figure 10).



Figure 10. Viewing the exterior. Source: Broadley 2011.

Focusing on behaviours, she interrogated visitors' actions such as pointing, touching, listening and looking and unpacked her observations of rule breaking in fourteen line drawings, an example of which is shown in Figure 11.

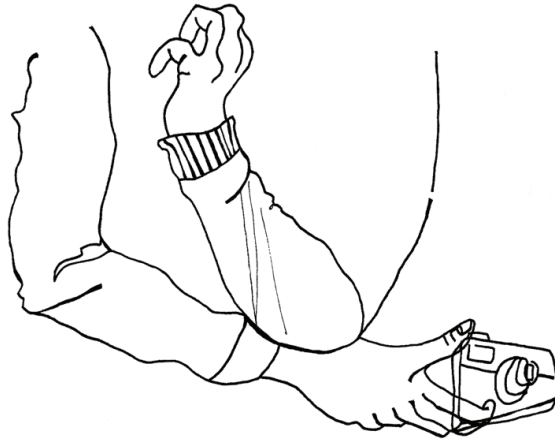


Figure 11. Interior photography. Source: Bradley 2011.



Figure 12. Helpful staff. Source: Bradley 2011.

In a further eight drawings DR2 explored a range of positive and negative interactions between visitors, students and staff. Figure 12 illustrates her representation of the Mack as a landscape encompassing digitally drawn characters while speech bubbles and text boxes contribute an additional level of narrative. As Figure 13 shows, she made six diagrammatic drawings to examine foreign visitors' behaviour and the problems implicated by language barriers.

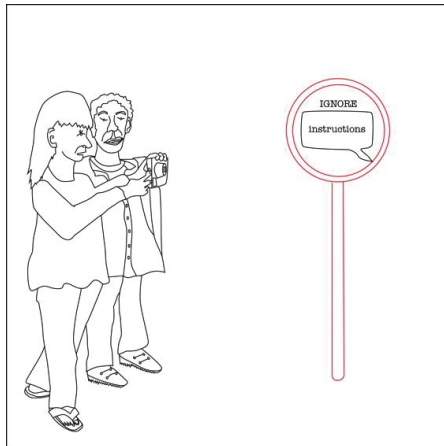


Figure 13. Visitors ignoring instructions. Source: Broadley 2011.

She then photographed customised *LEGO* figures as users situated against the Mack backdrop. By contextualising these scenarios with her interpretative written narratives as in Figure 14, she considered the needs of the building's diverse user groups and identified problems arising from the tour format.



The girl in the middle of this photograph is a first-year fine art student. She moved to Glasgow from Newcastle in September and is very excited to be studying in an institution with such a positive reputation. She has been set her first project to produce a series of

Figure 14. The fine art students. Source: Broadley 2011.

Echoing DR2's immersion in the field and her perceptions of the current user experience, the collection of drawings comprised a combination of media and styles derived from her established visual practice. They were not, however, solely personal expressions, but *problematizations* of observed and experienced social events. As such, she explored how the drawings could facilitate a discussion of the building and service from a stakeholder perspective.





Figure 15. *Building Observations: investigating the visitor service and user experience of The Mackintosh Building in The Glasgow School of Art – format and layout.* Source: Bradley 2011.

She carried out an interview with two members of GSA Enterprises' (tour coordinators A and B) to gather their insights surrounding the building's functions and identify opportunities to enhance the visitor experience. In preparation, she designed an observational logbook to use as a visual prompt (Figure 15). Mimicking the familiarity of the sketchbook and evoking her roles as a student user and design researcher, she positioned her drawings on pastel blue lines, captioned them with titles and hardback spiral bound the pages.

Two weeks prior to the interview, DR2 gave the tour coordinators each a copy of the logbook and a packet of *Mack-it notes*. These paper squares, seen in Figure 16, featured an illustration of the design researcher posing qualitative questions concerning their daily encounters with the building. A blank speech bubble was provided on the reverse for their responses. She encouraged them to examine the logbook and questions, write their responses on the *Mack-it notes* and attach them next to related drawings. This combination of tools allowed the exploratory conversation to be structured by DR2's drawings and questions but led by the tour coordinators' experiences and expertise.



Figure 16. Mack-it notes. Source: Broadley 2011.

### *Re-designing the Mack: interpreting insights and students as users*

The interview began with an examination of the construction work and its affect on the daily operations of the tours. In relation to the scenario depicting a group of builders working outside the Mack (Figure 17), tour coordinator B explained that she regularly undertakes a route check to determine any inaccessible areas and ensure the tour groups' safety. In her corresponding Mack-it note, she alluded to the student guides' dual identities and emphasised their responsibility to contextualise the significance of the architectural conservation to visitors.





evaluations, we appreciate the probe method's contribution to HCD participation, but argue that the designer's initial inspiration and critical interpretation are equally pivotal. As such, we return to our creative processes of designing the tools. Originating from our stages of observation, we propose that empathy, understanding and dialogue are promoted when human-centred designers assume the position of users. Moreover, by visualising their own experiences and knowledge in the creation of probe-like tools, designers can devise responsive ways to gather and evaluate the insights of others.

### *Modes of engagement*

We can identify similarities and discrepancies between our parallel uses and interpretations of our tools. DR1 sent the pack to Group 1 and asked them to complete it autonomously in their own environments. She simultaneously employed a similar pack in the facilitated workshop with Groups 2 and 3. DR2 gave her expert stakeholders the logbook and Mack-it notes prior to the interview to allow them to absorb the concepts visualised in her drawings. Their written interpretations were then employed to structure the interview discussion. In each of our studies, and building on Gaver's (1999; 2004) original cultural probe method, we refer to the tools given to participants to complete independently and in the absence of the designer as *remote probes*. When accompanying the designer in a workshop or interview setting, we found that facilitation and participation were enhanced through the presence of what we term *direct probes*.

By visualising the behaviours of visitors, students and staff, DR2 communicated her perceptions of problems arising from the tour service to the tour coordinators and promoted their individual reflections and responses through the Mack-it notes. Upon embarking on the interview, DR2 found that while tour coordinator B compared the issues conveyed in the drawings to her own experiences and recorded her thoughts through writing, tour coordinator A returned her annotated notes to their packet without connecting her insights to the content of the images. This indicates the difficulties in encouraging participants to engage with remote probes when the design researcher is not present to reiterate the purpose and process. Recalling the misgivings of Lucero et al. (2007, p.383), the remote probe responses alone were one-dimensional and insufficient. Yet by using the logbook and Mack-its in the interview to contextualise and co-evaluate her observations, DR2 uncovered additional rich insights regarding the tour's limited provisions for child, infirm and foreign visitors.

As a result, the central position of the logbook as a direct probe instigated a collective dialogue quickly as the tour coordinators verbally supplemented DR2's accounts with insider information.

Mattelmäki and Battarbee (2002, p. 268) suggest that the visual and material character of *empathy probes* stimulates social relations and an open dialogue in the design process. Assessing the probes' participatory applications, Graham and Rouncefield (2008, p. 196) consider how discursive participation can build relations between designers and users, investigative participation supports users in examining their daily experiences, and reflective participation encourages their communication of insights through their direct annotation of material artefacts. Combining remote probes and direct probes enriched our engagement with the participants, not simply by helping us collect their written and drawn accounts of everyday life, but by structuring and contextualising our interactions and fostering a sense of mutual understanding. This foregrounds the empathic and imaginative elements of participation that our probe creation, use and interpretation helped harness.

### *The designer as interpreter*

Our processes followed the premise that design opportunities and solutions should respond to the serendipitous information we uncovered and the decisions we made while moving between geographic, sociocultural and professional territories. Graham et al. (2007, p. 34) maintain that feelings of ambiguity and uncertainty are inherent in probes-based studies and that through the consensual working out process, diverse and surprising solutions can be generated from probe responses. This perspective is informed by and substantiates the notion that probes do not claim to discover a chain of factual evidence regarding participants' experiences and needs. To agree with Gaver et al. (2004, p. 53), the probes' exploratory nature promotes a combination of both ambiguous and prescriptive questions to help designers extrapolate fragmentary clues to frame and shape their resulting solutions.

DR1's proposals for a means of consulting marginalised young people and the insights and prototypes that emerged in DR2's study can be traced back to the participants' contributions in the workshop and interview, their interactions with the probe materials and the content and quality of their responses. This points towards the intersubjective process by which the collective experiences of designers and participants determine the direction and outcomes of HCD. In recounting their participatory design workshop with groups of teenagers in Hong Kong, Ho and Lee (2012, p. 74–75) deem intersubjective participation as achieving empathy with users and thus, capable of creating solutions that respond closely to their needs. Cementing the use of probes to stimulate empathy and the development of design solutions, it therefore follows that "designers need both information and inspiration to be innovative, in that sense all the user data should not be cut up into small dry facts" (Mattelmäki and Battarbee 2002, p. 270). To arrive at our solutions, we pieced together each participant groups' responses and supplemented these with our own subjective experiences.

### **The designer as visualiser and maker**

Returning to the implications of probe creation, we suggest that the designer acknowledges and negotiates their subjective understandings of the research context in the initial stages as an authentic starting point. In our studies, we found observation an intuitive technique to absorb and document our encounters while immersed in each environment.

DR1 created tools in response to the themes derived from the observational matrix and photographs. Whilst travelling through specific areas she recorded personal feelings of fear and intimidation, as well as feelings of safety and security. Questioning whether external perceptions of particular districts created some form of reputation which residents felt they had to uphold or conform to; DR1 was inspired to question how the participants' identities were formed and perhaps mirrored in their external environments. A further example of this reflection was in the construction of the second observation theme (*Cues and Clues*). Highlighting phenomena during the routes which precipitated emotional and behavioural change, DR1 questioned her own social and cultural values that were being translated through her perceptions, associations and stereotyping. This informed the activity of identifying and challenging clues which participants associated with fear and safety.

In DR2's study, the rules of the Mack tours state that interior photography is not permitted. These constraints drove DR2's broad-brush act of sketching and note-taking

in the initial tours and her convergent investigations of visitor behaviour and unmet needs in the final tours. She then reflected on the data contained in these field-notes to create her cartoon-like representations of interactions between people and spaces. The tensions surrounding the building's use as an art school on one hand and a museum on the other are evident in the images and result from her experience as both a student at the school and as a visitor on the tours. DR2 recognises that her drawings may be perceived as critical of the tour service and resentful of the visitors' presence, but suggests that intersubjective authenticity and rigour are reinforced in exploratory HDC research when personal biases are externalised and subsequently challenged.

## **The designer as user**

Advancing the Design Council's premise that designers should imagine themselves as product and service users and "eat their own dog food" (2007 p. 22–23), we maintain that a greater degree of empathy and understanding are reached and solutions are more sensitive to users' needs when designers recognise their subjective experiences. Regarding the design researcher's input and impact, reflexivity functions "as a way to constructively combine practice and analysis and to be honest about my [their] dual role of working in as well as studying the project" (Steen 2012, p. 69). Such roles occasionally became confused during our studies as we moved between studio-based creation and participatory fieldwork.

DR1 concedes that she strived to create an objective form of tool, removing herself from the designer-user equation by asking participants to define the concepts and terms that she assumed were central to her study. However, she notes that in the workshop, the participants themselves forged empathy. When struggling to answer certain questions or define key terms such as wellbeing, DR1 was asked to give examples, definitions and experiences from her own life. Through DR1 displaying compassion and gaining trust, her subjective involvement rendered a deeper, more insightful understanding, creating a dialogue where participants felt comfortable, safe and relaxed to divulge their personal experiences. In stark comparison to the rich, in some cases highly metaphorical insights gathered during the workshops, participants of the remote probe provided very literal responses with no real reflection, personal meaning or context.

Conversely, DR2 actively included her own subjective perceptions in the drawings in an attempt to negotiate an intersubjective discussion. In the interview, the staff members consistently drew from their experiences of working in the Mack as a form of response to the visible display of DR2's insights. The contrasting tones of DR1's open-ended questioning and DR2's personal visualisations of problems echo the varying relationships formed during the workshop and interview. While the group of young people and DR1 entered into a shared dialogue of mutual experiences, DR2 encountered a separation between herself as a student and the tour coordinators as staff members.

These insights confirm the influence of reflexivity and intersubjectivity when designers attempt to engage with participants through images and artefacts. As such, Inns' (2010, p. 24–26) conceptions of the designer as a negotiator of value, facilitator of thinking, visualiser of the intangible, navigator of complexity, mediator of stakeholders and coordinator of exploration remain evident in each of our studies. We framed sociocultural problems surrounding fear and safety and organisational imbalances with the goal of enhancing participants' lives and promoting innovative change. Our

observational practices helped us unpack these problems and begin to condense complex ideas into tangible insight-gathering tools. The negotiator-facilitator-visualiser role prevailed during our creation, use and interpretation of the probes while our positions as mediators and coordinators became particularly apparent in the project planning, logistical and participatory stages of the projects.

#### MAKING AND USING PROBES TO SHARE HUMAN-CENTRED KNOWLEDGE: WHAT'S THE BIG IDEA?

As the development of HCD continues, methodological innovation follows on naturally from methodological inspiration. The personalised qualities and bespoke applications of our remote and direct probes correspond with a need to blend methods that are at once conventional and game changing; rigid and imaginative; verbal and visual in order to enrich engagement, participation and insight-gathering. Visualising our own experiences renders them more concrete and those of participants can be considered from a more tangible standpoint. Participants are invited to confirm or refute the designer's assumptions. To develop previous deductions on visual and creative consultation techniques (King et al. 1989, p. 163–164), the probes' presence as an additional *participant* reduces inhibitions as ideas are mediated and translated through their materiality.

We drew from our own experiences to construct questions and imbue our tools with distinct visual styles. As a form of visual hypothesis, the probes waited patiently to be adjusted and amended through participatory activities. They were written on, drawn on, pointed at, picked up, talked about, criticised, celebrated and ultimately, witness to a complex intersubjective dialogue. The inquisitive probes gathered rich, interpretative evidence to underpin our design processes and solutions. This acknowledges the synthesis, interpretation and reconsideration of our insights as reflexive designers in tandem with the first-hand experiences of our participants. Our probe creation supports the degree of rapport, communication and collaboration needed for an effective HCD relationship.

Responding to Bedell and Steen's concerns (2005; 2008), we believe that reflexive visualisation and tool creation go some way to alleviating the fragility and intangibility of HCD. This positions the probes at the nexus of experiential exchange and knowledge sharing. Our processes suggest that human-centred designers can not only retain their creative, visual integrity, but that these traditional skills are increasingly pertinent in enhancing participatory engagement and achieving clarity as the discipline advances.

To obtain intersubjective empathy and authenticity through participatory activities, we urge students to acknowledge and interrogate their positions as both subjects and objects during the early stages of HCD exploration. At the same time, we ask design educators to accompany us in redefining the boundaries of HCD methodology by encouraging a less rigid approach to the selection of insight-gathering methods. When devising participatory strategies, we recognise the complexity attached to each unique sociocultural setting and endeavour to create bespoke tools and techniques. The level of visual connotation embodied by the logbook, for example, is an unsuitable way to engage with the young people from Edinburgh and the interactive, playful nature of the packs may not have generated useful insights from the GSA staff. The specificity required when designing probes supports our recommendation that designers immerse themselves in the field, become users, simultaneously reflect on their experiences and their observations of others, and gain an authentic understanding of the context for themselves. We propose that our subversion of established tools and techniques

reveals a reflexive and empathic role for the designer. By integrating their perceptions, feelings and emotions into visual and material insight-gathering tools, design students can elicit a holistic and rigorous human-centred dialogue.

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## Pedagogy for teaching design – with an emphasis on sustainable design

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**Abstract:** *Teaching sustainability is not solely a question of providing relevant information; it is foremost about training students to meet the challenges of tomorrow. In design this can mean to shift the focus from material, form and function towards systems, correlation and time – a process supported both by how we teach as well as what we teach. But pedagogy still seems to be treated like a poor cousin to the more important design knowledge. This made us curious about the correlation between pedagogy and teaching design for sustainable change.*

*By applying a study of Eilam and Trop (2011) onto the curriculum of an undergraduate design programme and through interviews with students we investigated the underlying pedagogy. Eilam and Trop had identified four pedagogical components that supported a holistic learning experience in their study.*

*It proves more fruitful to incorporate sustainability wholeheartedly in a programme, instead of teaching it as a separate course. Pedagogies like emotional learning in realistic design projects and multidimensional learning in theoretical courses support an education for sustainable change and prepare students to meet the challenges of tomorrow without missing their professional development.*

**Keywords:** *Sustainable Design, Pedagogy, Design Education*

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## Introduction

Since 1991 the School of Design at Linnæus University has offered an undergraduate design programme training general design skills and methods with an emphasis on sustainability. The curriculum for this programme slowly evolved through the engagement of associated staff made up of designers, architects and academics from the field of cultural studies/ art theory. They were driven by a belief that the traditional design curriculum had to change in order to prepare students for a future that would demand them to think more holistic and resourceful.

Throughout the years the programme has faced both praise for implementing a needed and unavoidable shift in the traditional design curricula, as well as harsh criticism for moralising and failing to prepare students for the design profession. We became curious if this is actually true, feeling the programme trained valuable design skills as well as implemented changes that not just characterise a good design education, but a good education in general.

Teaching sustainability is not solely a question of providing relevant information for students; it is foremost about training students to meet the challenges of tomorrow. In design this can mean to shift the focus from material, form and function towards systems, correlation and time as well as about developing an attitude and behaviour towards a more sustainable future. This process is supported both by how we teach as well as what we teach. But pedagogy still seems to be treated like a poor cousin to the more important design knowledge.

In our paper we investigate methods and approaches employed at the design programme to reflect on the underlying pedagogy used in teaching sustainable design. Our goal was to identify both strengths and weaknesses and to discuss if the skills really differed so widely from „traditional“ and „important“ design skills.

## Background

### *Sustainability*

The term sustainability refers to a general ability to sustain, to endure over time. Since 1980 the word has been used with a more environmental/ecological connotation leading to the most quoted definition of sustainability: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” which was first published in the report “Our common future” by the Brundtland Commission in 1987. Sustainable development has three dimensions: people (social), planet (environment) and profit (economic) (Chicks & Micklethwaite 2011).

Advocacy for sustainable development is the result of a growing environmental awareness, acknowledging that we humans take a much greater toll of the earth than the ecosystem can handle. Right now we are facing the challenge of population growth, the impoverishment of the ecosystem and climate change (Rockström, Klum 2012), risking the ecosystem we depend on (Thorpe 2007, 23).

Sustainability is a complex and complicated issue and the definition of sustainable development is not one that is generally agreed on (Chick & Micklethwaite 2011; Manteaw 2012). Some even accuse the term of giving an illusion of false understanding, comparing it to Orwell’s Big Brother “Newspeak” (Wals & Jickling 2002), by cutting down the amount of words to express something to a minimum and by doing so trying to diminish the range of thoughts.

Definitions like “Sustainable development refers to a development that creates (or protects) environmental, economical and social conditions that will support human well-being indefinitely” (Thorpe 2007; Chicks & Micklethwaite 2011) blur that even today with our unsustainable lifestyle we are not able to ensure conditions that support human well-being. The term also gives the illusion that we have all agreed on what to sustain (sustainability is largely based on Western needs and values (Manteaw 2012)) or that sustainable development after all is possible. The term development is after all rooted in our economic system that depends on constant growth.

Still we easily agree that the core idea of sustainability is valuable and worth striving for, even if its complexity implies that it will not be an easy task. Sustainable development often means to find a solution that causes the least harm, and not to find the perfect solution. This is often made difficult because the three pillars of sustainability people, planet and profit seldom can be satisfied at the same time. “Sustainable development requires an understanding of the complexity of the global ecosystem and of creative problem-solving to find solutions for wicked problems” (Murgatroyd 2010 in Sahlberg & Oldroyd 2010).

## *Design*

The common understanding of design is influenced by its countless use in every day lives. From hair design to home decoration design is presented as something concerned with beauty and fashion. But design is the core of being human, it is our activity of forming our existence and everything we surround us with, and by doing so influencing our well-being and quality of life. But the word design lacks a clear definition. “Design is to design a design to produce a design” shows that design can refer to (a) a noun indicating a field, (b) a verb indicating an action or process, (c) a noun meaning a concept or proposal or (d) a noun meaning the finished product (Heskett 2002).

Design is usually applied to improve the chance and success of a product on the market, improving sales and economic growth. Ideally design is meaningful, functional and enriches our life, but design can also be used to produce shallow gimmicks that respond to an illusion of wealth. Instead of satisfying needs, it is fuelling a desire for more. By using resources, shaping the production processes and influencing the afterlife of a product, e.g. if it will be recyclable or if toxics will leak into the environment once it has landed in a landfill, design has a huge responsibility for the environmental impact of a product. “Eighty percent of the environmental impact of the products, services, and infrastructure around us is determined at the design stage” (Thackara 2006).

Design has been criticised from within its own profession for many years. Victor Papanek urged designers to re-think their doing in 1971: “There are professions more harmful than industrial design, but only a few of them.” And before him many others had warned for finite resources and the negative impact of our doing. Criticism and a rising concern for the environment resulted in changes in the traditional design disciplines. New movements like Green Design (usually focusing on one ecological impact), Ecodesign (which considered the whole product life cycle), Corporate social responsibility (voluntary ethical behaviour of companies), and the more recent movements like Design for Sustainable Change, Transitional Design and Metadesign evolved. (Thorpe 2007; Chicks & Micklethwaite 2011; Burns, Cottam, Vanstone, Winhall 2006) Many advocates believe in designs ability to find alternatives to our unsustainable way of life and its ability to contribute the welfare of humankind (Barnwell 2011; Chick 2000; Heskett 2002; Margolin 1998; Thackara 2005; Thorpe

2007). And designers themselves realise that the design process concerned with creative conceptualization can be equally well used for designing intangible outcomes like experiences, behaviour or services.

### *Design education in higher education*

Design education is traditionally a practice-orientated education (Chick 2000, 164). Its curriculum is usually regulated and monitored by national agencies for higher education. In general students at undergraduate level are more or less introduced to the following skills and knowledge:

- different ways of visualisation (both two- and three-dimensional) including skills like drawing and modeling.
- basic elements of design like colour, form and material.
- an introduction to the design process which includes the ability to identify, formulate and solve problems by using appropriate methods.
- an introduction to design history, - theory and the cultural context of design.

Students are encouraged to develop their own artistic self, to experiment and to critically reflect on their role.

Because of the practical nature of design, it is important that students work on practical projects to train all elements of a design process like (a) an research phase in which information collected through research like literature, observation and dialogues with participants and producers; (b) an idea and experimentation phase and (c) an production phase in which the final design is produced (by hand, in a factory, through roll play and so forth). Besides practical and theoretical knowledge the student needs to be able to judge and make decisions, handle time allocation and focus and have a maturity in artistic expression. Ideally all projects done in higher education should also include (d) a phase of evaluation and reflection, where the project is presented, analysed and seen in a larger context.

Design education and what design can be has evolved during the years to become more complex, responding to a changing situation in the market (digital revolution, evolution of new economies and services, criticism for unsustainable doing) as well as due to an attempt to gain more recognition within the academic world. (Chicks 2000, 164; Chicks & Micklethwaite 2011).

Nowadays traditional programmes like Industrial Design, Graphic Design, Interior Design are supplemented by programmes teaching Design theory, Design philosophy, Strategic Design, Service Design, Experience Design, and especially design programmes that respond to the sustainable challenges that lay ahead (Savannah College of Art and Design, University of Brighton, Linneaus University) or programmes that work with concepts like Social Responsive Design (Central St. Martins, Design against Crime), Transformation Design (Design Council UK) or Metadesign (Goldsmiths) - to name just a few. "There is a growing demand for design graduates and researchers with specific environmental knowledge and skills" (Chick 2000, 163).

#### DESIGN EDUCATION VÄXJÖ

The design programme at Linnæus University is 3-year long bachelor programme in design on an artistic basis. The programme was started in 1991. It is based on a human-centered approach and offers a broad foundation in design with the option for students to engross individual interest in product design, visual communication, service design or other design fields – with a focus on sustainable development and human well-being.

The education focuses on training the basic skills, tools and methods during the first three terms, whereas the last three terms the students are mainly practising and expanding their knowledge in projects run in cooperation with the surrounding society. The practical courses always contain a certain amount of lectures, workshops, literature studies and tutoring. Every practical course ends with a presentation followed by a discussion. Some courses include field trips, group work and written reflections. During all six terms shorter courses address theoretical issues through literature studies, lectures and discussion. In case of Design, Art and Science a connection between theory and artistic expression is trained.

<b>Year 1_Fall</b>	<b>Design and Configuration</b> · Form and Content (7.5hp) · Form and Configuration (7.5hp) · Form and Communication (7.5hp)	· Designhistory I (4.5hp) · Design, Art and Science I (3hp)	theoretical courses
<b>Year 1_Spring</b>	<b>Design and Human Being</b> · Human being and artefacts (9hp) · Human being and identity (6hp) · Human being & human needs (9hp)	· Designhistory II (3hp) · Design, Art and Science II (3hp)	
<b>Year 2_Fall</b>	<b>Design and Production</b> · Form, Material and Production (18hp) · Form and Context (6hp)	· Culture Studies I (3hp) · Design, Art and Science III (3hp)	theoretical courses
<b>Year 2_Spring</b>	<b>Design and Designprocess</b> · Process and production (4.5hp) · Design process and industry (9hp) · Design process and society (9hp)	· Culture Studies II (4.5hp) · Design, Art and Science IV (3hp)	
<b>Year 3_Fall</b>	<b>Design for sustainability</b> · Design & sustainable development I (4.5hp) · Design & sustainable development II (7.5hp) · Design & sustainable development III (12hp)	· Culture Studies III (3hp) · Design, Art and Science V (3hp)	practical courses
<b>Year 3_Spring</b>	<b>Design and Designfields</b> · Independent work (22hp)	· Culture Studies IV (3hp) · Design, Art and Science VI (4.5hp)	

hp (högskolepoäng) = credits  
1.5hp = one week of studies.  
30hp = one term

Figure 1 The programme and its practical and theoretical components

### Year 1

Term 1 consists of an introduction to design, with a focus on composition, design tools and design history knowledge. Term 2 includes people's needs and the significance we attribute to products.

### Year 2

Term 3 deals with product manufacturing from a sustainability perspective. Term 4 focuses on the design process and student's individual orientation.

### Year 3

During Term 5 students engage in practical projects following their own specialisation, supported by more theory and tools for a sustainable development. During term 6 the students carry out an individual project. Design theory and methods are integrated elements in the courses, relating both artistically and scientifically to the

subject of design.

### *Pedagogy and higher education*

Educational science or pedagogy is concerned with how teaching and learning can take place under optimal circumstances – both from a theoretical and practical point of view. It is a discipline going beyond traditional subject boundaries. Learning involves three parties, the teacher, the student and the subject. All the three parts as well as the surrounding environment and society influence and colour the learning process in their way. Each teacher's pedagogy is and should be a result of his or hers personal view on knowledge, ethics, human beings in general, society and the teaching situation. It is the teacher's task to guide and stimulate a student to develop and to continue to develop by him- or herself (Stigmar, 2009).

Education can be seen as transmissive, which means education is used to pass on facts, skills and values to an inferior learner or it can be seen as transformative, which means knowledge and understanding are co-constructed within a social context (Wals & Jickling 2008). The classroom, in the view of Progressivism's most influential theorist, the American philosopher John Dewey, was to be a democracy in microcosm". "Dewey believed that learning is a wholehearted affair; that is, you can't sever knowing and doing, and with cycles of action and reflection, one's greatest learning occurs.

Those thoughts are today recognised in Swedish higher education. Higher education is supposed to not only support the gain of professional knowledge, but to offer the student the chance to grow personally and as a citizen. Chapter 8 of the Swedish law for higher education (Högskolelag) states that higher education should help students to do independent and critical judgements, to identify, formulate and solve problems and to be able to meet changes during their professional life. Students should develop the ability to search and judge information, follow new development and should be able to exchange knowledge with people outside their own profession.

#### ESD PEDAGOGY

The public debate about the need for change has resulted in an emphasis of the importance of Education for Sustainable Development (ESD) by the UNESCO. The UN Decade of Education for Sustainable Development (2005–2014) emphasising that education is an indispensable element for achieving sustainable development and that sustainability ought to be included into higher educational curriculum.

ESD is an approach to learning that "enhances the capacity to cope with uncertainties inherent in a complex world that is facing unprecedented challenges" (Jones, Trier & Richards 2008). The UNESCO has given schools and universities a leading role in preparing the upcoming generation for the sustainable challenges that lay ahead. "ESD promotes efforts to rethink educational programmes and systems (both methods and contents) that currently support unsustainable societies. ESD affects all components of education: legislation, policy, finance, curriculum, instruction, learning, assessment, etc. ESD calls for lifelong learning and recognises the fact that the educational needs of people change over their lifetime..." (UNESCO, 2012)

"The global environmental and social challenge is a crisis of values, ideas, perspectives and knowledge and is thus primarily a crisis of education (Marinova & McGrath 2004). We still employ the same pedagogy that was prevailing during the time the environmental crises developed (Eilam & Trop 2011, 43). Albert Einstein stated: "The significant problems we face cannot be solved at the same level of thinking we used when we created them."

## Methods

Teaching sustainability is not solely a question of providing relevant information; it is foremost about training students to meet the challenges of tomorrow. We expect this process to be supported both by how we teach as well as what we teach, but pedagogy still seems to be treated like a poor cousin to the more important design knowledge. We therefore chose to look closer at how those challenges of teaching design for sustainable change are addressed at the design programme, an undergraduate programme with a specialization in sustainability.

Our key research questions were (a) to investigate how pedagogy and teaching design for sustainable change are linked. What kind of pedagogy supports the education of design specific sustainability literacy? And (b) to see if and how this pedagogy was implemented in the above mentioned design programme. We hope to be able to identify both strengths and weaknesses, and to identify areas for improvement.

As part of our process we based our research first on literature studies to see what has already been said about sustainability and pedagogy. An analyse of ESD pedagogy's by Eilam and Trop (2011) proved especially interesting and we used their four essential components to analyse the curriculum of the design programme. This analyse was combined with our own observations and answers we received from 12 students in their 6th term (= the whole class) about how they judged their own education regarding design and sustainability. The question can be divided into following categories: Questions regarding knowledge like facts and keywords, questions regarding sustainability, questions regarding reflection and implementation/ actions for sustainability. The questions were sent by mail and seven out of twelve students answered. Six mailed back their answers and one gave the answers orally. We asked:

Questions regarding knowledge like facts:

- What courses have conveyed knowledge of sustainable development, keywords, the current development and debate?
- What courses have conveyed knowledge about materials and life-cycle analysis?

Questions regarding sustainability:

- What courses have contributed to your understanding of the environmental context of design?
- What courses have contributed to your understanding of the social context of design?
- What courses have contributed to your understanding of the political context of design?
- What courses have contributed to your understanding of the economical context of design?
- Were you familiar with the concept of "sustainable development" before your education at the Linnæus University?

Questions regarding reflection:

- What courses have questioned the concept of sustainability?
- Will design have an impact on sustainable development?
- Has your view on "sustainable development" changed during your education?

Questions regarding implementation:

- In what courses have you been able to use your knowledge about sustainability in realistic and substantial projects?
- What courses have focused on increasing your artistic capability?
- In which courses have you worked in interdisciplinary groups?

In the end of this process we also highlight certain courses that in our eyes support an education for sustainable development. Hopefully those examples can be of interest for others of how design and sustainability can merge.

We have tried to be objective in our selection, but the fact that we teach at this programme puts us in risk of being biased. At the same time it gives us an insight into the programme that can't be gained from looking at programme or course syllabuses. We still hope that this research gives some insight and raises questions about the pedagogy used to teach design for sustainable change.

## Result

### *Design skills to face the challenges*

Higher education has an important role to play in preparing students for the challenges that lay ahead and to support them in their development towards responsible global citizens and professionals (Chick 2000, 161-162). For a design education this means providing students for example with the following knowledge and skills:

- Students need to know facts and terminology to start with. They should be able to understand ongoing debates, to identify sustainability problems and to show awareness for the political and legal framework (Chick, 2000, 163-166).
- Students need to learn about tools and techniques, that help to make sustainable decisions like life-cycle analyse and the use of dialogue (Chick 2000, 168) and cooperation (Sahlberg & Oldroyd 2010, 288) as support in a design process. Sustainable development requires also an understanding of the complexity and interdependence of global problems and the need of creative problem-solving to find solutions to "wicked problems" (Chick 2000, 165; Sahlberg & Oldroyd 2010, 288).
- Every change starts with oneself and education should help students to unlearn their own unsustainable way of living (Manteaw 2012; Chick 2000, 167). Ideally the education supports the "acquisition of responsible environmental behavior and supports "active citizens participation" " (Ballantyne & Bain 1995, 293; Eilam & Trop 2011, 45)
- Besides envisioning a more sustainable future it's important that students take actions towards desired futures (Kagawa 2007). Design enables to envision the future and to see solutions that are yet not realised but can contribute towards a more sustainable future. (Chick 2000, 166) Both creative problem-solving (Sahlberg & Oldroyd 2010, 280) and the ability to think "out of the box" (Eilam & Trop 2011, 48) are essential skills in every design project. Projects done with surrounding communities can besides offer training, provide useful and real solutions, turning design schools into a "social resource: a potentially powerful and useful player in the transition

towards sustainability” (Manzini 2011).

- Education should raise questions about values and ethics (Eilam & Trop 2011, 49; Chick 2000, 163-165). It should discuss the destination of human kind (Wals & Jickling 2002, 127), give an understanding for the needs and rights of future generations and encourage long-term thinking (Chick 2000, 165), at the same time it should examine multiple perspectives in sustainable debates with a “no single right answer” culture (Sahlberg & Oldroyd 2010, 288; Kagawa 2007; Bain 1995). A complex and divers subject like sustainability will inevitable lead to "...tensions among the Triple Ps (people, planet, profit) or the three Es (efficiency, environment, equity) (Jickling & Wals 2008, 5) and students will need to evaluate different solutions, while none will prove perfect.
- It is important to prepare students for a changing world and uncertain future (Chick 2000, 162). Students trained today will retire around 2050 and the skill of lifelong learning will serve them to meet inevitable changes. (Wals & Jickling 2002, 130; Sahlberg & Oldroyd 2010, 282)

#### THE ROLE OF PEDAGOGY

Sustainable awareness and skills will only be successfully embedded, if pedagogy supports course and curriculum content (Wals & Jickling 2002, 129; Jones, Trier & Richards 2008). In the vast array of papers on “ESD pedagogy” and related subjects, Eilam and Trop analyse of prominent ESD pedagogies (2011) proved interesting for this analyses. They have identified four components, which should be implemented together to create a holistic learning experience.

The four components are:

- 1) **Traditional Academic Style of teaching and Learning:** Non-Natural Learning that takes place in a closed space without any (or hardly any) relation to the learnt subject.
- 2) **Multidisciplinary Learning** (Inter and/or Cross Disciplinary) as a pedagogy that combines knowledge from a variety of disciplines. A multi-perspective analysis is needed if students are to gain in-depth knowledge of environmental problems, and the ability to see things as systems rather than as isolated elements.
- 3) **Multidimensional learning** combines traditional and multidisciplinary learning plus adding a time and space dimension. This allows students to develop contextual ways of thinking and to think “outside the box”.
- 4) **Emotional learning** encourages students to express their feelings. To involve emotions into learning situations activates processes of value and ethics clarification.

Traditional teaching and Learning is important to teach knowledge and abstract concepts about sustainability, but simply accumulating knowledge about sustainability is not enough (Ballantyne & Bain 1995; Kagawa 2007). Multidisciplinary learning helps to understand interdependence and supports systemic thinking. In addition multidimensional learning supports the "development of contextual ways of thinking" and to understand non-linear changes in time and space. Emotional learning brings students to clarify their values and ethics; it trains successful teamwork and cooperation towards a common goal and supports personal and professional growth (Eilam & Trop 2011).

We used those four components to analyse the curriculum of the design programme



(see figure 2). As a complement and to avoid that our interpretation of the course syllabus was biased, we asked students about their opinion.

Course	Credits (hp = högskolepoäng)	Content	Traditional Academic Style of Teaching	Multidisciplinary Learning	Multidimensional Learning	Emotional Learning
<b>Term 1 1D1150_Design &amp; Configuration</b>						
01 Form and Content	7.5	Practical work on colour, form and visualisation. Intro Sustainability through lectures and books.				
02 Form and Configuration	7.5	Introduction to design process and terminology, 3d practical project				
03 Form and Communication	7.5	Graphic design in theory and practice				
04 Design History I	4.5	Design History and Theory				
05 Design, Art and Science I	3	Artistic expression of theoretical thoughts				
<b>Term 2 1D1160_Design &amp; Human being</b>						
01 The human being and artefacts	9	Practical and theor. exercises in ergonomics and product semantics. 3-dim. product design.				
02 The human being and identity	6	Fieldtrip. Reflection on identity, value and culture in relation to design.				
03 The human being & human needs	9	Basic knowledge and exercises of spatial creation and context for a chosen target group.				
04 Design history II	3	Design History and Theory				
05 Design, art and science II	3	Basic knowledge of creation and creativity with emphasis on creativity and critical reflection.				
<b>Term 3 1D1250_Design &amp; Production</b>						
01 Form, Material and Production	18	Material, form and industrial production in regard to sustainable development. Digital drawing and model techniques.				
02 Form and Context	6	Spacial configuration and exhibition techniques.				
03 Culture Studies I	3	Design in different cultural contexts.				
04 Design, Art and Science III	3	Artistic creation in relation to ideas of concept and context.				
<b>Term 4 2D1260_Design &amp; Designprocess</b>						
01 Process and production	4.5	Real-life exhibition design project.				
02 Design process and industry	9	Concept generation based on analysis of a cooperating company's business idea.				
03 Design process and society	9	Design for municipality & other public org.				
04 Cultural studies II	4.5	Role of design in a changing & complex society.				
05 Design, art and science IV	3	Critical reflections & creation on site/non-site.				
<b>Term 5 2D1350_Design &amp; Sustainability</b>						
01 Design & sustainable development I	4.5	Understand and articulate thoughts about your role as a designer in a sustainable society.				
02 Design & sustainable develop. II	7.5	Conduct a project in a given context using diff. methods and tools for sustainable development.				
03 Design & sustainable develop. III	12	Conduct a project grounded in an idea around social sustainability in a given context.				
04 Culture studies III	3	Design from sustainable macro&micro perspect.				
05 Design, art and science V	3	Articulate a design process in written form.				
<b>Term 6 2D136E_Design &amp; Designfields</b>						
01 Culture studies IV	3	Design culture and designer's role				
02 Independent work	22	Indiv. exam project & exam exhibition				
03 Design, art and science	4.5	Science theory and research methodology.				

Figure 2 Overview of the programme and styles of teaching

#### STUDENTS THOUGHTS

The students answered in our interview that their view on sustainability had changed from “only shallow” to a deeper understanding in the significance, the full scale and the importance of sustainable development during the six terms. Their answers showed that each term had emphasized different aspects of sustainability. Focus was on the environmental aspects in term one and two, on social and economical and aspects in term three and four and during term five and six the political dimension was unified with the aspects above. Their perception of sustainable development had changed similarly during the same period. Courses that increased their understanding

of the relationship between design and sustainability were all theoretical courses and 1DI250\_01 Form, Material & Production, all courses in term 5 (Design & Sustainability I – III) and the independent project in term 6. Cultural studies III & IV was especially pointed to as the course that conveyed knowledge of sustainable development, keywords, and current development and debate the most.

Regarding knowledge about materials and life-cycle analysis 1DI250\_01 Form, Material & Production, 2DI350\_02 Design and Sustainability II and all courses in term 6 turned out to be the most important for the students.

We are aware of that multidisciplinary learning helps to understand interdependence and "linkages between cause and effect" (Eilam & Trop, 2011, 47), unfortunately this does not happen very often in the programme. Two students (in projects students choose with whom they want to cooperate with) had worked in interdisciplinary groups in 2DI260\_01 Process & Production. Others named 2DI260\_02 Design process & Economy, 2DI260\_03 Design process & Society and 2DI350\_03 Design & Sustainability III. Several students did not answer the question and one student said she had never worked in any interdisciplinary group during the education.

Regarding practical projects, the students answered that they have been able to use their knowledge about sustainability in realistic and substantial projects in all courses in term 3 - 6 or "in all courses from term 3 when the concept of sustainability became comfortable to use". They especially point out 2DI350\_03 Design & Sustainability III and 2DI36E, the exam project.

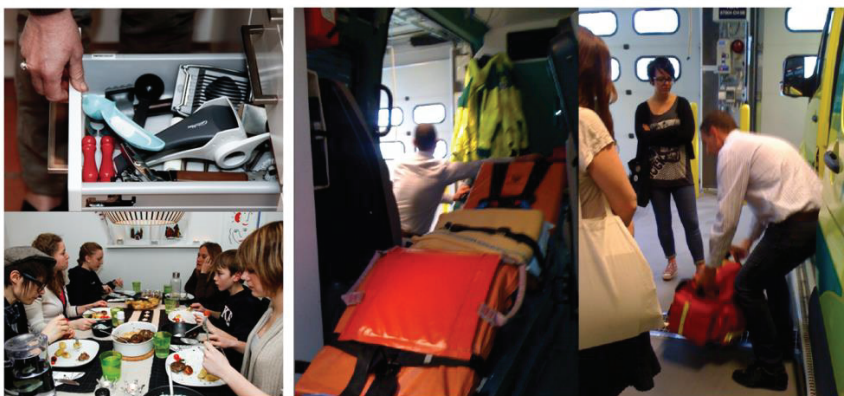
The course Design & Sustainability III lets students test their skills in highly challenging projects, for example by finding ways how design can help a village suffering from unemployment and racism or by developing projects around the well-being of elderly people. In this course students spent several days in the environment and with the people they are designing for. Additional lectures by people outside the design field like doctors, sociologist, ethnologist and politicians introduce give them additional inside to different topics. This course often touches a nerve, stirring up emotions about political situations, refugees, health care, life and death and students are forced to position themselves in their role as citizens and designers. At the same time the students address real human needs, train citizen skills and their own confidence (Peterson 2009). They also get a chance to channel their thoughts and emotions like frustration and anger into positive action and get an understanding for the complex and conflicting interests, which make it hard to find perfect solutions.



**Figure 3** Students working in the course *Design & Sustainability III*

It is important to encourage critical thinking, to question and challenged preexisting beliefs and to examine multiple perspectives in the sustainable debates and as part of the learning process (Sahlberg & Oldroyd 2010, 288; Kagawa 2007; Bain 1995). This is even emphasised in the Swedish law for higher education (högskolelag). When asked in what courses the concept of sustainability was questioned, the student's replies indicated that this was the case during Cultural studies I-IV and during the whole last two terms.

What we don't know from our interviews is how much students have changed their own behaviour. 2DI350\_01 encourages student to become aware of their doing by writing their own manifest, but it would need more detailed interviews and observations to judge this aspect.



**Figure 4** Students studying kitchen appliance and working with the local emergency and crisis management.

Another example for a practical course is 1DI160\_01 Design & Human Beings in which students visit families in their homes at the start of the project. During one evening they cook a meal for a family and talking about cooking habits and kitchen appliance to discover something that could be improved by design. Afterwards the students work like in any other design education, creating products that are a mixture of functionality and aesthetics. But speaking of aesthetics, when asked about courses that focused on increasing artistic capability, one answered in 2DI350\_02 Design & Sustainability II was the outspoken goal "to find your own style" and another student answered 1DI160\_01 Human & artefacts, 1DI160\_03 Human & Human needs, 2DI260\_03 Designprocess & Society, the exam project and an evening course offered by the programme. Another student experienced this as an exchange student and three students chose not to answer the question.

## **Discussion**

### *Strengths and weaknesses*

Sustainability has been incorporated wholeheartedly into the programme. It is neither reduced to a sentence in the programme syllabus or pressed in a single course like this can be the case in other design educations (see for example the programme syllabus for BA Industrial Design at Konstfack that contains one course dedicated to sustainability per year: Uthållighet 1 (2hp), Uthållighet 2 (7hp) and Uthållighet 3 (2hp)). An inclusion in all courses allows for a more holistic learning experience and the use of a pedagogy to support this development (Wals & Jickling 2002, 129; Jones, Trier & Richards 2008). We see this resulting in students that experience a development in their view on sustainability and an increased understanding of the relationship between design and sustainability (environmental, social, political and economical). "It is only when the principles of sustainability are embedded as a core philosophy into the design curriculum that it will become apparent that the traditional design culture needs to be fundamentally challenged. Only then will students experience the powerful contribution design can make towards creating a sustainable world" (Chicks 2000, 167).

At the same time the students are given the option to test their ideas in real-life projects connected to the surrounding society. Theory becomes connected to actually envisioning a better future. Here students become aware of the difficulties to go from thought to action, and how to balance the complex and conflicting interests of different stakeholders. It seems especially important that some courses encourage emotional learning forcing students (and ideally teachers, too) to clarify their value and ethics (Eilam & Trop 2011). Complex and diverse subject like sustainability need to be addressed by talking about values to avoid "Newspeak" (Wals & Jickling 2002).

Education should not bias student's objectivity, but neither is value-free education possible nor desirable. Like medical education, which has "a clear bias towards human health, not disease (Orr 1992) and many other professions that have codes of conduct, the design profession and education can only grow through a reflection on values. Notable the theoretical courses play a great role in understanding, reflecting and discussing sustainability and values. Here the programme differs from other design educations, that often just offer design history, missing other subjects that can contextualise design and address its role in society, contribute to a more liberal education (Chick 2000, 164).

One weakness is that multidisciplinary learning is less present than hoped for.

Projects in combination with the surrounding community and lectures present a beginning, but students need more opportunities to work with students from other faculties in trans- or interdisciplinary groups and to meet professionals outside the field of design. The interdisciplinary groups students referred in our questions have unfortunately been groups that had contact only for a short moment.

### *Potential*

Is an emphasis on sustainable design risking the core subject matter being taught?

This misconception results on one hand from contradicting expectations and different views on what design is (Heskett 2002). If Design is only seen as a profession giving form to products for mass production and serving an industry, it can seem unnecessary to include sustainability more than in a lecture or two. But if we acknowledge design's ability to envision and to drive innovation, a more critical approach makes sense. Dealing with projects around sustainable change means not more than using the traditional design process in highly constrained situations.

A misconception can also result from seeing sustainability as curriculum content instead of pedagogy employed (Jones, Trier & Richards 2008) to support a holistic learning experience. "Fortunately the qualities and pedagogy's that prepare young people to make a creative and collaborative contribution to national competitiveness and address global ecological challenges for a sustainable future are similar" (Sahlberg & Oldroyd 2010).

One field of improvement the design programme would need is how to support the artistic development during the education. Our research showed that students seem to see a weakness in their artistic development. How and what pedagogy can be used to increase the students' artistic capability at the same pace as their design skills and understanding of the sustainability context of design? The students name that since theory has to confirm every decision, artistic development is set aside, instead of seeing constrains as advantages that can produce highly creative results. There are still many options to express oneself artistically within a sustainable framework. Principles that apply for good design apply for sustainable design too.

We see clearly that an education depends on not just what we teach but also how. Still we fear that pedagogy will continue to be treated like a poor cousin not because of ignorance, but also because each discipline demands its professional. Professional teachers would need to team up with professionals from the field of pedagogy to implement pedagogical framework like Eilam and Trop's, and to discuss how pedagogical frameworks could be adjusted to suit certain subjects. We tried to contribute to a discussion about the pedagogy used to train design students to meet the challenges of tomorrow, but this is only a first beginning.

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## Another future for designers in America

Kate CATTERALL\*

**Abstract:** *The rationale behind mass-industrialization, now normalized, is embodied uncritically in the practice of many new designers. What if the industrial past could be explored and experienced as a foreign territory, providing a vantage point from which to critically evaluate contemporary design practices and define new paths? Young American designers are searching for alternate roles, and ways to design and live. Many experiment with models from elsewhere, places where new futures are growing from useful pre-industrial remnants. America, a country synonymous with industrialization, has no such resources upon which to build new practices, and slowing while creating value through quality is pitted against the dominant ideology of democratic capitalism and a national mythology that conflates freedom and prosperity, with ownership and abundance. Students who lack understanding – critical or otherwise – of mass-production, its precedents or antecedents, learn first-hand the values of making one and making one million by producing spheres through whittling, turning, casting, and using software defaults to send the perfect sphere off for automated reproduction, ad infinitum. This exercise develops in the manufacturer (student) a nuanced understanding of worth and consequential value, and creates receptivity, otherwise absent, for identifying and testing new patterns of behaviour.*

**Keywords:** *Sustainability, reconfiguring values, design education*

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## **Another future for designers in America**

Previously the parameters of the design project were tightly drawn and narrowly defined; an appropriate form for a particular purpose, executed economically using readily available materials and technologies, for the purpose of keeping the client happy and the economy afloat. And for the better part of a century design education has facilitated, supplying a stream of serviceable designers and stylists for immediate deployment in the burgeoning design fields.

Over the past two decades however, the design discipline, well used to incremental change caused by the introduction of new tools and methods, has experienced a seismic shift, the complexity of which has yet to be absorbed into design education, practice and the greater culture. A shift precipitated by the far-reaching implications of scientific revelations suggesting that mitigation and sustainable growth will not avert the coming environmental and economic crises. A reality complicated by the social impact of ubiquitous computing, and the expansion of the design activity to include development of strategic planning tools for use in business, politics and urban planning.

Victor Papanek's legacy and a widespread appreciation of the Cradel-to-Cradel approach notwithstanding, design education in the United States if focused on sustainability at all, has embraced the idea of sustainable growth. The requisite training for designers focused on sustainable growth does not question the values and social mores that fuel rampant consumerism, nor does it explore the consequences of expanding the existing economic and industrial system in order to situate alternate options.

Once incongruities within the sustainable growth model become visible, the design project expands to include a critique of the role design and designers plays in an economic system sustained by designed obsolescence and hyper consumption; and morphs quickly into a wicked social, environmental, economic and increasingly political problem. The enormity of the problem confronting humanity paralyzes most designers and educators. What kind of skill set to introduce? How to structure engagement with seemingly insurmountable problems? With few clear answers to proffer most educators choose to skirt the topic and teach to more conventional material.

Designer, writer and educator, Meredith Davis's recent comments on the nature of design education in the United States affirm that:

...most undergraduate programmes focus on the design of de-contextualised objects and a process with the goal of fixed, 'almost perfect' results. Mastery of an abstract visual language precedes investigations of context, as if formal logic can be imposed on any problem and the intent of design is to simplify rather than manage complexity.

In cases where methods must be applied to existing settings, problem statements are often defined by the faculty rather than by the students, and are rid of complexity and contradiction. (Davis 2011)

In the early 1970's Horst Rittel acknowledged the pervasive uncertainty and complexity that was to frame all coming design tasks. He recognized that conditions would no longer permit simple solutions, and the observations he made then, remain relevant for students today as they engage in the process of design, negotiating new futures for humanity. In their essay *Why Horst W. J. Rittel Matters*, Rith and Doubberly outline the fundamental ideas that Rittel introduced.



Simple problems (problems which are already defined) are easy to solve, because defining a problem inherently defines a solution.

The definition of a problem is subjective; it comes from a point of view. Thus, when defining problems, all stake-holders, experts, and designers are equally knowledgeable (or unknowledgeable).

Some problems cannot be solved, because stake-holders cannot agree on the definition. These problems are called wicked, but sometimes they can be tamed.

Solving simple problems may lead to improvement—but not innovation. For innovation, we need to re-frame wicked problems.

Because one person cannot possibly remember or keep track of all the variables (of both existing and desired states) in a wicked problem, taming wicked problems requires many people.

These people have to talk to each other; they have to deliberate; they have to argue.

To tame a wicked problem, they have to agree on goals and actions for reaching them. This requires knowledge about actions, not just facts.

Science is concerned with factual knowledge (what-is); design is concerned with instrumental knowledge (how what-is relates to what-ought-to-be), how actions can meet goals.

The process of argumentation is the key and perhaps the only method of taming wicked problems.

This process is political.

Design is political.

(Rith and Dubberly 2007, p. 73)

Still absent from the education of most designers in 2013, is the challenge to critically assess the broader context within which the design activity is undertaken, to develop methodologies derived from personally relevant values and to seek opportunities to contribute to the work of collaborative multidisciplinary teams; learning to research, then facilitate effective communication through the design process.

This paper characterizes some of the cultural impediments still facing design programs in the United States that seek to negotiate alternate routes for designers, and presents projects from the Design Program at University of Texas at Austin, that serve as experiments in reorientation of values aimed at a thoughtful reconfiguration of design practice in Texas.

### *A Complicated Context*

Tim Jackson a former member of the now defunct UK Sustainable Development Commission - a British Government think-tank - has asserted, "Society is faced with a profound dilemma. To resist growth is to risk economic and social collapse. To pursue it relentlessly is to endanger the ecosystems on which we depend for long-term survival." (Jackson 2009, p. 193)

Design is situated between these two realities and is uniquely positioned to negotiate possible futures that depolarize and reframe the situation in the hope of offering more positives outcomes.

However, it is a challenge to contextualize for students in America the importance of design research that produces models for a sustainable future when the urgency of

calls to action from elsewhere appear radical, situated alongside an on-going national debate that gives credence to climate change skepticism.

Mitt Romney, the 2012 candidate for President criticized his opponent Barack Obama, for listing climate change as a primary threat to US national security. While his running mate, Paul Ryan openly called into question the motives of climate change scientists, by suggesting that they intentionally mislead the public undercutting business interests. Perhaps in the wake of Hurricane Sandy, the 2012 storm that wreaked unprecedented but predicted havoc on the North Eastern United States, attitudes and research dollars will shift. But for the present, uncertainty remains and widespread doubt has the effect of maintaining the status quo as the nation asks – ‘If climate change is really such a pressing issue, why is our government not saying and doing more about it?’ Waiting for a clear directive, citizens divest themselves of personal responsibility and shelve the issue for later, assuming they will be called upon to act at the appropriate time. As a result, action at the governmental, local and personal level has effectively been stalled.

### *Meanwhile it is business as usual (and shopping as usual) in the United States.*

The Du Pont corporation’s vice president for safety, health and environment, Paul Tebo, has been credited for creating the term *Sustainable Growth* in order to make sustainable development acceptable to corporate business.

Growth was very important. I tried sustainability and the business leaders saw it as status quo. I tried sustainable development and they viewed it as environmental sustainability. I tried sustainable business [but] growth is what organizations want – either you’re growing or you’re not and not growing is not a very good sit. (Holliday, Schmidheiny and Watts 2002, p. 15)

Even though *Life-Cycle-Analysis* (LCA) and *Life-Cycle-Thinking* (LCT) have proven to be effective tools for improving business efficiency, and have profoundly shaped environmental policy within the European Union, in the United States where regulation of business meets with more resistance, the Environmental Protection Agency (EPA) has had more limited capacity to effect change. The Clinton Global Change Initiative (CGI) may indeed have more leverage and is pursuing the idea of more efficient production and shorter supply chains, if not cyclical industrial systems. The CGI annual meeting 2012, Design for Impact, brought Wal-Mart (ASDA in the UK) and IDEO together to discuss, if not propose, solutions that might be advantageous on both environmental and economical levels.

It is apparent that the dilemmas faced by many designers are remarkably similar to those faced by most Western governments. Both are confronted by predictions that climate change will precipitate a contraction of global markets, with immense and negative economic consequences, and both fail to strategize for that eventuality.

As designers and governments question the long-term viability of dependency on market growth, fuelled by practices of design obsolescence and conspicuous consumption, both are faced with the conundrum: how can a reasonable standard of living be sustained, if production and consumption is slowed in order to afford humanity a brighter long-term future?

Designed obsolescence having reached its zenith, and hyper-consumption having transformed artefacts once purchased to last lifetimes into ephemera, we are left with

little to indicate the human endeavour over the past 70-years that is truly trans-generational, except perhaps landfills.

It is within this context that many students ask whether the design field can move beyond being handmaiden of industry and become a useful tool for transforming the understanding of value, and with it the logic of production and consumption, in order to create culturally relevant artefacts within sustainable social and economic systems.

In Italy, the Slow Food and Design movements were able to connect contemporary possibilities for sustainable living with the pre-industrial traditions and practices of that region. Slow movements having utilized traditional Italian methods of production for food and artefacts and have championed the cultural importance of product quality and longevity, while defining a more humane, satisfying and environmentally feasible existence.

As American designers and producers explore alternate modes of operation for the future they are confronted with an absence of such lessons and useful remnants upon which to build; and new ways of practicing seem pitted against the dominant ideology of democratic capitalism and a powerful national mythology that conflates freedom and prosperity with ownership and an accumulation of material goods.

In a country where the economy derives 70% of its earnings from consumption, designers (students) struggle to recognize, challenge or redefine ascribed cultural values, and while international examples are useful, it is individual experiences and personally relevant examples that are instructive when creating the fissures necessary for recreation of lifestyle and design practices in the United States.

### *Design Education*

Precedents within the United States are few, but pro-active design teams led by educators like Samuel Mockbee, founder of Rural Studio with the School of Architecture at Auburn University, David Orr, leader of the proposed Green Arts District with Oberlin College, and Emily Pillot, who leads Project H and its school based sustainable building programs, all provide useful templates for field research in design that grapples with the enormity of the socio-economic and environmental problems at hand. Through addressing actionable items at the local level they have created 'labs' to transform small local communities into demonstrable models for sustainable intervention. These examples challenge other educators, students and communities to find ways in which to become engaged while also making the argument that rhizomatic interventions are the most efficient way to effect large scale transformation quickly; and it certainly beats waiting around for professional organizations, or legislators to take the lead.

Design interventions in the social realm, requiring off-site work are the exception rather than the rule for design education within Universities, as projects that pose awkward questions in the social realm, and that are enacted outside a design studio are often viewed as a liability. In addition, there is a new focus on the vocational aspects of design even within research universities. Long the benchmark of success in technical schools, the value of drafting skills may trump that of broader critical thinking in circumstances where industry funding for research is sought to supplement dwindling resources from public coffers. Such funding often comes with strings attached and has the potential to limit research that does not have recognizable market applications. The fear being that,

Education, diminished to the level of instrumental functionality, becomes ever more vocational and bonded to supporting the status quo. It produces compliant service-oriented subjects and displaces the essence of learning and, in so doing, erodes our ability to be critical – understood as a facility of judgment able to disclose the work (given and made) so that directional responsibilities can be adopted. (Fry 2002, p. 214)

It is the job of design education in the coming years to safeguard this critical capacity; a project slowly underway.

There is hope in design education, but progress has been astoundingly slow. Randy Swearer, an expert in design, higher education management and strategic planning, led changes in the 1990's that situated design education at University of Texas (UT Austin) and Parson's The New School for Design within a liberal arts and sciences tradition. He restructured both programs and established curricula that introduced common design research and thinking methods in trans-disciplinary studio-based settings. Swearer is currently Provost at Philadelphia University, where design thinking has been introduced into the university-wide curriculum.

Australian design writer and philosopher Cameron Tonkinwise has also been instrumental in developing programs in the United States, at Parson's and at Carnegie Mellon University, with a focus on socially responsive forms of designing, sustainability and dematerialized design. Jamer Hunt recently established a graduate program at Parson's, TransDesign, which is project-based and collaborative and which "incorporates a profound understanding of the ways design transforms social relations". He was also involved in building the Design Criticism curriculum at the School of the Visual Arts in New York, home to the new Products of Design MFA that endeavors to search "beyond the mass-produced object, encompassing instructional, interventional, narrative, experiential, and speculative possibilities—all aimed at creating the new types of value that catalyze positive change". Similar objectives inform the Design for Change Center at Stanford University which, as the programs website states is "aimed a directing design thinking towards creating strategic paradigms that bring about rapid change in some the larger problems facing mankind, such as energy, climate change, water and global health".

From the first iteration of the Design Program at UT Austin in 1992, the curriculum has been focused on the collaborative, societal, trans-disciplinary future of the design disciplines. At UT, sustainability, history and theory are integral components of every design studio, a lecture lab format ensures that students synthesize and internalize theoretical and historical concerns as they produce new proposals. Core skills in design are augmented by a curriculum that requires participation in courses across the research campus and collaborative work in the public realm.

## **The courses**

### *Discussion Lab: Understanding Consequences*

A reassessment of disciplinary assumptions through a critical review of past practices is viewed as an essential part of the education process for students at UT. However, in Texas, a seminar style introduction to the history of the industrial revolution and contemporary ideological impediments to ideas like slowing production, product longevity and shortening supply chains, can quickly become politicized and

have a polarizing effect on students; effectively shutting down meaningful debate and limiting capacity for critical reflection on dearly held beliefs.

Through undertaking this series of seemingly innocuous studies, students who lack understanding – critical or otherwise – of mass-production, its precedents or antecedents, learn first hand the values of making one and making one million by producing four spheres through whittling, turning, casting, and finally using software defaults to send the perfect sphere off for automated reproduction, ad infinitum. This exercise develops in the manufacturer (student) a nuanced understanding of worth and consequential value, and it thus creates receptivity, otherwise absent, for identifying and testing new patterns of behavior.

The course explores the values that inform production and consumption from personal to national levels, and affords students an opportunity to experience the thrills and consequences of production methods while learning valuable prototyping skills. This is a lively arena in which divergent perspectives can be aired within the context of a common experience.

### *Whittling*

Sitting together, working and talking, students discuss how satisfying this low-impact process is. Despite sore fingers and slow progress, there is a sense of accomplishment as a sphere slowly emerges from a cube of wood. The discussion turns from how a skillful individual could make a full range of useful artifacts for personal use without much overhead investment, to nostalgia and the ‘unrealistic and bourgeois aspirations of William Morris.’ Students talk about speed, or lack thereof. They consider perfection, honing skills through experience and a sense of autonomy.

#### THE ROLE OF THE PERSON IN PRODUCTION:

Students discuss how unusual it is today to fully understand the tool that you use and control an entire process which yields limitless formal possibilities, only bounded by the imagination.

#### SOCIO-ECONOMIC IMPACT:

How about the idea of frugality; fulfilling basic needs, producing items for your own use, or becoming the ‘go-to’ person in a community; and exchanging your products with others, for necessary items within, or perhaps outside of a currency system.

#### ENVIRONMENTAL IMPACT:

This method implies a slower use of materials in a locale allowing opportunities for renewal. This is a world of lower density, more dispersed communities. Slower production methods mean fewer artifacts in circulation, greater likelihood of extended use accompanied by a make-do and mend philosophy. The dominant materials in use at this scale of production are clay, wood and perhaps metal, most of which can be assimilated or reused.

#### CURRENT RELEVANCE:

The slow food and design movements are focused on limited production of high quality, trans-generational artifacts and using materials native to a region. This way of working has the potential to sustain environment, communities and traditions and to reinsert values compromised by conspicuous consumption and global overproduction.

## *Lathe*

The lathe initiates an oddly symbiotic relationship between body and machine. Students are thrilled with speedy production of a more perfect sphere. They feel empowered. The process is still contingent on their skilfulness, so they retain a sense of satisfaction and ownership. They say that the power and speed supplied by treadle, water or electricity is amazingly 'addictive'. There is some loss of freedom; the fixed axis dictates a very symmetrical outcome for everything, every time and that obviously shapes what can be designed using the process. This feels like progress, but there is agreement that it is informative to know how to whittle and to have other options.

### THE ROLE OF THE PERSON IN PRODUCTION:

The lathe is like a prosthetic enhancing human capacity. Repetitive stress injuries are pervasive in communities of lathe workers. We shape the objects, as the process shapes us, to adapt Churchill's comments on architecture.

### SOCIO-ECONOMIC IMPACT:

Production is amplified 20-fold (even for beginners!); at first this is thrilling and it appears to be a positive development. Then the conversation turns towards credit in order to buy a lathe. Is this one lathe, or many? What if there are lots? It would lead to massive resource depletion, while quickly flooding regional markets. It would lead to the building of factories and cities. Whole urban infrastructures would grow to house the people who made the things, and supply chain systems would develop to transport raw materials to the factories. Those systems would facilitate trade networks. Energy sources would become an issue at some point, right? And then new sources for raw materials and new markets would need to be secured and defended.

### ENVIRONMENTAL IMPACT:

Despite the painfully quick transformation of economies and ways of life, huge rewards are evident as the basic standard of living is raised for many. The rapid depletion of national resources on the local, regional, and then global level even seems to be feasible and justifiable. It looks like this system may have the potential to benefit everyone in the long run.

### CURRENT RELEVANCE:

The on-going hunt for cheap labor, natural resources and energy resources leads to global inequity and conflicts.

## *Casting*

The mold-making process is compelling, but the cast is only as good as the original. It takes planning and skill to make an effective mold, which is expensive. The process is rapid, but replicated forms and components require clean-up, removing traces of sprues, mold seams, then perhaps attaching components to one another, before finishing, polishing, dipping, painting, chroming. The expense of the mold has the tendency to limit the range of forms in produced and when the number of standardized units in circulation exceeds demand markets can stagnate. Styling and designed obsolescence are a logical consequence of this process.

### THE ROLE OF THE PERSON IN PRODUCTION:

Designing the mold becomes the most inventive moment in the process, so those who assemble and finish have discrete assignments and only see fragments of the

whole. The discussion turns to Ford's assembly line and its social or psychological impact on the worker. There is a sense that the assembly line breached the final link with the skilled artisan and decreased worker satisfaction, but this sacrifice for the sake of efficiency might still be a good thing.

SOCIO-ECONOMIC IMPACT:

Casting (and other automated processes) yields a relatively cheap, crude product, but the process is fast, not very labor intensive and it does not require a very skilled (educated) labor force. Metal, glass and finally plastic products become pervasive as supplies wood dwindle and become more expensive.

ENVIRONMENTAL IMPACT:

Material throughput and energy consumption (coal) rise as industry uses smelting to extract metal and molten metal is cast. By-products are toxic and voluminous on an industrial scale – disposal is at first haphazard. In the post-WW2 period, plastics take off; a cheap renewable material stream, a petroleum by-product whose use forms a closed loop production system of a kind. Fossil fuels are the main source of energy for production, it is recognized that pollutants released as a result of extraction are problematic to health, environment and national security. Nuclear energy emerges.

CURRENT RELEVANCE:

Increased automation, production and consumption yield decreased worker/citizen engagement, human redundancy, and a frantic search for new or renewable materials, and energy streams. There are clear signs that most social, biological and technological systems are being pushed to their limits in order to maximize output for economic gain.

### *3D Printing (and continuous production)*

All those earlier struggles with perfection of form! Now idiosyncrasies and mistakes are a thing of the past. A sphere is one of the easiest objects to generate using 3-D rendering software. No need to build it, there is a default tool that can create most basic geometries. Generate, then send the file to a 3D printer next-door, or halfway across the planet. That was easy, command PRINT and voila. Everyone is thrilled, it's so easy; it's magical!

THE ROLE OF THE PERSON IN PRODUCTION:

A person makes a Stereo Lithography file translating an idea into a digital form. A nuanced translation might occur if designer and renderer talk, but if they are not the same person or even in the same country so cohesion is a challenge. Software defaults and the limitations of industrial processes limit the scope of the form. If the designer only knew the processes more comprehensively, if only experiments and prototyping were not prohibitively expensive invention might occur. Material choices and formal decisions are dictated by economic viability given the anticipated lifespan of the artifact. Product longevity is an unknown quantity and a business liability. Designers become voyeurs and somewhat redundant. The design and production process is fragmented, unrelated people working on loosely related components of an unwieldy global project.

SOCIO-ECONOMIC IMPACT:

The designer becomes dislocated from the place and processes of production. Experimentation becomes less likely as those who are able to challenge production assumptions through experience and contextual knowledge become fewer. A

generation of designers who lack production know-how, or hands-on prototyping experience tend to replicate more than they invent, severely limiting the transformative capacity of design. Goods are not always economically available to those who produce them.

ENVIRONMENTAL IMPACT:

Circuitous supply chains lead to higher carbon footprints for commodities, but it's cheaper than local production. Outsourcing often leads to production in countries with poor working conditions and compensation for labor, and lax health, safety and environmental regulations. Small-scale garage manufacturing enterprises are on the rise, but environmental regulation on these operations is non-existent.

CURRENT RELEVANCE:

Lower labor and material costs elsewhere push industry to pursue fabrication abroad. Large-scale manufacturing industries are scarce in first world, so what option is there? Energy use for transportation is high. Obama's vocational education plan initiates a conversation about creating a new cadre of localized, skilled labor in America, this could be a means of over-coming mass unemployment and apathy; engaging the population and fostering sustainable communities.

Students reference a recent New York Times commentary which observes that:

Ask the administration or the Republicans or most academics why America needs more manufacturing, and they respond that manufacturing spawns innovation, brings down the trade deficit, strengthens the dollar, generates jobs, arms the military and kindles a recovery from recession. But rarely, if ever, do they publicly take the argument a step further, asserting that a growing manufacturing sector encourages craftsmanship and that craftsmanship is, if not a birth-right, then a vital ingredient of the American self-image as a can-do, inventive, we-can-make-anything people. (Uchitelle 2012)

After experiencing the amazing achievements of the Industrial Revolution, it is time to reflect on its negative consequences, its failures, its legacy and how this history might inform the future.

Dear Brothers and sisters in Apollo, why don't you like to speak of your defeats? Perhaps you're so ashamed of them? But I can reassure you. Of all the things you have entrusted to me the most interesting were the flops. Why not tell me yours? You understand that such an exercise would be not only exiting and interesting but also entertaining and informative – The culture of success and everything around us soon disappears, but failures linger a long time in the memory. Failures show you the conditions they were produced in, methods and usages, and can help the unskillful to see the minefields they will have to cross. (Enzensberger 2011)

### *CATTt (Research Determined by Personal Values)*

The *CATTt* manifesto functions as a useful method for testing values derived during the previous project, and for specifying a research territory. By appropriating *CATTt*, a generative tool originally intended for literary application, students are guided step-by-step through the process of defining a starting point for a semester-long critical design project.

*CATTt* (manifesto, Ulmer, 1991)

C= Contrast (opposition, inversion, differentiation)



A= Analogy (figureation, displacement)  
T= Theory (repetition, literalization)  
T=Target (application, Purpose)  
T= Tale (secondary elaboration, representability)  
(Ulmer 1994, p. 8)

The manifesto requires a confident affirmation of an opinion as exemplified by one student's position, "I think Facebook selling my personal information without explicit permission is wrong" which lead to recognition of the broader implications of this condition: "I am opposed to the commodification of my personal identity in the virtual realm." The next step is an analysis of the methods used by Facebook and other online entities to commodify their users' information. When the method is fully understood it is easier to describe what opposition to the problem might be and to clearly specify counter-methods. The first three steps of the manifesto clarify an argument for behaving and designing in a very deliberate way based on personally defined values. The target phase requires that parameters be drawn and a specific context be identified for the design project. Finally, tale allows for the elaboration of a future design scenario, a first draft that demonstrates the potential impact of newly defined values and design behaviours.

This years proposals ranged from: an K-12 evaluation method for introduction into the public education system, designed to educate future citizens while instilling self-determination, autonomy and ownership of the process, a strategy standing in stark contrast to outcomes derived from standardized testing and learning by rote; a range of social interventions designed to forge stronger communities capable of regaining control of everyday life from the drug cartels in Monterrey, Mexico; a project confronting the predominantly masculine workspace, content and visual language associated with digital game development, while questioning cultural assumptions embedded in common responses to pink and the "girly aesthetic."

This experimental process affords students great latitude and has also yielded concepts that debate the plausibility of fully automated factory, that is regional, carbon zero and uses a robotic production system for sustainably processing organically grown fibers that would afford unprecedented amounts of leisure time while maintaining standards of living for the community; more familiar urban farming scenarios that propose sustainable and fully networked communities using local exchange and trading systems; and critical design proposals that integrate regional climate change data into development proposals in order to forecast future local needs.

Projects aimed at reconfiguring values that affect how the design project is conceived are pivotal at all levels in the curriculum and augment a range of projects that focus on designing very specific artefacts, services and systems. In the undergraduate curriculum many projects also occupy a more familiar disciplinary territory and focus on the design of objects and interactions.

### *Better Things (Ethics and Designed Obsolescence)*

If we design and produce considering materials and energy as finite resources, product longevity becomes a priority, and quality of the artefact trumps quantities of cheap throwaway stuff. If we carefully and cleanly produce what we need and design things to last lifetimes, we can interrupt the cycle of waste.

WHAT IS PRODUCT LONGEVITY AND WHAT DETERMINES QUALITY?

*It is:* an item that can be useful for long enough to validate the cost of its production, at very least. This does not relate to the cost in terms of the loan you took out to buy it, but the cost as determined by Life-Cycle-Analysis, or carbon accounting, which estimates the total carbon dioxide equivalents emitted at every step of the process that led to the artifact arriving at your door – and then some. For example the carbon footprint of a laptop computer suggests it should be functional for 11-years, however, it is generally acknowledged that the industry falls short on this by about 7-years; the reason for this being more economic and fashion driven than technical, given that the hardware is light enough to suffice, it would be totally viable to upgrade software and exchange internal components.

*It is:* an item that has a deeply rooted cultural meaning enabling its insertion into the rituals of everyday life and ensuring its more permanent status. A fine set of cutlery, a tea pot, a pen, a chair – these items regularly make their way from one generation to the next, some only imbued with personal histories, but many also having a current utility or purpose that ensures they are both treasured and used.

*It is:* any artifact that is kept because it works well, feels good to the touch, cooks evenly, is weighted perfectly; is familiar, comforting, reliable and even elegant; it is a thing of beauty that we will never replace. These things are by nature more expensive, they are the things grandparents saved for and only a few could buy on a whim before the advent of the debt economy. Elitist? Perhaps that could be argued, but if we keep producing cheap plastic crap in the name of democracy that leaves us with a very serious problem.

This project starts with a life-cycle analysis of two small domestic items, one of which is assumed to have a short lifespan and one that might qualify as trans-generational. This process introduces LCA and tests assumptions about artifacts, materials and mechanisms. It situates the conversation about quality and longevity, and provides a platform upon which to build a design that might achieve trans-generational status. This might lead to proposals to extend the life of existing materials, or durable mechanisms, or research into renewable materials for a sustainable throw-away society, or new forms that support longevity on a whole variety of practical and psychological levels.

Outcomes range from a systematization of reuse, using materials with no inherent resale value and huge landfill potential (bike tire inner tubes, or swivel chair bases), to create small, local 'factories' for the production of new furnishings; to BeLeaf, a plant-based recyclable tableware system; to more polemic solutions that question the nature of gift giving – by proposing a gift that takes the form of a *derive* handbook designed to help friends spend a day of discovery together.

### *Networks: University-wide and regional*

The German Government's Advisory Council on Global Change (WBGU) issued a Social Contract for Sustainability in 2011, framed in a recent tweet from John Thackara as "A 400-page how-to plan from Germany's most prestigious scientific institutions for a 'Great Transformation'." (Thackara, 2012)

WBGU puts the socio-economic consequences of climate change center stage, poses difficult questions and proposes ways forward by challenging citizens to transform personal value systems, while outlining why good intentions frequently fail. WBGU report also considers the possibilities of completely circular industrial economies that are restorative and in which material flows are classified as either,

biological nutrients that can re-enter the ecosystem safely, or are technical nutrients designed to circulate at high quality without the waste.

McDonough & Braungart have argued a for a circular

cradle-to-cradle strategy [that] allows us to see our designs as delightful expressions of creativity, as life-support systems in harmony with energy flows, human souls, and other living things. When that becomes the hallmark of productive economies, consumption itself will have been transformed. (McDonough & Braungart)

It is within this frame students consider the impact that a trans-generational, or longevity requirement might have on the on production methods, material choices and even the proximity of production to communities utilizing the items. It will also have an impact on the types and numbers of artifacts produced, not to mention economic systems.

Projects which foster strategies for creating networks and which introduce, as Ezio Manzini frames it, “sustainable social innovation that is – small, local, open and connected,” are crucial to the future of both design education and regional development. A seedling network is presently being cultivated at the UT Austin campus, where colleagues in Textiles, Environmental Science, Biology, Agriculture, Human Ecology are congregating around a project alongside colleagues from Design, Urban Planning, Social Work, Education and elsewhere.

The project, which is in the planning stage, is designed to test the possibility of applying the idea of product longevity to a typically ephemeral commodity – clothing – and exploring possibilities for a regional system for making climate appropriate clothing for Texas. As students move forward focused on designing clothing that is suitable for the region, breeches the fashion-system and positively impacts Texas on an environmental, social, economic and political level, there is a realization that to reduce the carbon footprint of artifacts, regional supply chains need to be improved, and networks of production and distribution need to be reconsidered. Local plant-based dyes make sense, building communities of local skilled labourers and designing curricula for training schemes would be a necessity; research regarding the environmental consequences of different scales of textiles processing, and farming fiber-yielding plants will be necessary; and so the project and its contributors could grow exponentially.

We know that Alpaca and goat farms, and organic cotton growers already produce raw materials locally, and that the Alpaca and goat wool is hand treated and spun, finding its way into the craft networks. Bamboo production for textiles does not yet factor for textile production in the region and the cotton that is grown in Texas is shipped to the East Coast for processing and weaving into cotton jersey, then returned to Texas to be made into t-shirts and bags. The big Texas textile mills closed in the late 1960’s and production moved to other states, Vietnam, and then Mexico. Perhaps this is an impediment to production, or perhaps testing could happen on a smaller scale locally, while a full range of options are explored.

The goal of the project is to bring together faculty (and students) with academic expertise and work with growers, spinners, weavers, tailors, hobbyists and former textile workers (often Mexican immigrants) who contribute experiential and tacit knowledge, to produce a collection of garments that are locally sourced, and designed for life along the 30th parallel. In the process research into the feasibility of regional textiles production will be developed and presented. Students may also find ways to

insert themselves into the politics of development and become more actively engaged in issues pertaining to Texas agriculture, local production, environmental policy, trade training and business.

Slow progress is being made in design education, but mandates like the “Designers Accord” published by IcoGrada in 2011 (<http://edutoolkit.designersaccord.org>) and the growing number programs interspersed across the country indicate that change is gaining momentum.

Design is becoming engaged in the work of demonstrating alternate models to unsustainable ways of doing and living. As Tim Jackson suggests:

Progress relies crucially on the construction of credible alternatives. The task is to create real capabilities for people to flourish in less materialistic ways. At a societal scale, this means re-investing in those capabilities: physically, financially and emotionally. In particular, we need to revitalize the notion of public goods. To renew our sense of public space, of public institutions, of common purpose. To invest money and time in shared goals, assets and infrastructures. (Jackson 2009 p. 193)

We believe that students who have experienced working in collaborative teams, have an understanding of what it takes to activate social networks, and have questioned the idea of economic growth in order to determine new positions from which to practice design, will ultimately be able to insert themselves into industry, non-profits and politics, effecting incremental change through communal or independent action.

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# Inspiring and Investigating Imaginative Capability of Design College Student

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**Abstract:** *One's imaginative capability will influence his/her design idea and final product, therefore the imaginative capability is important to a designer. People always considered that the imaginative capability is natural endowment; however, the authors considered that it could be inspired by the family and school education. The purpose of this research was to find a feasible way to inspire students' imaginative capability, and investigate the relationship between the students' imaginative capability to their family education and school education respectively through a devised experimental teaching. For this purpose, some reasonable influential factors of imaginative capability were selected by references and experts' suggestions, and then classified into three facets. The facets were personality, study atmosphere, and imaginal thinking respectively. The experimental teaching proved that the imaginative capability indeed can be raised by acquired education.*

**Keywords:** *Imagination, imaginative capability, design.*

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## **Introduction**

Imagination is an important element in college-level design courses. Imagination used to be regarded as innate, but many researchers have pointed out that it can be cultivated and enhanced by education (Fettes & Judson, 2010; Fink, 1976; Lindstrand, 2010).

In Taiwan, college-level design courses for imagination development are very limited. As a result, core design courses play a significant role on improving students' imagination. Conventionally, core design courses have the following features: long lecture hours, multiple instructors, pluralistic student projects, and subjective evaluation by instructors. This type of courses is conducted by having students work either in groups or individually for design projects while instructors give guidance and evaluates the outcomes. Therefore, when developing imagination-related teaching strategies, the aforementioned features of core courses have to be incorporated into the courses, and follow-ups should be carried out. The aim of this study is to investigate issues related to imagination development in college education.

The study subjects were design-major college students and college design instructors in Taiwan, and the study was conducted using experimental teaching. The first step was to design a supplementary teaching material and to integrate the material into the lectures for improving students' imagination. The second step was to develop an instructor questionnaire for investigating grading preferences of the instructors. The last step was to acquire information related to students' background and to assess the association between instructor grading and learning performance, social skills, and family atmosphere of students. The objectives of this study are described below:

- Establishing imagination grading factors: These factors were determined from the instructor questionnaire, which would be filled out by the instructors and used to determining their grading preference.
- Establishing the student questionnaire: The student questionnaire was developed for investigating three aspects related to students: learning performance, social skills and family atmosphere. The aim is to investigate whether these three aspects are associated with instructor grading.
- Finding association between students' imagination performance at the initial development stage and their final grades given by the instructors was investigated.
- Finding association between student gender and instructor grading and possible causes were investigated.

## **Related researches**

IERG considered that imagination is generated in the brain through affective activities and is closely linked to brain functions. Imagination and rationality do not contradict each other. Instead, imagination enriches our rational thinking.

Singer & Singer (2005) considered that imagination is a formal feature illustrating the capacity of an individual for reproducing images or concepts derived from basic senses. Trotman (2006) divided the context of imagination into six types of behavior (Solitary Imagination, Contemplative Imagination, Imaginative Correspondence, Contributory Imagination, Imagination Dissonance, and Reciprocal Collective Imagination) and considered that they are interlinked with each other.

Passmore (2007) explained the differences between imagination and fantasy. First, imagination is about the mind at work. Imagination is a work and is purposive, and it is about putting effort into cultivating a possible but a not yet realized project based on the interests of problem-solving, comprehension, or creation. Fantasy, on the other hand, is the mind at play. It is about actions unrestricted by any purpose or demand. Aside from their different purposes, imagination and fantasy are alike and are difficult to be differentiated. Beghetto (2008) conducted a survey on teachers' role and viewpoints on imagination thinking in K-12 education. He considered that imagination and memory process are complementary to each other.

Cheng *et al.* (2010) used a mixed design of pretest and posttest approach to evaluate the effect of associative teaching on students' poetry creation. The research tool that Cheng and his colleagues adopted to test creativity thinking is a language scale. These researchers considered that a well-designed creativity training could improve students' divergent thinking and problem-solving skills. Canadian education philosopher Egan (2010) proposed an in-depth learning approach called Imaginative. He thought that this approach should be used to replace some exams adopted by the current education system. He also pointed out that what education reform really needs is to elicit students' learning interest and to inspire their imagination.

## **Method and tools**

### *Method*

For finding a feasible way to inspire students' imaginative capability, and investigating the relationship between the students' imaginative capability to their family education and school education respectively, a devised experimental teaching is necessary in this research. Further, for supporting the experimental teaching with no interference, three tools were developed and introduced into the in the teaching. The first one is a supplementary teaching material for inspiring imagination, and it was used to help students improve their imaginative capability in the core design course. The second one is an instructor questionnaire, and the purpose is to investigate preferences of each instructor at grading and to understand whether they prefer students with good imagination development. The third one is a student questionnaire, which was focused on their learning performance, social skills, and family atmosphere.

### *Tool A: Teaching material for inspiring imagination*

The proposed supplementary teaching material for enhancing imagination included comments from design instructors of other schools. Consensus was reached that the supplementary teaching material should be presented as a picture album for the experimental group to write in and to use in the class. The content of the teaching material and the procedures were designed based on general design courses. Honestly, we did not entirely change the current teaching mode; we just used a picture album, which was developed based on traditional teaching mode, to give the students some clues for inspiration and record students' imaginative thinking progress. The teaching material is composed of weekly worksheets, and no extra burden would be added to the students. The worksheets and their corresponding procedures were designed to harmony with the course progress. They are: A. Site investigation, B. imagination of Image, C. imagination of Scene, D. imagination of Product, E. Team discussion, F.



Incubation for Concept, G. Concept concretion, H. Drawing for image design, I. Drawing for scene design, J. Drawing for product design), and K. Final exhibition.

### *Tool B: Instructor questionnaire*

The instructor questionnaire was used to investigate grading preferences of the three instructors (coded as Instructor A, B, and C) teaching the experimental course. The goal is to investigate whether instructors' final grading can be influenced by the initial stage of imagination of students. This questionnaire was developed in accordance with the principle that experimental teaching courses have to have a design imagination development stage that lasts for at least three weeks. Moreover, during the first three weeks, procedure A to G of the supplementary teaching material has to be carried out. According to the progress of the experimental teaching, the grading aspect of imaginal thinking was formulated for the questionnaire. This research asked comments from experts in the design educational or psychological field. After discussing with these experts, fifteen imagination grading factors and the corresponding questions with Likert 5-point scale were established for the grading aspect.

### *Tool C: Student questionnaire*

The student questionnaire covers the aspect of personality traits and learning atmosphere. Questions in the student questionnaire were formulated based on information collected from published imagination-related or creativity-related research achievements (Sorry there are over 6 references including international and Taiwanese research achievements therefore no citation here for saving the article size). According to the progress of the experimental teaching, two grading aspects were formulated for the questionnaire: personality and study atmosphere. This research asked comments from experts in the design educational or psychological field. After discussing with these experts, ten imagination grading factors and the corresponding questions with Likert 5-point scale were established for each of the two grading aspects.

## **Experimental teaching**

### *Process*

Because influences on imagination were divided into personality, study atmosphere and imaginal thinking, and the collection of questionnaire were from the instructors and students, therefore the questionnaire survey was conducted in two stages. At the first stage, the supplementary teaching material was offered to students from the experimental group for elevating their imaginative thinking capacity, and the instructors evaluated all the students. This was used to observe variation in students' imagination and to record their imaginative thinking process. Next, the students were asked to fill in the student questionnaire after the last lesson of the experimental teaching. The purpose of this is to understand impacts from personality traits and learning atmosphere on imagination as well as students' learning requirement based on their learning condition and environment.

### *Participants and curriculum*

The participants in this experimental teaching were all students in their junior year at the Department of Creative Design of National Yunlin University of Science and

Technology (DCD of YunTech). For integrating industrial design, visual design, and architectural/spatial design, the students in this department come from a variety of different school admission background.

The experimental teaching was conducted between 24 April 2010 and 22 June 2010. The curriculum selected for this experimental teaching was "Integrative Design for Creative Living II," which was the core design curriculum of that semester. The curriculum topic "Integrative Design for Flexible Adoption of Unused Space and Innovative Product Marketing," which expected the students to present their imaginative achievements focused on carrying out space renovation in coordination with the development of peripheral products for innovative marketing, *i.e.* the students were assigned to establish a brand-new-shop project. There were a total of 63 students (49 Females and 14 Males) in this curriculum, and they were divided into 3 clusters comprising 20 groups. Restricted within the real teaching process, one cluster is assigned for challenge to the YunTech's art centre and the others are to the Hsingchi Memorial Hall at Touliu, Yunlin County, Taiwan. Every cluster was led by one teacher. Each cluster has 3 experimental groups and 3-4 control groups depending on the use of supplementary teaching materials in the curriculum.

### *Result and discussion of teaching experiment*

Because of the pluralistic university entrance approach that is currently implemented in Taiwan, students admitted into the school where the research took place came from both general high schools and vocational high schools in metropolitan and rural areas. In the face of such variety, how can course instructors, who must teach the course as well as judging the students, tutor the students justly on their imaginal work? How can they conduct a teaching evaluation that helps them to find out from the class identify those students in their classes who possess high imaginative capability? The investigation described herein was designed to answer these questions; moreover, it is hoped that the answers can be used as a preliminary reference for teachers who wish to improve their teaching later on. In addition to inspiration for students' imagination, the research was conducted with the following questions:

- Does the presently used judge manner of design course require modification?
- Do students' imaginative capabilities have an effect on the grade of their final works?

The discussion on these questions is presented below.

#### DOES THE PRESENTLY USED JUDGE MANNER OF COURSE REQUIRE MODIFICATION?

To evaluate the effectiveness of the experimental teaching, outside judges from were invited to participate in an evaluation; the number of the inner judges was equal to the number of inner judges. The evaluation was carried out to investigate evaluation done by different instructors and to explore ways to make the evaluation more objective and fair.

First, the students were divided into an experimental group and a control group (*i.e.* the students who used supplementary teaching material and who used no supplementary teaching material). There were a total of six judges (referred to as judge A to F; judge A, B and C were the inner judges, *i.e.* the course instructors; whereas judges D, E and F were outside DCD of YunTech), and each graded the student's final work. The obtained scores for the experimental group and the control group were analysed using the student's t-test. Next, the scores were

classified into the inner judges vs. the other outside judges, depending on which judges gave the score, and analysed using the student's t-test (see Table 1 for results).

As Table 1 shows, the scores given by the judges ranged between 85.6 and 93.82. The judge F gave the highest average scores, whereas the judge B in gave the lowest average scores. The scores given by the judge F varied significantly ( $p = 0.008$ , less than 0.05), while scores given by the other judges did not. One possibility for this is that when the students were presenting their works, a lively and vivacious atmosphere minimized the variation. For this item, all the judges gave the experimental groups higher scores, indicating that the inner judges and the outside judges hared a consistent viewpoint.

**Table 1.** Data analysis of judgements of experimental vs. control groups by different judges.

Judges	Groups	Student Amount	Avg.	Std	t-test	
					t	Signification p
A <sup>#</sup>	Experimental groups	28	90.00	4.497	0.337	0.738
	Control groups	35	89.66	3.316		
B <sup>#</sup>	Experimental groups	28	87.00	3.868	1.067	0.291
	Control groups	35	85.60	6.450		
C <sup>#</sup>	Experimental groups	28	90.18	2.957	1.578	0.121
	Control groups	35	88.14	6.878		
D <sup>#</sup>	Experimental groups	28	89.71	3.660	0.362	0.718
	Control groups	35	89.11	8.116		
E <sup>#</sup>	Experimental groups	28	87.96	5.948	1.530	0.133
	Control groups	35	86.00	3.670		
F <sup>#</sup>	Experimental groups	28	93.82	3.560	2.384	0.020*
	Control groups	35	91.51	4.010		

Note: <sup>#</sup> Judge A, B and C are also course instructor A, B and C, whereas judge D, E and F are outside DCD of YunTech.

\* denotes a significant difference.

As Table 2 illustrates, the average score given by the two groups of the judges ranged between 263.40 and 271.50. Scores given by the outside judges were generally higher than those given by the inner judges, but the difference was not found to be statistically significant. In other words, inviting the outside judges from did not significantly affect the judgement for students' final works. However, because this experimental teaching session was conducted only once, it is not possible to guarantee that the judges were consistently fair; therefore, this may not be applicable to future sessions. To normalize the experiment, the authors suggest that, while it is valuable to have the inner judges (course instructors) judge the students when tutoring individuals, at the end, the outside judges should be invited to join the judgement. By doing so, the judgement will cover more aspects, and grading will be more fair and with a broader scope.

**Table 2.** Data analysis of inner judges' and outside judges' judgements on experimental vs. control groups.

Judges	Groups	Students	Avg.	Std	t-test	
					t	Signification p
Inner Judges (A,B and C)	Experimental groups	28	267.18	10.180	1.153	0.253
	Control groups	35	263.40	14.749		
Outside Judges (D, E and F)	Experimental groups	28	271.50	11.442	1.530	0.131
	Control groups	35	266.63	13.379		

**DO STUDENTS' IMAGINATIVE CAPABILITIES HAVE ANY EFFECT ON THE GRADE OF THEIR FINAL WORKS?**

There are many factors that affect the quality of design-major students' final works. For example, imagination elicited during conceptual thinking, model making skills, 2D layout arrangement, ability to use 3D drawing software, and presentation style can all affect the project evaluation. To investigate whether students' imaginative capabilities have impact on the score of the judgments for students' final works, Pearson's product-moment correlation was employed to analyze the three imagination aspects as well as the influential factors. Correlations between the factors and the judgment by the three inner judges (i.e. course instructors) are presented in Table 3.

For "personality" as shown in Table 3, the correlation coefficient for teacher C's scores and the influential factor "full of confidence" is 0.309 ( $p = 0.017$ , less than 0.05). It is possible that the judge rated the imaginative capacity of students who expressed this with confidence than those who did not. The scores of the judge A and B did not correlate with any factors of this aspect, suggesting that these two teachers treated all the factors of personality traits equally and did not put emphasis on any specific factor. For "study atmosphere," the correlation coefficient between the judge A's scores and influential factor "interactive discussion" is 0.341 ( $p = 0.008$ , less than 0.05). This finding indicates that the judge considered that interactive discussion between instructors and students or between students themselves in the class can effectively improve imagination. The scores of the judge B and C are not significantly correlated with the influential factors of this aspect, indicating that these two teachers treated all the factors of learning atmosphere equally and did not put emphasis on any specific factor. For "imaginative thinking," the correlation coefficient for teacher A's score and influential factor "information heterogeneity" is 0.293 ( $p = 0.020$ , less than 0.05). This finding indicates that the teacher considered that the existence of variation in the collected data can stimulate pluralistic associative thinking among the students. The correlation for the judge A's scores and influential factor "information acceptability" is 0.530 ( $p = 0.000$ , less than 0.05). This finding indicates that the judge put emphasis on whether the materials collected by the students are relevant to the theme of the creative project. The correlation coefficients for the three instructors' scores and influential factor "material relevancy" are 0.586, 0.411, and 0.357, respectively ( $p = 0.000$ , 0.001, and 0.004, respectively, suggesting significant correlations). This finding indicates that these three teachers put emphasis on the elements collected by the students for the creative project and considered that these elements should be related rather than scattered or unrelated. Similarly, the correlation coefficients for the three instructors' scores and influential factor "information appropriateness" are 0.575, 0.304, and 0.532, respectively ( $p = 0.000$ , 0.015, and 0.000, respectively, suggesting significant

correlations). This finding indicates that the judge placed a similar level of emphasis on whether the materials used for the renovation site are reasonable.

For “imaginative thinking,” the correlation coefficient for the judge A’s scores and influential factor “drawing relevancy” is 0.403 ( $p = 0.001$ ). This finding indicates that the judge considered that the rough diagram prepared by the students should be related to the theme instead of being completely unrelated. The correlation coefficient for the judge B’s scores and “detailed description” is 0.324 ( $p = 0.009$ ), indicating that the instructor put emphasis on the level of detail in the students’ drawing. The three teachers all stressed the importance the components being varied, and the correlation coefficients are 0.440, 0.503, and 0.422, respectively ( $p = 0.000$ ,  $0.000$ , and  $0.001$ , respectively, suggesting statistical significance). This finding indicates that having pluralistic components in the rough diagram is an important factor that influences the teachers’ judgment of students’ imagination. The correlation coefficients for the scores of teachers A and B and ‘story context’ are 0.281 and 0.371 respectively ( $p = 0.026$  and  $0.03$  respectively, all less than  $0.005$  and thus statistically significant). This finding indicates that these two teachers preferred to see students presenting a complete story in the rough diagram, as this gave the story more life and vibrancy. “Imagination comprehensiveness” was a factor emphasized by the judge A; the correlation coefficient is 0.456 ( $p = 0.000$ , less than  $0.05$ ). This indicates that the judge thought that the students should consider all the techniques and theories that are used for each stage of the project, and they should possess a good understanding of the theories and techniques and apply them skilfully.

**Table 3.** Correlations between the factors and the three judges’ final judgements.

Judges	Correlation	Factors from Personality									
		IQ	Pleasantness	Responsibility & Enthusiasm	Emotional stability	Management	Self Control	Dominance & Control	Pursuit of Changes	Curiosity	Work Hard
A <sup>a</sup>	Correlation coefficient	0.201	0.139	-0.006	-0.004	0.077	0.062	0.175	0.183	0.073	0.201
	Signification p	0.126	0.294	0.962	0.979	0.560	0.641	0.186	0.164	0.581	0.127
B <sup>a</sup>	Correlation coefficient	-0.009	0.151	0.052	0.157	0.206	-0.004	0.166	0.056	0.046	0.202
	Signification p	0.949	0.255	0.694	0.236	0.118	0.974	0.210	0.671	0.729	0.125
C <sup>a</sup>	Correlation coefficient	0.059	0.116	-0.025	0.124	0.156	0.002	0.084	0.142	-0.089	0.309
	Signification p	0.655	0.381	0.853	0.350	0.239	0.990	0.529	0.283	0.053	0.017*
	Correlation	Factors from Study Atmosphere									
		Question Encouraged	Positive Affection	Interactive Discussion	Assumption Questions	Supplementary Visual/Audio Teaching Materials	Teacher-Demonstration	Answering Students' Questions	Homework Assignment	Art Activities	Art knowledge
A <sup>a</sup>	Correlation coefficient	0.053	-0.003	0.341	-0.125	-0.095	-0.030	-0.142	0.104	0.202	0.167
	Signification p	0.692	0.984	0.008*	0.346	0.476	0.824	0.284	0.434	0.126	0.207
B <sup>a</sup>	Correlation coefficient	-0.084	-0.012	0.204	-0.188	-0.052	-0.035	-0.038	-0.051	0.120	0.043
	Signification p	0.527	0.929	0.121	0.154	0.694	0.795	0.777	0.702	0.367	0.745
C <sup>a</sup>	Correlation coefficient	-0.173	-0.063	0.122	-0.126	-0.120	-0.178	-0.154	-0.044	0.068	-0.044
	Signification p	0.190	0.634	0.355	0.342	0.365	0.176	0.244	0.742	0.607	0.740

Judges	Correlation	Factors from Imaginational Thinking														
		Information Volume	Information Heterogeneity	Information Acceptability	Material Relevance	Information Appropriateness	Drawing Relevance	Detailed Description	Component Pluralistic	Story Content	Imagination Comprehensiveness	Original Insight	Imagination Integration	Expansibility	Imagination Refinement	Interesting level
A*	Correlation coefficient	0.007	0.293	0.530	0.568	0.575	0.403	0.103	0.440	0.281	0.456	0.398	0.267	0.311	0.217	0.385
	Significance p	0.954	0.020*	0.000*	0.000*	0.000*	0.001*	0.423	0.000*	0.026*	0.000*	0.001*	0.034*	0.013*	0.008*	0.002*
B*	Correlation coefficient	0.011	0.234	0.077	0.411	0.304	0.236	0.324	0.503	0.371	0.214	0.365	0.202	0.351	0.165	0.351
	Significance p	0.933	0.065	0.551	0.001*	0.015*	0.062	0.009*	0.000*	0.003*	0.093	0.003*	0.112	0.005*	0.197	0.005*
C*	Correlation coefficient	-0.086	-0.069	0.073	0.357	0.532	0.107	0.181	0.422	0.097	0.168	0.390	0.179	0.392	0.126	0.406
	Significance p	0.504	0.593	0.572	0.004*	0.000*	0.405	0.156	0.001*	0.449	0.189	0.002*	0.159	0.001*	0.324	0.001*

Note: # Judge A, B and C are also course teacher A, B and C respectively.

\* denotes significantly correlated.

For “imaginative thinking,” the three teachers all considered “original insight” to be critical, and the correlation coefficients are 0.398, 0.365, and 0.390 respectively ( $p = 0.001, 0.003, \text{ and } 0.002$ , all less than 0.05 and thus statistically significant). This finding indicates that students’ final products should be distinct in order to be innovative; moreover, they should not be derivative or cliched. For the influential factor “imagination integration,” only the judge A’s scores indicate a significant correlation (correlation coefficient = 0.267,  $p = 0.000$ , less than 0.05 and thus is statistically significant). In other words, this teacher valued students’ ability to integrate their imaginative integration capacity and all the suggestions into a comprehensive notion and then apply this integrated idea to the final product. ‘Expansibility’ is another important influential factor. The correlation coefficients for the scores of the three instructors are 0.311, 0.351, and 0.392, respectively ( $p = 0.013, 0.005, \text{ and } 0.001$ , respectively, all less than 0.05 and thus statistically significant). This finding indicates that the three teachers put emphasis on whether a project possesses market or development potentials. For “Imagination refinement,” the correlation coefficient for the judge A’s evaluation scores is 0.217 ( $p = 0.000$ , less than 0.05 and thus statistically significant). This finding indicates that this judge considered that student’s imagination should be comprehensive and sophisticated instead of superficial. For “interesting level,” the three judges shared a similar perspective. The correlation coefficients for the scores of the three instructors are 0.385, 0.351, and 0.406, respectively ( $p = 0.002, 0.005 \text{ and } 0.001$ , respectively). This finding suggests that all the judges considered that projects that are more humorous and fun are better at attracting consumer attention and interest.

According to the above analysis, there are numerous influential factors from the imaginative thinking aspect that are significantly correlated with the three judges’ judgments. These findings have revealed that students with better imaginative performance are more likely to gain approval from the three judges and thus score more highly in their final judgment.

## Conclusion

There is no doubt that the imaginational capability of students majoring in design does affect the quality of their final works. This research found that imaginational thinking processes during class exert more of an influence on the quality of the design work than either personality or study atmosphere. As a result of this, it is clear that how best to encourage students to cultivate their imagination during the imaginational

thinking process is a topic well worth investigation in the context of education research. During the experimental teaching session undertaken in this study, students from the experimental group received supplementary teaching material that was designed to assist them in material collection for their imaginational achievements. Although statistically this supplementary teaching material did not much significantly enhance students' imaginative capabilities, the experimental group using the supplementary material still performed better than the control group did. In other words, factors that are highly correlated with the grade of the project, *e.g.* information appropriateness, original insight, and interesting level, should be stressed much more than they are currently in the new edition of the supplementary teaching material.

As for the plans for future research related to design imagination, due to various restrictions, only junior students major in creative design at National Yunlin University of Science & Technology participated in this experiment. It will be a good idea to expand the scope this study to other fields or groups to gain more fully understanding on the actions and effects of imagination. For example, the experimental teaching can be given to design-major students at regular universities and technology colleges respectively to investigate their imagination performance. This is a way for assessing differences between various teaching environments in Taiwan.

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# Learning problems and resources usage of undergraduate industrial design students in studio courses

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**Abstract:** *Design students face certain learning problems and difficulties as they explore the design problems space. The purpose of this study is to understand those learning problems and the resources that undergraduate industrial design students need in studio courses. To collect the data, a questionnaire was designed according to the preliminary studies. A total of 334 students from 4 Taiwanese universities participated in the survey. The results demonstrated that the most difficult design tasks for students included concept generation, design presentation and design decision. The main problems that the students experienced included the cost issue in design presentation, time pressure in design documentation, inspiration in concept generation, digital modelling in design presentation and vertical (deep) thinking in concept generation. The causes of these problems were personal issues, resources and interactions with instructors and peers. The learning resources that the students used to solve their learning problems fell into four categories: people, object, method and environment. The information provided in this study can deepen the understanding of the learning process of students and provide a reference for teaching planning and the setting of the learning resources in design education.*

*Keywords: learning problems, learning resources, design education.*

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## Introduction

Today, design is a powerful weapon that companies use. Thus, it is important to educate excellent designers for the industry. The essential feature of design education is “learning by doing”, especially in industrial design. Students acquire design knowledge and skills through operating real design problems.

Learning is the act or process of developing skills or knowledge (Arsham 2002), and understanding the learning process can improve education. A learning system includes many elements, such as instructors, learners, content and materials, and environment. Therefore, in order to understand the learning process, it is important to gain a holistic view from different viewpoints.

However, design students also experience learning problems. Due to the features of industrial design education, the problems that the students experience and the resources which they use in the learning process may differ from those in other domains. However, few studies have discussed the learning problems and learning resources in design education.

This study aims to reveal the problems of industrial design learning from the students’ viewpoint, in order to explore these learning problems and the resources that the students used to overcome those problems in the undergraduate industrial design studio course. The results can deepen the understanding of the students’ learning process and provide a reference for teaching planning and the setting of the learning resources in industrial design education.

## Literature Review

### *Design professionals’ learning*

Design is generally considered to involve abductive reasoning, which addresses ill-defined problems and uses a construction process to solve them (Zimring and Latch Craig 2001). Design knowledge covers the body and relationship between object and subject. It is difficult to understand or to describe, and it must be understood with reference to the problem context. This knowledge also cannot be delivered by a traditional lecture course. The most common method of dissemination is “learning by doing”, such as the apprentice system; thus, design learning emphasizes working with actual problems to acquire professional knowledge and techniques (Schön 1987). Accordingly, students need to acquire advanced knowledge through working with design problems in the real world. In the learning process, an instructor demonstrates and leads learners to engage with a real design problem. The learners try to observe, understand and grasp the various methods and techniques through the process, to cultivate observation and decision-making capabilities, to explore their own talents and, finally, to develop their own procedure, style and philosophy of design. Therefore, the design process can be considered a social process in which the result is constructed using various kinds of knowledge and which involves interaction and negotiation between participants (Bucciarelli 2001; Oak 2011).

The studio is the main and most important pedagogy of design education (Schön 1987) that has been in use for almost 100 years (Reimer and Douglas 2003), especially in architectural and industrial design. The main distinguishing feature of studio pedagogy is the learning of the procedure and methods of design and the accumulation of experience through the process of solving actual design problems. The emphasis is on the presentation of design concepts and ideas, the critique and communication

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involved in the design process, and the learning of advanced design knowledge through reflection on design problems. Hence, learners go through the procedure of design to solve real or simulated design problems (Attoe and Mugerauer 1991; Budd, Vanka and Runton 1999; Forgbler and Russell 1999). Through the studio, learners are exposed to a number of learning experiences which focus on two key aspects. The first is learning how to design by engaging with a process of designing or a suite of possible design methodologies. The second is evincing knowledge about concepts and/or situations through the act of designing (Smith, Hedley and Molloy 2009).

The design studio is the heart of most industrial design and architecture curricula. There are several factors associated with a successful design studio. The “studio teaching project” (<http://www.studioteaching.org>) supported by the Australian Learning & Teaching Council proposed that there are several key qualities or characteristics that play an important role in a typically successful studio programme: (1) People: lecturers, tutors, technicians, members of professional communities and student peers; (2) Facilities and Resources: space, equipment, technologies and materials; (3) Projects: areas of study, tasks and problems to be solved, especially those related to industry/profession; and (4) Time: the proportion of course time provided for the studio and hours of access to facilities. Attoe and Mugerauer (1991) also mentioned that the factors associated with teaching excellence in design studios include three considerations: (1) the teacher as self (aspects of the teacher’s own life that contribute to good teaching); (2) personal style (the way the teacher behaves); and (3) course format and implementation.

### *Learning problems and resources in the design studio*

The design studio is the place to practice and integrate the knowledge and skills acquired from the courses in the programme. There are various people involved in the design learning process, for example, classmates, instructors, technicians and other experts. The design studio also requires an environment and setting to support the design learning process, such as a personal work space, workshops and library. Learning the process of design is similar to designing; both events involve spending certain periods of time thinking through the process and attempting to achieve some interesting results. Learners often have to explore and discover their own paths to gain knowledge and skills (Chang and Huang 2002). Furthermore, the students face a number of problems as they work through their design process.

#### LEARNING PROBLEMS

The students’ learning problems or difficulties are complex and dependent on a range of factors, including course organization and development, the subject or topic being taught, the teaching style and the students’ expectations (Chang et al. 2000; Pirrie, Hamilton and Wilson 1999).

In particular, design students experience some learning problems and difficulties when they explore the design problems space. Yang, You and Chen (2005) investigated the difficulties faced by industrial design students and their career guidance needs and found that the students encountered the following problems: (1) high learning pressure and frustration; (2) a heavy workload, depriving them of extra-curricular activities and leisure time; (3) competition among classmates, influencing peer relationships; (4) high costs of materials, resulting in financial pressure; (5) feeling of uncertainty and worries about the future; and (6) insufficient interaction between faculty and students. In addition, Mawson (2007) compared the workplace practices of six experienced

designers and investigated their experience of a teaching practicum designed to help secondary school students develop design skills. The results revealed that the students faced two types of problems. First, they experienced technical problems related to the skills needed to produce the product. The second type of problem was related to the nature of the materials and the tools needed to do the job. The teachers also identified three basic problems with their experiences. One was the students' antipathy towards, and ignorance of, the design element in the technological process. Another was the students' lack of practical experience. A further problem was the entrenched traditional views of technical education in the schools that were not congruent with the approach of the relatively new technology curriculum.

#### LEARNING RESOURCES

Learning resources are defined as information, represented and stored in various media and formats, which assists student learning as defined by provincial or local curricula. This includes, but is not limited to, materials in print, video and software formats, as well as combinations of these formats intended for use by teachers and students (*Learning Resources* 1999).

Learning the process of design is similar to designing (Chang and Huang 2002). The design students need some resources to solve the learning problems and difficulties they encounter, as well as to solve the design problems with design resources and knowledge. Some of the design resources used to solve the design problems may also be the same resources for solving the learning problems.

Little research has discussed the design learning resources or even the study method. Brown et al. (1996) developed a learning resource questionnaire to gather information on the learning resources used by students. These resources may include not only lectures, tutorials and courseware, but books, hand-outs, notes and discussions with other students. They regarded this information as important to teaching staff in assessing and increasing the value of the resources for students by ensuring their effective integration into a course.

With regard to the design learning resources, Chiu (2010) investigated students' knowledge sources and knowledge sharing in the design studio, the definition of design knowledge resources is similar to the design learning resources in this study. The results demonstrated that the top four knowledge resources requested by juniors were books and magazines, studio-mates, schoolmates and the Internet. In the same order, the top four knowledge gain sources were books and magazines (40%), studio-mates (22%), schoolmates (12%) and the Internet (9%). The top four knowledge sources requested by seniors were books and magazines, the Internet, studio-mates and auditing desk critiques. In terms of the percentage of knowledge gain, books and magazines were 25%, the Internet was 23%, studio-mates were 20% and auditing desk crits was 15%.

The research of You, Yang and Liao (2007) explored industrial design students' learning attitudes in Taiwan. Some results of the study also related with the learning resources, including the following: (1) while learning design, students want teachers to share their design experiences with them; (2) they tend to ask classmates or friends for help when they encounter difficulties; (3) they devote a great deal of time and emphasize creative thinking and model-making during the design process; and (4) their design concepts mostly come from their life experiences.

## Summary

The main method for design education is the studio, where students obtain design knowledge through the design process by operating real design problems. Design students face some learning problems and difficulties in the design learning process, and they try to use some learning resources to solve these problems, such as seeking and gathering the resources to solve the design problems. However, little research has discussed the learning problems and learning resources in the design education domain. This paper shall explore the learning problems and learning resources to increase the understanding of the learning process of design students.

## Methods

A survey was conducted to investigate the learning problems that students encounter and the learning resources that they use to solve the learning problems in industrial design studio courses. The main research questions were as follows:

- What do students consider to be the most difficult design tasks?
- What are the major and most common problems that students experience?
- What are the issues that cause the learning problems?
- What kind of resources do students use to overcome the problems?

## Subjects

The survey respondents were 334 undergraduate industrial design students from 4 universities in Taiwan. There were 114 male and 220 female students. The subjects' attributes are shown in Table 1.

**Table 1. The attributes of the subjects.**

University	Total	Year of core course			Gender	
		2	3	4	Male	Female
U1	61	20	24	17	22	39
U2	99	40	30	29	29	70
U3	84	34	29	21	32	52
U4	90	30	29	31	31	59
Total	334	124	112	98	114	220

On average, the students spent 23.17 (SD = 18.15) hours per week on their design learning projects. Per day, they slept for 5.82 (SD = 1.43) hours and spent 5.80 (SD = 3.28) hours surfing the Internet, on average.

## Data collection and analysis

The data were collected using the abovementioned survey. The survey was designed according to the results of a preliminary study (Chen and Tang 2011) that formulated the categories and items of the learning problems and resources. The survey questions were in three parts: (1) the learning problems that the students experienced in each design task; (2) the resources that the students used to solve the problems in each design task; (3) the basic information of the subjects.

It took about 20–30 minutes for the participants to complete the questionnaire. All the data were entered into an MS Excel datasheet, then sorted and checked. Finally, SPSS software was used to statistically analyse the data.

## Results

### *The difficulty of design tasks*

The results regarding the difficulty of the design tasks are shown in Table 2. The students reported that the top 3 most difficult design tasks were *concept generation* (75.7%), *design presentation* (38.6%) and *design decision* (37.7%).

**Table 2. The most difficult design tasks for students. (DR: Design Research, CG: Concept Generation, DDec: Design Decision, DP: Design Presentation, DDoc: Design Documentation.)**

		Design Tasks									
		DR		CG		DDec		DP		DDoc	
Category	Item	N	%	N	%	N	%	N	%	N	%
Gender	Male	45	39.5	81	71.1	41	36.0	35	30.7	14	12.3
	Female	57	25.9	172	78.2	85	38.6	94	42.7	16	7.3
Course	Basic Product Design	40	32.3	98	79.0	41	33.1	57	46.0	11	8.9
	Product Design	32	28.6	87	77.7	47	42.0	40	35.7	13	11.6
	Senior Design Project	30	30.6	68	69.4	38	38.8	32	32.7	6	6.1
Total		102	30.5	253	75.7	126	37.7	129	38.6	30	9.0

#### GENDER

According to the male students, *concept generation* and *design research* were the top two most difficult tasks, and according to the female students, they were *concept generation* and *design presentation*.

Chi-square tests were conducted to test the homogeneity of the proportions between genders. The results indicated that the male students (39.5%) regarded the *design research* task as more difficult than the female students (25.9%), and the female students (42.7%) regarded the *design presentation* task as more difficult than the male students (30.7%).

#### CORE COURSE

Regarding the core course, the results suggested a decreasing trend in *concept generation* and *design presentation* from year 2 to year 4. The students in the third year product design course regarded *design decision* and *design documentation* as more difficult than the students in the second year basic product design and fourth year senior design project courses. However, there were no significant differences between the core courses.

### *The design learning problems*

The result of the frequency and percentage of the learning problems that the students experienced are presented in Table 3. The main problem that the students frequently experienced was associated with the cost of *design presentation* tasks, with 59.8% of the students responding that they always encountered this problem. Further, 58.0% responded that they had experienced time pressure with regard to *design documentation*; 54.2% always encountered digital 3-D modelling problems in *design presentation* tasks; and 51.2% frequently experienced vertical thinking problems in *concept generation* tasks.

**Table 3. The learning problems that the students experienced in each design task.**

*Learning problems and resources usage of undergraduate industrial design students in studio courses*

Task	Problems	Never		Few		Always		Total	
		N	%	N	%	N	%	N	%
Design Research	Data collection	13	3.9	201	60.2	120	35.9	334	100.0
	Data sorting	48	14.4	218	65.3	68	20.3	334	100.0
	Data analysis	18	5.4	226	67.7	90	26.9	334	100.0
	Data Presentation	45	13.5	198	59.5	90	27.0	333	100.0
	Understanding of the design theme	42	12.6	212	63.5	79	24.0	334	100.0
	Selection of the design direction	15	4.5	178	53.3	141	42.2	334	100.0
	Target setting	26	7.8	198	59.5	109	32.7	333	100.0
Concept Generation	Lateral thinking	15	4.5	173	51.8	146	43.7	334	100.0
	Vertical thinking	15	4.5	148	44.3	171	51.2	334	100.0
	Concept presentation skills	28	8.4	162	48.5	144	43.1	334	100.0
	Inspiration	8	2.4	135	40.4	191	57.2	333	100.0
	Form & Style	22	6.6	179	53.6	133	39.8	334	100.0
	Reference information	59	17.8	203	61.1	70	21.1	332	100.0
Design Decision	Decision-making ability	32	9.6	193	57.8	109	32.6	334	100.0
	Quantity of concept	32	9.6	162	48.5	140	41.9	334	100.0
	Quality of concept	16	4.8	154	46.1	164	49.1	334	100.0
	Criteria for evaluation	40	12.0	189	56.6	105	31.4	334	100.0
	Evaluation method	55	16.5	193	58.0	85	25.5	333	100.0
Design Presentation	Digital modelling	18	5.4	135	40.4	181	54.2	334	100.0
	Physical modelling	19	5.7	182	54.7	132	39.6	333	100.0
	Graphic	62	18.6	170	51.1	101	30.3	333	100.0
	Oral	52	15.6	151	45.2	131	39.2	334	100.0
	Organization & logic	49	14.8	190	57.4	92	27.8	331	100.0
	Cost	26	7.8	108	32.4	199	59.8	333	100.0
Design Documentation	Data collection	83	24.9	180	54.1	70	21.0	333	100.0
	Organization & structure	52	15.6	211	63.2	70	21.0	333	100.0
	Layout & editing	44	13.2	181	54.4	108	32.4	333	100.0
	Time	26	7.8	114	34.2	193	58.0	333	100.0
	Cost	64	19.4	110	33.3	156	47.3	330	100.0

To identify any difference due to gender and core courses, the data were re-coded from the normal scale to an interval scale, thus converting "Never" as "0", "Few" as "1" and "Always" as "2". Table 4 presents a summary of the test results. The results indicated that the female students significantly and frequently experienced problems related to the selection of the design direction in *design research*, vertical thinking and

concept presentation skills in *concept generation*, quality of concept and criteria for evaluation in *design decision* and digital modelling in *design presentation* task.

The third year product design course students experienced problems with the selection of the design direction in *design research* tasks more so than the fourth year senior design project course students. The third year students also encountered vertical thinking problems in *concept generation* tasks more often than the second year students in the basic product design course.

**Table 4. The results of the test of differences by gender and course with significance level .05. (F: Female, M: Male, 2: second year basic product design course, 3: third year product design course, 4: fourth year senior design project.)**

Task	Problem	Gender	Course
Design Research	Selection of the design direction	F > M	(3, 2) ≥ (2, 4)
Concept Generation	Vertical thinking		(3, 4) ≥ (4, 2)
	Concept presentation skills	F > M	
Design Decision	Quality of concept	F > M	
	Criteria for evaluation	F > M	
Design Presentation	Digital modelling	F > M	

### Issues that caused learning problems

Five issues developed based on the preliminary research (Chen and Tang 2011) were listed and presented in a multiple choice format to determine the main issues that caused the learning problems. The issues related to the learning problems that the students experienced included *personal* (67.3%), *resources* (40.1%), *interaction with instructors* (28.9%), *interaction with peers* (19.4%) and *others* (2.8%).

Table 5 summarizes the results of the problems caused by the issues in each design task. A chi-square test was conducted to test the homogeneity of the proportions between design tasks. The results revealed that there were significant differences between the design tasks in terms of each issue.

**Table 5. The results of the issues that caused learning problems in each design task. (DR: Design Research, CG: Concept Generation, DDec: Design Decision, DP: Design Presentation, DDoc: Design Documentation. \*\*\* p < .05)**

Issues	DR		CG		DDec		DP		DDoc		Test of homogeneity	
	N	%	N	%	N	%	N	%	N	%	X <sup>2</sup>	df p
Personal	1735	64.9	1637	70.0	1304	65.1	1686	72.1	1285	64.1	53.009	4 .000 ***
Resources	1031	38.6	1122	48.0	724	36.1	884	37.8	795	39.7	81.549	4 .000 ***
Interaction with instructors	884	33.1	812	34.7	808	40.3	472	20.2	307	15.3	454.760	4 .000 ***
Interaction with peers	589	22.0	542	23.2	405	20.2	411	17.6	261	13.0	91.062	4 .000 ***
Others	79	3.0	58	2.5	43	2.1	67	2.9	70	3.5	7.862	4 .097

Figure 1 below shows the radar chart of the percentages corresponding to the issues in each design task. *Personal* was the main issue that caused learning problems,

especially in the *design presentation* and *concept generation* tasks. The *resource* issue's proportion of *concept generation* was significant higher than in other tasks. The proportion of *interaction with instructors* in *design decision* tasks was significantly higher than in other tasks. In *design decision* tasks, the proportion of *interaction with instructors* was also higher than the *resource* issue.

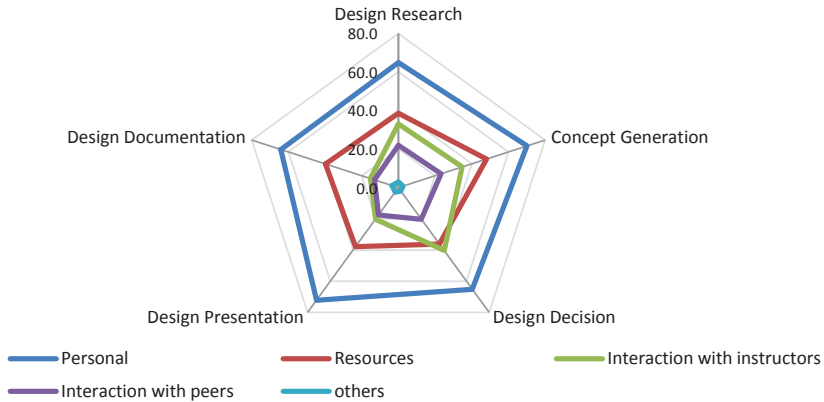


Figure 1. The radar chart of the issues caused learning problems in each design task.

Table 6 presents a summary of the analysis results for the issues by gender. There were some significant differences related to gender. The proportion of male students' learning problems caused by *resources* and *interaction with peers* issues were significantly higher than they were for the female students. The proportion of *personal* issues was significant higher among the female students than the male students.

Table 6. Analysis of the issues that caused learning problems by gender. (\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ )

Issues	Male (M)		Female (F)		Test of homogeneity			Post test
	N	%	N	%	$\chi^2$	df	p	
Personal	2517	64.4	5130	68.9	23.843	1	.000	*** F > M
Resources	1635	41.8	2921	39.2	7.141	1	.008	** M > F
Interaction with instructors	1106	28.3	2177	29.2	1.128	1	.288	
Interaction with peers	823	21.0	1385	18.6	9.809	1	.002	** M > F
Others	92	2.4	225	3.0	4.226	1	.040	* F > M

The analysis results of the issues by core course year are shown in Table 7. The proportion of *personal* issues in the second year basic product design and third year product design courses were significantly higher than in the fourth year senior design project course. In terms of the *resources* issue, the proportion for the third year product design course was significantly higher than for the second year basic product design and fourth year senior design project courses. The proportions of interaction with instructors and interaction with peers for the fourth year senior design project course were significantly higher than for other courses.



**Table 7. The results of the issues that caused learning problems by course. (BPD: Basic Product Design, PD: Product Design, SDP: Senior Design Project. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ )**

Issues	BPD (2)		PD (3)		SDP (4)		Test of homogeneity			
	N	%	N	%	N	%	$\chi^2$	df	p	Post test
Personal	2977	70.0	2584	68.5	2086	62.6	50.312	2	.000	*** 2 > 4; 3 > 4
Resources	1630	38.4	1632	43.2	1294	38.8	23.136	2	.000	*** 3 > 2; 3 > 4
Interaction with instructors	1163	27.4	1052	27.9	1068	32.1	22.919	2	.000	*** 4 > 2; 4 > 3
Interaction with peers	649	15.3	763	20.2	796	23.9	90.743	2	.000	*** 3 > 2; 4 > 2; 4 > 3
Others	142	3.3	76	2.0	99	3.0	13.541	2	.001	** 2 > 3; 4 > 3

### Design learning resources

The learning resources that the students used to solve the learning problems comprised 4 categories: *people* (27.9%), *object* (24.7%), *method* (29.4%) and *environment* (18.0%). Figure 2 shows the percentages of the learning resource categories and items. The *people* resources include instructors, peers, technicians, experts, family, friends and others. The *object* resources include the Internet, books and magazines, existing products, tools and equipment and others. The *method* resources include brainstorming, discussion, observation, interviews, practice, computer-aided and others. The *environment* resources include library, workshops off campus, processing factories of campus, department stores and others.

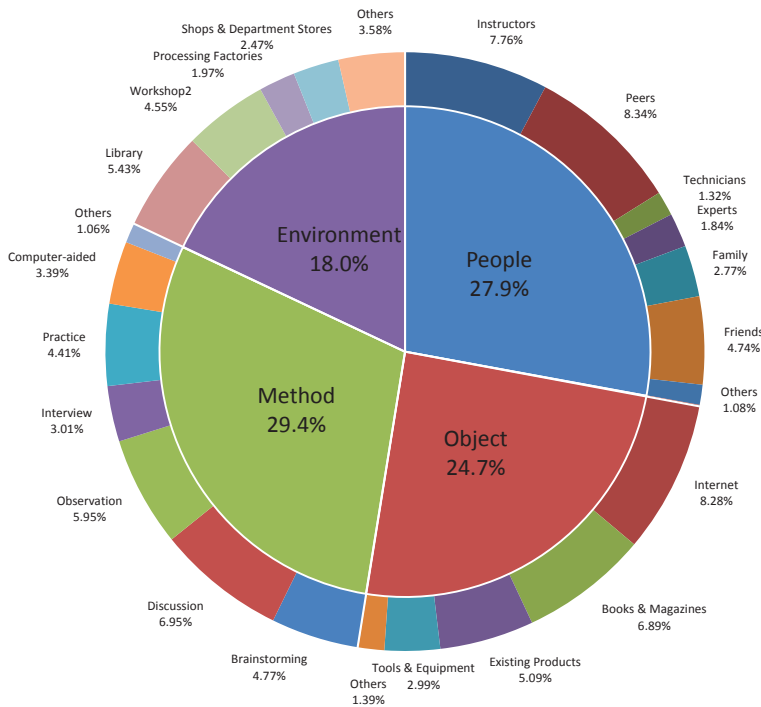


Figure 2. The learning resource categories and items.

*Learning problems and resources usage of undergraduate industrial design students in studio courses*

Table 8 presents a summary of the frequency and percentage of each resource. The results indicated that peers (58.7%), the Internet (58.2%) and instructors (54.6%) were the most used learning resources for solving the learning problems. The top 3 resources that the students used in *design research* tasks were the Internet (68.8%), peers (62.4%) and instructors (59.7%); in the *concept generation* tasks, they were the Internet (69.6%), peers (63.9%) and instructors (63.1%); in *design decision* tasks, they were instructors (66.8%), peers (58.4%) and discussion (57.8%); in *design presentation* tasks, they were peers (58.4%), practice (48.5%) and instructors (45.1%); and in *design documentation* tasks, they were peers (48.2%), the Internet (47.3%) and books and magazines (40.3%).

**Table 8. The categories and percentage of the learning resources in each design task. (DR: Design Research, CG: Concept Generation, DDec: Design Decision, DP: Design Presentation, DDoc: Design Documentation.)**

Categories	Items	Design Tasks											
		Total		DR		CG		DDec		DP		DDoc	
		N	%	N	%	N	%	N	%	N	%	N	%
People	Instructors	6198	54.6	1594	59.7	1475	63.1	1339	66.8	1055	45.1	735	36.7
	Peers	6662	58.7	1667	62.4	1494	63.9	1170	58.4	1365	58.4	966	48.2
	Technicians	1056	9.3	227	8.5	238	10.2	212	10.6	248	10.6	131	6.5
	Experts	1470	12.9	329	12.3	373	16.0	313	15.6	281	12.0	174	8.7
	Family	2211	19.5	490	18.3	551	23.6	326	16.3	456	19.5	388	19.4
	Friends	3783	33.3	1024	38.3	918	39.3	581	29.0	721	30.8	539	26.9
	Others	862	7.6	182	6.8	181	7.7	111	5.5	169	7.2	219	10.9
Object	Internet	6612	58.2	1837	68.8	1628	69.6	1152	57.5	1047	44.8	948	47.3
	Books & magazines	5503	48.5	1391	52.1	1453	62.1	972	48.5	879	37.6	808	40.3
	Existing Products	4058	35.7	1046	39.1	1214	51.9	813	40.6	540	23.1	445	22.2
	Tools & equipment	2385	21.0	461	17.3	560	24.0	381	19.0	624	26.7	359	17.9
	Others	1111	9.8	166	6.2	141	6.0	177	8.8	323	13.8	304	15.2
Method	Brainstorming	3806	33.5	1031	28.6	1172	50.1	728	36.3	463	19.8	412	20.6
	Discussion	5550	48.9	1589	59.5	1305	55.8	1159	57.8	827	35.4	670	33.4
	Observation	4747	41.8	1216	45.5	1331	56.9	890	44.4	704	30.1	606	30.2
	Interview	2398	21.1	677	25.3	623	26.6	517	25.8	301	12.9	280	14.0
	Practice	3521	31.0	547	20.5	738	31.6	451	22.5	1135	48.5	650	32.4
	Computer-aided	2624	23.1	706	26.4	594	25.4	335	16.7	556	23.8	433	21.6
	Others	847	7.5	114	4.3	114	4.0	116	5.8	225	9.6	278	13.9
Environment	Library	4334	38.2	1220	45.7	1157	49.5	769	38.4	588	25.1	600	29.9
	Workshops	3630	32.0	879	32.9	804	34.4	687	34.3	764	32.7	496	24.8
	Processing factories	1570	13.8	376	14.1	356	15.2	277	13.8	322	13.8	239	11.9
	Shops & stores	1969	17.3	516	19.3	654	28.0	368	18.4	221	9.5	210	10.5
	Others	2857	25.2	639	23.9	514	22.0	456	22.8	660	28.2	588	29.3

Figure 3 presents a bar chart of the percentage of the resources used in each design task. The top 2 types of resources that the students used in *design research* tasks were *object* (36.7%) and *method* (30.0%); in *concept generation* tasks, they were *object* (42.7%) and *method* (35.8%); in *design decision* tasks, they were *object* (34.9%) and *method* (29.9%); in *design presentation* tasks, they were *object* (29.2%) and *people* (26.2%); and in *design documentation* tasks, they were *object* (28.58%) and *method* (23.7%). There was a similar pattern of usage in the resource types. The students used the most resources in *concept generation* tasks and the fewest in *design documentation* tasks. The students used the *object* type resources the most and the *environment* type resources the least.

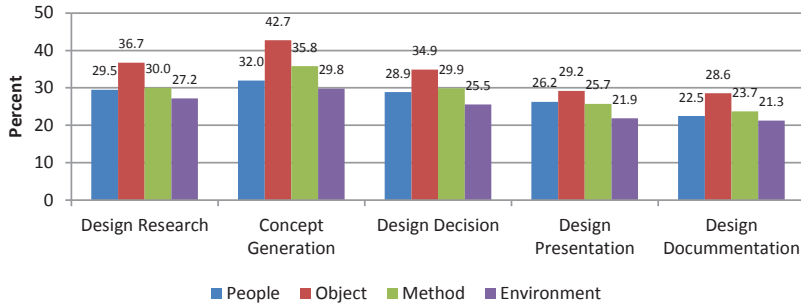


Figure 3. The proportions of learning resources used in each design task.

Figure 4 shows a comparison of the proportions of the learning resources used by gender. The results suggested that the male students used more resources to solve the learning problems than the female students did, especially in the case of *environment* resources.

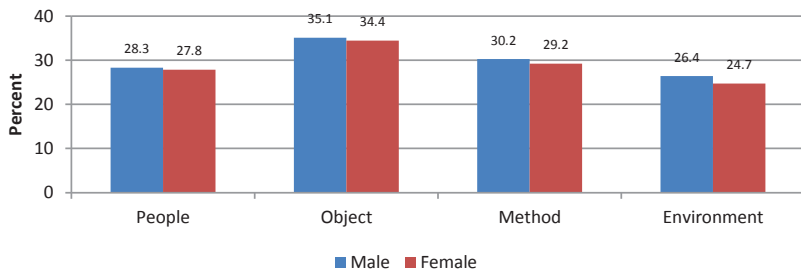


Figure 4. The proportions of the learning resources used by gender.

Figure 5 presents a bar chart of the proportions of resources used in different types by core courses. The results illustrated that the students progressively relied on the *people* type resources from the second year to the fourth year core courses, and their usages of *object* type resources gradually decreased as the course year increased.

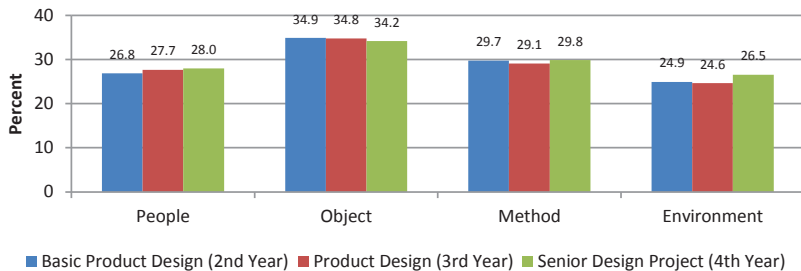


Figure 5. The analysis of the usage proportion of learning resources by core course.

## Summary

The results revealed that the students experienced learning problems within the learning process, especially in *concept generation* tasks. The learning problems were mainly caused by *personal* issues, and they relied on *people* resources to help them solve their problems. There were several differences between genders and among core courses in terms of the learning problems, issues and resources usage.

In terms of gender, both the male and female students regarded *concept generation* as the most difficult task. However, the male students regarded *design research* as a more difficult task than the female students did. Moreover, the female students regarded *design presentation* as more difficult than the male students did, especially in digital modelling. The proportions of males who had problems caused by *resources* and *interaction with peers* issues were significantly higher than among the female students. The proportion of female students who had *personal* issues that caused problems was significantly higher than among the male students. Overall, the male students seemed to use more resources to solve their problems, especially with regard to *environment* resources.

Concerning the core courses, there was a decreasing trend in the proportions of students who regarded *concept generation* and *design presentation* as difficult tasks from second year to fourth year. The students in the third year product design course significantly and frequently experienced problems in the selection of the design direction in *design research* tasks as compared to the fourth year senior design project course students. The third year students also experienced vertical thinking problems in *concept generation* tasks more so than those in the second year basic product design course. In the fourth year senior design project course, the proportion of problems caused by *personal* issues was the lowest, but the proportions of issues associated with *interaction with instructors* and *interaction with peers* were higher than other courses. The students progressively relied on *people* resources from second year to fourth year, and gradually decreased their usage of *object* resources as the course year increased.

## Concluding remarks

The purpose of this study was to investigate the learning problems that undergraduate industrial design students experienced and the resources they used in core courses with studio pedagogy. The results illustrated that (1) *concept generation* was the most difficult design task for the students; (2) the main learning problems that the students frequently experienced were cost problems within *design presentation* tasks, time pressure in *design documentation* and digital modelling in *design presentation* tasks; (3) the top two main issues causing learning problems were *personal* and *resources*; (4) the top two resources that the students used for solving the learning problems were *method* and *people*. These findings are consistent with those of previous studies (Chiu 2010; Yang, You and Chen 2005; You, Yang and Liao 2007). Several additional findings and reflections are elaborated below.

### GENDER ISSUE

The results indicated that there were significant differences between the males and females in terms of the difficulty of design tasks, learning problems and resources usage. The proportion of female students in the industrial (product) design domain gradually increased from 48.11% in 1998 to 61.06% in 2011 in Taiwan (Ministry of Education 2011). Therefore, it is worth studying the issues concerning the education and career development of female designers.

#### PEOPLE ISSUE

The learning problems in *design decision* tasks were mainly caused by *personal* and *interaction with instructors* issues. Furthermore, the students preferred to solve these problems by relying on *people* resources, such as instructors and peers. Design practice can be seen as a social process that involves interaction and negotiation between participants (Oak 2011). In the design studio, students have to interact and negotiate with the instructor to propose solutions to design problems. Thus, the instructor plays an important role in students' learning process (Attoe and Mugerauer 1991). Consequently, the quality and quantity of the design instructors in studio courses should be considered.

#### PERSONAL ISSUE

Most of the students regarded *personal* issues as the main issues causing their learning problems. These *personal* issues were related to personal talent and abilities (Chen and Tang 2011). The results indicated that the students lack confidence in their talent and abilities acquired from their other courses. It is important to enhance students' confidence and to make sure that the students have really learnt the knowledge and skills that their courses are designed to impart. Further, the students must learn how to use this knowledge and skills to ensure the integrity of their design projects. However, students seem to ignore design methods.

Design professionals' learning is a complex issue. This study attempted to explore the learning problems and resources from the learners' viewpoint. The findings can deepen the understanding of the design learning process. They could also be applied in teaching and future research. However, there is a continuing need for an adequate theoretical basis for the practical application of design education.

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## Design: The continuous construction of competences

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**Abstract:** *This article concerns high education curricula and training of designers. The key question considered by Design teachers and explored in this article is: How can we supply designers with useful and essential skills through training that will allow them to effectively respond to the needs of business environment?*

*To answer this question we present the results of a research designed to focus on market and business needs of design competences, and expectations about designer's performances.*

*We intended to provide further information and discuss the curricula in design higher education. Finally we present a model that allows higher education institutions to design new and innovative higher education curricula in design, able to fulfil company's requirements.*

**Keywords:** *Competences, Curriculum, Design studies, Competitiveness*

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## Introduction

There are several different expressions of concerns from the researchers, professors and higher education teachers regarding the quality of graduate training in Design. If in conferences as the one taking place since 1998 – *Conference on Doctoral education in Design* – designers training problems are tackled and discussed at PhD level, it should also be urged to determine and to question, at bachelor and master levels, the training problems of those professionals that are going to integrate working teams that contribute to good success and good business performance, in this kind of meetings of researchers.

Commercial success is becoming ever more dependent on design or on drawing-up of strategies by business fabric, where design is included contributing definitely to the creation of products that satisfy a wide range of consumers' increasing requirements (Potter, 1999, p. 24).

As Margolin (2010, p. 73) refers, design is an activity that produces new products but, for the hit of the product in the market it is important to understand arising needs.

Currently, it is appropriate to make a few observations that might contribute to improve the designers' training, considering, as Bessa & Vaz (2007, p. 29) refer, that the implementation of the Bologna Process allows to apply sharp system reforms and, therefore, it is drastically changing higher education, polytechnic and university education in our country and in Europe.

In terms of designers' training it is important to think of strengths and weaknesses in terms of acquisition and development of competences, in order to address the structuring of curricula, aiming the training's improvement of the current and future professionals of design, making possible its developments from beginners to experts or specialists. Loyens (1997) advocates the importance of understanding the type of knowledge or of competences a Designer should have, in order to provide substantive input for education/training in design.

Some more active views not only acknowledge the gaps in the acquisition of competences during training but also focus relationship that should exist between the business world and the educational institutions. Hence, Monally (2004, p. 49) underlines the urgency of the updating of the existing courses, for tracking the design's constant development, for helping and including the national competitiveness, identifying design as an essential and targeted activity, to allow a greater flexibility and the exchange of tasks and knowledge, foreseeing the performance of tasks in teams grouped according to several abilities and skills.

Looking at design as one of the main factors that influence the cultural and image identity of a country, Morelli (2011, p. 90), highlights the important role of designers at technological and social innovation level contributing significantly to the improvement of the aesthetic quality and technical quality of the products and materials.

Designers begin to be required both to dominate a broad range of knowledge and capabilities, and to demonstrate competences that, to date, have not been sufficiently valued in the training of these professionals. But these are taken into account by the business fabric as essential for the incorporation of these professionals in the companies.

To that end, the need to understand how higher education training in design equips graduates with the competences needed for a good professional performance was considered Subject of Study.



If, in terms of general aim, the need to define the competences' profile that the labour market requires can be identified, currently, and in the future until 2015, in specific terms, the Designer will be given the answers for the following objectives:

- Identify the higher education teachers' point of view in terms of future acquisition, development and needs of several competences for the performance of graduates in Design;
- Analyse the vision of graduates in Design in terms of acquisition and development of competences throughout the received academic education;
- Understand the approach of graduates in terms of the importance and development of competences acquired during training aiming their professional performance;
- Analyse the perception of the graduates in Design, in terms of the future (until 2015) importance and need of several stated competences;
- Examine to what extent the higher education institutions of Design contribute to their students acquisition and development of several stated competences during their course;
- Analyse the correspondence between the designers and higher education teachers perspectives about the competences that have less or more importance in terms of need, in an 2015 horizon;
- Identify some measures that can be taken into account in the structuring of curricula in Design, to the level of development and acquisition of designers competences; measures channelled to meet the needs of business world.

#### Competences: Designer's Competences

The concept of competence has been used with multiple meanings, reflecting different perspectives and subject areas as in psychology, education, politics, management, and others.

According to Cabral-Cardoso, Estêvão & Silva (2006, p.11), generally, the concept of central competences is used in strategic management to name the collective learning that allows the company to develop a clear set of outputs that can help it assuring competitive advantages.

When setting competences as attributes of an individual, with its knowledge, attitudes, abilities and capabilities that affect the performance of the individual or serve the objectives of production of organizations, the link between the skills domination and the professional performance becomes really clear.

However, often, the competences are linked to a higher performance or to a qualified performance (Cabral-Cardoso, Estêvão & Silva, 2006, p.11).

The concept of competence has been the object of many different analysis and approaches, nevertheless, all dealing with personal and professional qualities or attributes.

Boyatzis (1982, p.45) does an approach to the concept of competence identifying it as a feature, or attribute, needed for a professional to perform its functions in an efficient, effective and competent way.

According to Cabral-Cardoso, Estêvão & Silva (2006, p.12), some studies that were carried out, in agreement with the perspective that recognises that the competences represent an addition to the value and determine the professional performance, usually indicate the strong focus on performance and effectiveness of the education-training system. Thus, these refer that the objective of the training will be to give

individuals varied and variegated competences, turning them able to develop, in a competent way, any task or function assigned to them, and that at the same time allow a better adaptation and appropriateness of their operating posture to the position hold.

In a society where the globalization, the technological developments and the developments in information and communication technology stand out the value of the human resource, the concept of education and training emerges in parallel with the gradual and growing awareness of the importance of procurement procedures, development and update of knowledge and of skills (Dercy e Tessaring, s.d., p. 17).

In a study of Aneca (2001) categories of competences are adopted, such as: transversal and specific skills that are part of the academic and professional profile of the designers.

Among the specific skills, the study of Aneca (2001, p. 433) shows the existence of subgroups of competences, being these subject knowledge and expertise, professional skills, academic skills and other specific skills, as the acquaintance and domain of specific techniques.

In the group of transversal skills (generics), the Aneca (2001, p. 531) lists three subgroups, namely instrumental, personal and systemic competences.

If the study presented by Aneca, in terms of the implementation and processing of data obtained from the questionnaires to entrepreneurs, designers and professors or higher education teachers, refers the groups of competences listed above, around the description and identification of professionals profiles of designers in the various areas of expertise, this study refers one other group of competences that, in the current context, may not be left out: competences of corporate nature. Thus, in this study is stressed that the profile of the designer must have knowledge of the economic dynamics and of the economic reality, including the importance of Design at this level: *“Design improves the policy of innovation and of communication of the company, (...) the global results of companies, (...) is a job that generates value at a macroeconomic level, (...) improves the competitive level of a country with respect to the other countries (...) favours the transfer of technology (...) and can help restructure an economic sector within a regional economic policy”* (Aneca, 2004, p. 422). In this definition some aspects are underlined that are presented to justify a professional profile of a Designer to train. From this, in fact, one can draw a suggestion for a classification of entrepreneurial competences.

Regarding the definition of competences in Design or of designers, a number of definitions arise, either by different researchers, or by international and national associations.

To define the skills of Design is glossing over the scope and the performance of a job or a professional, over the different fields of intervention and over the applied methods by designers for the planning and accomplishment of their projects. Currently, the term Design is used to define the whole job, and in global terms, designer is used to characterise and identify the professional that engages this activity.

About the competences of the designer, Potter (1999, p.20) outlines some skills or behaviours that, in his opinion, should be dominated by designers. Thus, this professional must have high responsibility in the supervision of the ongoing work, providing instructions for operating. The Designer must, then, be totally aware of the problem raised, must thoroughly analyse it, classify it and address all the available and given information, adding also the ability to judge and criticise with great imagination.

Furthermore, Potter (1999, p. 24) underlines the designer capacity for decision-making referring that the final decisions affect, vitally, the aspect, the appearance of the work that, whenever they bear this with special care, they always express the functional and circumstantial environment.

In each phase of Design the author refers that the debate, the questions and the arguments should make its presence felt so that the final product that derives be marketable towards the customer.

Hence it is understood that the designers developed competences and abilities to interpret the cultures of the user, needs and behaviours to be able to translate them in terms of industrial supply (Verganti 2003) quoted by (Nicola Morelli, 2011, p. 95)

Still about a statement of specific competences in Design, non-differentiated in specific areas of expertise, Costa (2003, p.97) refers that the designer must be able to implement ideas and projects in an original way, through forms that contain meaning. For the author, the designer is the interpreter of the structure, the strategy, the management and of the company's personality. It is also strategist and is capable of directing its work with the best intention; it is a communicator and, therefore, its work is exactly to convey and to implement an identity in the mind of the public.

In his perspective for an approach, Costa (2003) defends that the designer must, primarily, be a person that communicates well and has entrepreneurial spirit, it must think on Marketing at the time of selling its own work, mastering some essential principles of that area, and it must be able to present its arguments to customers. This author enhances an idea that aims the adaptation of this professional to the current context of globalization, of high business competitiveness, that supports itself in a strong designer's training in management and commercialisation techniques.

The designer can't, however, neglect the concern about social, human, aesthetic, environmental, ecological and political factors during the creation, achievement and accomplishment of ideas and projects of Design. Team work ability with groups of people of many different areas and cultures is also a determinant factor for the characterization of a good professional of Design (Papanek, 1995, p. 10).

The designer works for a vast population universe, addresses a broad public of consumers and not just an elite and, thus, the designer has to be able to devise objects of Design that not only match their designed, projected and conceived functions, but also can cover and meet the aesthetic and functional needs of a high and diverse number of consumers.

The designer, when worried about understanding and establishing the structural, organizational, functional, expressive and economic relations, has always to bare in mind the interests and needs of final users that are the main agents or targets of its products, in the market, under the current concerns with global sustainability and environmental protection. Within the competences that are inherent to designers, the capacity for critical reflection and the monitoring of market developments and technologies are included (APD, 08/11/2008).

According to the "Associação Portuguesa de Designers" (Portuguese Designers Association), to the designer, in the course of its work, competences are assigned: competences as know how to analyze the existing constraints, namely budget, deadlines, the nature of the problem and of its solving stakeholders, competition and markets, applicable legislation, available resources and means of productions. And the designer must know how to integrate these constraints in order to determine the best solution.

So, the designer must be understood as a professional with the ability to contribute for the chain of production, included in teams formed by other professionals, specialists and technicians, during all the process of strategic planning and programming of products, always co-responsible for the implementation of productive policies, in different sectors or existing departments, in finding the best solution or the best procedure and not only the definition of final or formal aspects of a system (APD, 08/11/2008).

Still searching for a definition of competences of designers, some definitions are found that are oriented towards the attitude of the designer as a leader of a process within the organisations concerned. Thus, Totterdill (2002, p. 14) refers that a designer, when responsible for a project, must be able to lead people involved in the process, from customers, to technical specialists, to consultants, managers, etc.. It must know how to manage the time and the customer network and also the organizations. The author notes the vision that ascribe the leaders of Design the responsibility to help companies to clear, define and organize their desires, plans and mid-term aims. In this position, the designer must also be able to, as a team, define or develop the strategies that allow the realisation of the wishes of the several parts involved, of the company and of the consumers. Following this definition of competences of the leaders of Design, the author lists those that according to him are the main competences to request this professional. These are: have a future vision, develop strategic aims, direct the investment of Design, manage company's reputation (corporate identity), develop, implement and accomplish the innovation and work to lead the Design.

In the study developed by Totterdill (2002, p. 66), several competences linked to the fulfilment of several objectives, or to reach diverse purposes are also identified. By this means, the competences are grouped to serve globalization, to allow a quick answer, to have added value, direct sales, to allow the expansion of the customized consumption and the achievement of technical products.

Having been described the diverse competences of the designers, either by several authors and researchers, or by various national and international institutions of Design, efforts were made to identify the referred competences as being business-driven and professional-driven; competences now presented in Table 1.

Table 1 - Identification of entrepreneurial and professional competences

Competences	Author
1 - Ability of analysis and understanding of the features and functioning of the company/customer, its market strategies and business objectives and objectives of profitability	- Costa - ICSID
2 – Ability to Integrate the reality of the company/customer in the global and specific market context	- APD - ICSID
3 - Systemic view of the company	- Costa - BEDA
4 - Competence to establish market strategies in the scope of projects that develops	- BEDA
5 - Competence in the selection of market segments and development of an appropriate image of product/brand/company	- Costa
6 - Capacity to interpret socio-economic tendencies and the behaviour of consumers	- IEFPP - Costa - Munari
7 - Ability of analysis of constraints and definition of criteria to take into to account within the company's business context	- Potter
8 - Capacity to communicate to the company/customer with effectiveness, orally or by writing, the proposals, the briefings, etc.	- ICSID - BEDA - APD
9 - Competence to provide the company/customer clear information regarding style, functionality, security and other aspects inherent in the specific nature of its intervention	- Costa
10 - Capacity to work/project considering the international context	- ICSID
11 - Capability to view and communicate visually the information	- ICSID - BEDA
12 - Ability to fulfil the defined deadlines and budgets	- BEDA
13 - Competence in the guidance, in the construction, building or production of the product of Design	- BEDA
14 – Teamwork ability, coordinate and/or work in multidisciplinary teams	- ABD - Potter - Gondim - APD - ICSID

Bearing in mind the collection and identification of several previously presented competences, according to various authors and institutions, a research work was done to test and understand the strengths and weaknesses, and the main gaps, of the current training of designers that are now presented and described.

## Methodology

The achievement of the study implied a series of operations of data collection and data processing. The collection of primary information was made via questionnaire addressed to graduates and professionals of design of the expertise areas of Textile Design, Fashion Design, Equipment Design and Interior Design. The whole process of completion and conception of tools to collect information has resulted from the

research, analysis and processing of information collected during the previous bibliographic review, according to the described method by Hill & Hill (2005).

The universe of designers of the expertise areas in analysis was defined from a database of APD<sup>1</sup>, AND<sup>2</sup> and CPD<sup>3</sup>, having been identified a total of 200 professionals. The questionnaires were distributed to individuals of the universe through email and the answers were received the same way. The sample, composed by 70 designers, that represent 35% of the universe, was obtained by applying the technique of convenience sampling, having been taken into consideration for the study those that, after contact, showed themselves willing to collaborate.

Respondents were questioned about the level of acquisition, development or importance of listed business and professional competences, by the use of a 1-to-5 scale, where 1 corresponded to “weak level” or “absent”, 2 corresponded to “insufficient level”, 3 corresponded to “average/medium level”, 4 corresponded to “good level” and 5 corresponded to “high level” or “full acquired or dominated”. The assessment of the acquisition level of competence took into consideration three different contexts: at the end of school (graduation), during the professional experience and in medium-/long-term (2015 horizon).

The questionnaires have been subject to analysis and statistical processing, using the programme SPSS.

This study resulted in the elaboration of a model that intends to serve as a basis for the structuring of the new curricula of the BA and MA courses in Design.

## Presentation and analysis of results

This study is based on a sample of 70 designers, 57.8% of whom are male.

Referring the year in which they completed their courses, 71.8% graduated between 2000 and 2008, and 19.7% between 1995 and 1999.

When questioned about their professional background, 60% of the respondents stated that they worked in private companies, 11.7% in the public sector and 28% did not answer the question.

The obtained data by questionnaire were stored in a SPSS file and later statistically analysed. The analysis of the psychometric properties of the questionnaire was based on analysis of internal consistency and validation of the questionnaire. It was drawn up with the use of the coefficient Cronbach's alpha as a measure of internal consistency (reliability) test that assesses whether the questionnaire is able to obtain similar results from the same respondents in similar circumstances, but at in different moments and of factor analysis as a form of validity of construct and content. The questionnaire validity refers to the fact of assessing if the questionnaire measures what is supposed to measure, in a repeatable and consistent way. A good internal consistency must go above an alpha of 0.80. (Hill & Hill 2008).

The general scale and the 14 competences (items) in the three different contexts (“on school completion”, 0 “during experience...” and in “medium/long-term”) present highly significant estimated values of reliability and validity.

We conclude that the questionnaire has satisfactory internal consistency reliability, as 14 of the 14 items had  $\alpha > 0.8$ .

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<sup>1</sup> “Associação Portuguesa de Designers” (Portuguese Designers Association)

<sup>2</sup> “Associação Nacional de Designers” (National Designers Association)

<sup>3</sup> “Centro Português de Design” (Portuguese Design Centre)

The global Cronbach's  $\alpha$  for the questionnaire about business and professional skills of designers was of 0.909. When estimated at entrepreneurial/professional competences in the three different contexts, the Cronbach's  $\alpha$  was of 0.935 for "on school completion", 0.958 for "during experience..." and of 0.847 for "medium/long-term", thus obtaining very good results. By the following three tables it can be concluded that regarding the values of Cronbach's  $\alpha$  if one of the items is deleted, they all will be a value below the  $\alpha$  value of the global scale. Hence all the items were well-formulated.

That is, each item is correlated on average with the remaining items.

**Table 2 – On School Completion**

	Mean	Std. Deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A1.1	1,6667	1,44168	,768	,928
A1.2	1,7536	1,43901	,740	,929
A1.3	1,3913	1,40605	,667	,931
A1.4	2,0580	1,38143	,591	,933
A1.5	2,5797	1,20545	,824	,927
A1.6	2,3478	1,65233	,719	,930
A1.7	1,7101	1,42562	,641	,932
A1.8	2,6087	1,25109	,693	,930
A1.9	2,6377	1,32810	,780	,928
A1.10	2,5362	1,53948	,771	,928
A1.11	3,5797	1,33291	,549	,934
A1.12	2,8696	1,14934	,547	,934
A1.13	2,7391	1,30217	,697	,930
A1.14	3,1739	1,37152	,653	,931

**Table 3 – During professional experience**

	Mean	Std. Deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
B1.1	3,6667	1,17156	,644	,958
B1.2	3,7536	1,03477	,793	,955
B1.3	3,6522	1,23462	,649	,958
B1.4	3,3043	1,10219	,761	,956
B1.5	3,6232	1,21391	,891	,953
B1.6	3,6667	1,25636	,671	,958
B1.7	3,4348	1,06382	,719	,957
B1.8	3,7101	1,23790	,845	,954
B1.9	3,6812	1,23065	,893	,953
B1.10	3,3478	1,17356	,777	,955
B1.11	3,9565	1,28835	,815	,954
B1.12	4,0580	1,18674	,863	,953
B1.13	3,6667	1,15894	,788	,955
B1.14	4,1739	1,14989	,712	,957

**Table 4 – Medium-/ long-term**

	Mean	Std. Deviation	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
C1.1	4,7391	,58542	,496	,837
C1.2	4,8406	,44136	,518	,838
C1.3	4,4348	1,06382	,735	,821
C1.4	4,5072	,90136	,485	,841
C1.5	4,8261	,61731	,714	,824
C1.6	4,7681	,73053	,351	,847
C1.7	4,2464	,96109	,494	,842
C1.8	4,8551	,42962	,736	,829
C1.9	4,8116	,60087	,652	,828
C1.10	4,7971	,50234	,554	,835
C1.11	4,8261	,45233	,238	,849
C1.12	4,9130	,33162	,404	,844
C1.13	4,9275	,31243	,500	,841
C1.14	4,9565	,20543	,551	,843

The analysis of variance allowed realizing the significant differences between the classification averages of the several competences in the three contexts: acquisition during academic learning; acquisition or development during personal and professional experience; tendency for medium-term development (2015 horizon). As the analysis of the designers' answers, also the current analysis tried to facilitate data understanding and data analysis by presenting a graphic for each group of competences with classification's averages in the three contexts.



Table 5 – Averages and deviation pattern of the designers' answers about acquisition, development or importance of Business and Professional skills: A – During University/school learning; B – During professional experience; C – In a 2015 horizon

	Competências	Average			Deviation Pattern		
		A	B	C	A	B	C
Entrepreneurial and Professional Competences	1.1 Ability of analysis and understanding of the features and functioning of the company/customer, its market strategies and business objectives and objectives of profitability	1,67	3,67	4,74	1,44	1,17	0,50
	1.2 Ability to Integrate the reality of the company/customer in the global and specific market context	1,75	3,75	4,84	1,44	1,03	0,44
	1.3 Systemic view of the company	1,43	3,76	4,57	1,41	1,07	0,74
	1.4 Competence to establish market strategies in the scope of projects that develops	2,09	3,35	4,57	1,37	1,03	0,72
	1.5 Competence in the selection of market segments and development of an appropriate image of product/brand/company	2,58	3,62	4,83	1,21	1,21	0,62
	1.6 Capacity to interpret socio-economic tendencies and the behaviour of consumers	2,38	3,72	4,84	1,64	1,18	0,44
	1.7 Ability of analysis of constraints and definition of criteria to take into account within the company's business context	1,71	3,43	4,25	1,43	1,06	0,96
	1.8 Capacity to communicate to the company/customer with effectiveness, orally or by writing, the proposals, the briefings, etc	2,61	3,71	4,86	1,25	1,24	0,43
	1.9 Competence to provide the company/customer clear information regarding style, functionality, security and other aspects inherent in the specific nature of its intervention	2,64	3,68	4,81	1,33	1,23	0,60
	1.10 Capacity to work/project considering the international context	2,54	3,35	4,80	1,54	1,17	0,50
	1.11 Capability to view and communicate visually the information	3,58	3,96	4,83	1,33	1,29	0,45
	1.12 Ability to Integrate the reality of the company/customer in the global and specific market context	2,87	4,06	4,91	1,15	1,19	0,33
	1.13 Competence in the guidance, in the construction, building or production of the product of Design	2,74	3,67	4,93	1,30	1,16	0,31
	1.14 Competence to establish market strategies in the scope of projects that develops	3,17	4,17	4,96	1,37	1,15	0,21

Thus, it is shown that this group of competences is acquired in the learning context in a clearly insufficient level, data that 28.6% of the competences are acquired at an average level less than 2, 57.1% in an average level less than 3 and only 14,3% reach an average level of acquisition bigger than 3 and less than 4.

The analysis of the average acquisition of the business skills through professional practice reveals that the designers develop these competences dominantly in the working context, but with an average level of domain between 3.35 and 4.17, the superior averages at 4 are only 14.3% of the listed skills.

As far as anticipation of the need of domain of the business and professional skills is concerned, most of the respondents suggest that the tendency will be, in medium-

term, towards the imperative of excellence since the average of the levels of all the competences falls within the range of 4.25 and 4.96; only 7% is under 4.5.

## **Discussion of the results**

The difference recorded between the averages of acquisition, or of development, of business and professional competences, at school or in business context, show that higher education training in design in Portugal does not provide these competences at an appropriate level. Although some competences as, for instance, the “Ability to Integrate the reality of the company/customer in the global and specific market context”, are typically acquirable according to the professional experience, others, as the “Capacity to communicate to the company/customer with effectiveness, orally or by writing, the proposals, the briefings, etc.” or the “Capacity to interpret socio-economic tendencies and the behaviour of consumers” can be a target for school learning. This study shows that the competences that allow the integration of graduates in the labour world, and the competences that allow them to achieve their roles in the company with a good level of performance, demonstrate significant deficit in the set of competences that define the profile of the graduate in design.

As far as differences between the levels of acquisition of competences at the end of courses and the levels with which designers will be confronted in the 2015 horizon are concerned, according to the respondents perspective, these play a differential even more significant. In the 2015 horizon, if the significant increase of the level of requirements for performance in each of the listed competences is accomplished, and the low level of adequacy of education regarding business and professional competences is maintained, the future graduates in design will face serious difficulties in integrating the labour world.

### ***Model of Curricula Structuring***

After the study conducted and the information about the levels of domain of the competences in design, according to the view of higher education teachers and professors, and of professionals extracted, the concept of a model that supports the structuring of the curricula of the design courses aiming its adequacy to the requirements that the design professionals will face in the 2015 horizon was made.

The model, of indicative nature, should contribute, mainly, for the informed reflection about forward-looking structural and specific amendments: fundamental to assure a good performance of the future designers. Thus, more than create a bedding for the structure of new courses or the restructure of existing courses, the model aimed to offer a reflexive support that, based on the analysis of the collected information during the current work, makes it easier for the groups of teachers and professors, responsible for the courses, to reach a decision about the profile of the graduates at the end of the course.

Therefore the model was built based in a set of assumptions.

The first assumption reflects an actual structure of higher education in BA and MA. Thus, the basic and structuring competences of the design professional profile should be acquired during BA. The competences more complexes are framed by the MA, although, when they are structuring competences, their acquisition should begin in BA. The competences that involve professional experience for their full acquisition are incorporated in the business context domain. These competences can be fully acquired either as they enter the world of work or through doing projects in companies leading

to the accomplishment of the dissertation, expected in the 2<sup>nd</sup> year of MA. PhD, due to its orientation towards I&D activities, was not taken into account.

The second assumption to build the model was that this should be focussed in the levels of demanded performance in the 2015 horizon, taken from the integrated vision of all the respondents, teachers, professors and designers. The obtained answers' structure showed that professionals are more divergent among themselves than the teachers. Such aspect may be explained by the fact that designers' professional practices occur in different business and sectional environments, therefore with diverse competitiveness demands; while teachers, although with differences between the profiles of the courses they teach and the profiles of the framing Schools, have analogous work logic, framed by similar objectives: the higher education training, graduate and post-graduate in design. The vision that the teachers demonstrate is, plainly, influenced by worries about integrated learning of design students. On the one hand, the designers during their professional practice lose, perforce, the perspective about where the role of school ended and the result of the professional and personal experience began and, mainly, in which pre-acquired competences they based the acquisition or the development of their professional competences.

Thus, the option to consider the two integrated visions emerged as a way to encompass the answers of the people responsible for the training and the recipients of this same training. On the other hand, and in spite of the registered differences, in average, both groups' perspectives corresponded: all the competences are needed and the demanding standard tends toward significantly increase in the near future. Attesting to this fact, the obtained answers placed the required performance levels for all competences between 4 (Good) and 5 (Very good), what represented significant upgrade.






The third assumption that results from the first and the second considers that, once acquired, the competences should be maintained, if possible deepened, even if the business or professional environment is not ripe. Thus, in the cases where there was loss or reduction of the level of domain of a given competence during professional life, its maintenance or deepening is taken into account in the model as training domain during life, framed in advanced short-term courses of study.

The model was then build for a group of competences defined during work, being each competence allocated to the higher education training in BA and MA, to the short-term training and to the training in business context.

The competences appear associated to additional information, since it is considered useful for the user to outline the present/past weaknesses and the future critics. Thus, the competences that registered higher (>4.75) average levels of performance requirement take a colour and the ones that register averages between 4 and 4.75 assume a different colour. The competences which acquisition was considered deficient during academic training (<2.5) are marked with a red symbol. In the performed factor analysis, the structuring competences of the explaining factors – extracted from the data of the questionnaires addressing the teachers, professors and designers – were indicated through specific symbols, properly identified in the legend of the model.

Thus, the use of the model was made easier because all aspects that can be considered important in the structuring or restructuring of curricula of courses of design are in evidence: competences that urge to be considered and that have been weaknesses (red icon), the competences that need to be reinforced with urgency because they are critic in the 2015 horizon (on a yellow background), those that should be a learning target and an ongoing reinforcement (bachelor, master), again and so

forth. The interpretation of the model works because it is easy and direct. The graphic representation of the model is presented in the following tables.

Legenda	
	Valor médio de competência exigida no horizonte 2015 que varia entre 4,00 e 4,75
	Valor médio de competência exigida no horizonte 2015 que varia entre 4,76 e 5,00 (excelência)
	Competência cuja aquisição no âmbito da formação superior acusou um valor médio inferior a 2,50 (fraco ou insuficiente)
	Competência estruturante de um factor explicativo extraído através da análise factorial aplicada à informação recolhida junto de docentes do Ensino Superior em Design
	Competência estruturante de um factor explicativo extraído através da análise factorial aplicada à informação recolhida junto de designers.
CACD	Curso Avançado de Curta Duração

#### Legend

Average value of required competence in 2015 horizon that varies between 4.00 and 4.75

Average value of required competence in 2015 horizon that varies between 4.76 and 5.00 (excellence)

Competence which acquisition scope within higher education training has an average value inferior to 2.50 (weak or insufficient)

Structuring competence of an explaining factor through the factor analysis applied to the collected information among the Higher Education teachers in Design

Structuring competence of an explaining factor through the factor analysis applied to the collected information among the designers

Advanced Short-Term Course

*Table 6 – Identification of the business and professional competences listed in the proposed model*

- 
- 1.1** Ability of analysis and understanding of the features and functioning of the company/customer, its market strategies and business objectives and objectives of profitability
  - 1.2** Ability to Integrate the reality of the company/customer in the global and specific market context
  - 1.3** Systemic view of the company
  - 1.4** Competence to establish market strategies in the scope of projects that develops
  - 1.5** Competence in the selection of market segments and development of an appropriate image of product/brand/company
  - 1.6** Capacity to interpret socio-economic tendencies and the behaviour of consumers
  - 1.7** Ability of analysis of constraints and definition of criteria to take into to account within the company's business context
  - 1.8** Capacity to communicate to the company/customer with effectiveness, orally or by writing, the proposals, the briefings, etc.
  - 1.9** Competence to provide the company/customer clear information regarding style, functionality, security and other aspects inherent in the specific nature of its intervention
  - 1.10** Capacity to work/project considering the international context
  - 1.11** Capability to view and communicate visually the information
  - 1.12** Ability to fulfil the defined deadlines and budgets
  - 1.13** Competence in the guidance, in the construction, building or production of the product of Design
  - 1.14** Teamwork ability, coordinate and/or work in multidisciplinary teams
-

Código da Competência	Categorização	Enquadramento de aquisição da competência			
		1º ciclo	2º ciclo	CACD	Contexto empresa
1.1					
1.2					
1.3					
1.4					
1.5					
1.6					
1.7					
1.8					
1.9					
1.10					
1.11					
1.12					
1.13					
1.14					

Code of Competence | Categorization | Acquisition framework of competence |  
BA | MA | CACD | Business Context

Figure 1 – Model for application to the business and professional competences

## Conclusions

Gradually, the entrepreneurs value more the fact of being able to count with the incorporation, within their organizations, of the design professionals that participate in the definition of strategies in collaboration with multidisciplinary teams.

The designer will be demanded not only the technical competences, the domain of methodologies for the enforcement and accomplishment of projects, but also the knowledge of methods of production of the products it conceives. There will also be required the domain of competences that are connected with the study, the analysis and the knowledge of markets, of strategies of marketing and of brand logic analysis, as

well as all the competences that are related to the integration of this professional in the business world and that reflect in the understanding of the organizational structure and of the functioning of the company where it is incorporated.

The designers-respondents point out that the biggest gaps in their school learning are connected with the domain of business and professional competences that represent the relationship designer–company/organization: from the presentation and development of the idea, based in market studies and in tendency studies, till the elaboration of specifications and monitoring of all the process of projects' implementation.

The competences that are in fact related to the ability of analysis and understanding of the features, structure, functioning, as well as of the strategies and constraints of companies and clients/customers, and those that entail the knowledge and study of business context, its markets, its tendencies and behaviour of consumers for which projects are developed, are referenced by the main international organizations linked to design, as ICSID<sup>4</sup> and BEDA<sup>5</sup>, and by several researchers. These competencies are pointed as those that are not acquired or are little developed in the academic context, and become focus of concern in the context of designers' training.

As a consequence, the initial preparation, as far as business and professional competences are concerned, should be deepened in higher education, because this aspect is important to companies that increasingly look to integrate design graduates in their teams, to face the ever high and growing competitiveness of the global market.

The employability of the future graduates depends on their domain of competences that are currently gaps in their training. Really, until today, it is through professional experience that the designers see themselves facing the business realities and it is only during the practice of the job that they develop competences related to knowledge of companies, of its organizational structures and markets, of marketing, etc..

It is important, however, to take into account that the school is neither able nor will be able to correspond to all the learning requirements of the students, future graduates in design. If four year of learning is insufficient, the reduction of the period of studies to three years worsens the situation. It is obvious that the spirit of Bologna does not involve the reduction of that period, but does involve the establishment of conditions so that many, preferably all graduates, continue their studies and complete MA. Several competences, necessarily, must be developed during MA learning, because they have to be structured from prior acquired competences or entail maturity/experience in the domain of methodologies and/or technical or mental processes.

Business and professional competences, due to what they imply at the level of domain of the specific nature of the organization, can only be fully dominated in entrepreneurial context. Even so, the appropriate training of graduates in this domain can't be neglected in higher education that tackles the need to develop strategies of teaching/learning that allow students to know the entrepreneurial reality.

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<sup>4</sup> International Council of Societies of Industrial Design

<sup>5</sup> Bureau of European Design Associations

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## Understanding the PhD by Publication

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**Abstract:** *This case study refers to the submission of prior research for the award of PhD by Publication, and compares and contrasts this with best practice in conventional PhDs. Unlike a conventional PhD, which is usually taken at the beginning of a researcher's career, the PhD by Publication may be taken after a lifetime of research. The regulations governing such awards vary across institutions, but the award is often granted to very experienced research practitioners who have a track record of significant publication in their area of specialism, indeed they may already be leading authorities in their subject. There are several aspects of this relatively new award which are different to a conventional PhD. This case study details the approach taken by a candidate and his supervisor, and discusses the problems and opportunities that arise from this qualification.*

**Keywords:** *PhD by Publication, doctorates, training*

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## **Introduction**

This is a case study of a PhD by Publication awarded by a UK university, and compares and contrasts this with best practice in conventional PhDs. Unlike a conventional PhD, which is usually taken at the beginning of a researcher's career, the PhD by Publication may be taken after a lifetime of research. The regulations governing such awards vary across institutions, but the award is often granted to very experienced research practitioners who have a track record of significant publication in their area of specialism, indeed they may already be leading authorities in their subject. Often the award is restricted to teaching staff of the institution, though this is not always the case. There is usually no requirement to undergo classes or training in methods and study skills, and there are several other aspects of this new award which are different to a conventional PhD. The publications which are the focus of the award are often bound into a thesis or portfolio which includes a newly written statement that sets the work in context. This case study details the approach taken by the candidate and supervisor, the principles that underpinned the decisions made, and discusses the problems and opportunities that may arise from this qualification.

## **Doctorates**

Doctorates (in the UK) have been awarded for several centuries. Today there is a wide range of doctoral awards with different purposes and nomenclature. In recent years traditional forms of doctorate such as the PhD have been supplemented by equivalent awards at doctoral level such as professional doctorates which are often workplace-based related to the candidate's everyday work, and undertaken by part-time study. Similarly in art/design there has been growth in what are known as practice-based doctorates which may be the result of high level professional practice where designing or the candidate's own artefacts form a significant point of reference for the investigation (Durling et al, 2003). All these awards have an element of systematic inquiry which may lead to the award of PhD or ProfDoc, DArts and several more award titles.

The different types of doctorate have been summarised as:

PhD

Taught Doctorate

Doctor of Medicine

Higher Doctorates

Professional Doctorate

Practice-Based Doctorate

PhD by Publication

(taken from Green and Powell 2005: 47)

Even within PhD awards there are distinct differences of approach to being admitted to the programme: the coursework involved; examinations that have to be passed; as well as the kinds of methodological structures that are acceptable within that particular university culture. Some programmes appear to be more heavily taught, for example the model of PhD in the USA is predicated on taught methods classes which are taken prior to submission of the research proposal. Evidence from conference and journal papers suggests that more doctoral researchers across Asia develop their expertise in a specific design science mode than their counterparts in

Europe. Design departments in older UK research intensive universities perhaps have more prescribed process and outcomes than the traditional art schools which now sit largely within the new post-1992 universities.

This paper comprises a case study of best practice in the process leading to the award of PhD by Publication by an experienced designer. It is therefore not the purpose of this paper to compare and contrast each type of doctoral award, nor the differences between these programmes. However, before discussing the PhD by Publication it will be helpful to contextualise the more conventional PhD study in relation to this rather different and newer award.

## PhD

The modern PhD is typically seen as demonstrating command over a narrow area of inquiry and, through persisting in rigorous research, to make an original contribution to knowledge. The PhD is primarily a training in how to conduct research. The period of study is usually accompanied by the informed guidance of one or more supervisors, some training in relevant methodology, and the acquisition of advanced study skills. A programme of research is proposed by the candidate and agreed formally by the host university, before the main study is undertaken. The outcome is usually a bound thesis which is examined by one or more external examiners, and subsequently by an oral examination of the doctoral researcher.

Over the past couple of decades, in the design sector there have been many debates, symposia, conferences, and journal papers dealing with the award of the PhD (Rust 2003)

Broadly, for the UK art/design sector and cognate departments, the award of PhD is a relatively recent phenomenon, arising partly from the growth of research following funding changes and the establishment of the new universities from the previous polytechnics, starting from about 1992. It should not be surprising that in a newly developing research domain, at the outset there will be few qualified supervisors themselves holding the PhD, and the nature of this new award might be debated in the context of traditional PhDs long awarded in older disciplines. Sometimes innovation has been hotly contested. The Jiscmail discussion forum 'phd-design' has been a major venue for such debates (phd-design) among a particular group of academics, as well as various conferences and doctoral workshops. National bodies have responded to such issues by publishing guidelines or regulations relating to the research student experience (for example AHRC; Vitae).

The new universities have responded largely by implementing formal doctoral training within design departments, for example by formal research training leading to a PGCert qualification for research students, and consortia arrangements to raise the quality and relevance of training (DART) among others. It is recognised that developments in technology, perhaps especially through digital media and communications, have opened opportunities for different kinds of doctoral processes and outcomes (IoE).

So, a typical PhD researcher may experience: a problem or question that they want to investigate and answer; will be given some training in study and research methods appropriate to their field of study; will undertake a prolonged literature search and review to establish prior and current art in the field; will propose and implement a research design and analyse its findings; and finally will demonstrate their process and original contribution to knowledge through a thesis which is substantially in written

form, and defend their position through viva voce (Durling, 2002). Typically, this process takes at least three years of full-time study, or 5-6 years of part-time study, guided all the while by one or more expert supervisors. There may be other checks and balances such as annual reviews or assignments that must be passed satisfactorily for the candidate to remain registered on the programme. There is therefore a formal training element to the study, though the extent to which the programme is taught varies considerably across the cultures of individual institutions and nations.

## **PhD by Publication**

It is not uncommon among UK universities to offer another kind of PhD often known as PhD by Publication (or known by a number of other titles including PhD by Published Work(s) and PhD by Portfolio). This award has been linked with an aspiration on the part of institutions to recognise members of existing teaching staff who, for whatever reason, have not previously gained a research degree, yet have had extensive experience of practicing good quality research over a period of years. One justification for this approach is that in the more practice-based subjects such as design, it is common for practitioners to hold a studio masters degree but not a PhD, yet they may have learned research 'on the job' and have an extensive record of publication. In a few cases, individuals are recognised authorities in their subjects and hold professorships. Unlike a conventional PhD where a study is planned in advance, the PhD by Publication route is more akin to an APEL process (accreditation of prior and experiential learning) where the contribution to knowledge has already been made, and simply needs to be brought into a form that may be assessed (OCA).

Arising from the debates mentioned above, a body of literature has been published on the nature and standards of the conventional PhD. Conversely, relatively little has been published on the PhD by Publication. Given the large number of academics who will have entered the academy from a position of design practice rather than research practice, coupled with a university's need to accredit its research professionals, such a model of PhD appears timely and helpful to the sector in giving recognition to good quality research in whatever way it has been learned.

While the actual wording varies from place to place, a review of awards of PhD by Publication across UK Higher Education institutions showed a common set of expectations:

- the award is claimed to be equivalent to a conventional PhD by thesis
- the candidate must already have a substantial body of work in the public domain, often around a sustained theme or study over some time.
- the work must show originality arising from the application of independent critical power.
- there should be an identifiable contribution to knowledge.
- a written statement will be provided that sets the works in context.
- the whole (publications and contextual statement) will be brought together into a single work that is deposited in the university library.
- the bound work will be assessed by at least one independent external examiner, often two.
- the work will be assessed within one year (sometimes six months) of the date of first registering for the award.

There are however some significant variations in the regulations, for example:

- whereas some universities restrict the award to their own staff or those having strong connections with the institution, others will also accept external applicants.
- work in non-written form may be allowed, so long as it is capable of being assessed.
- some awards are conducted in collaboration with other institutions, with a variety of arrangements for supervision and attendance in the UK and overseas.
- some supervisors are named as such with a record of successful completions, whereas some are termed mentors which suggests perhaps a more light-touch advisory role.

Following enrolment for PhD by Publication, given that there is no requirement to undertake any training courses or further studies - it being presumed that the published work is already the product of someone of doctoral standing – it begs the question what is it that the PhD is being awarded *for*?

## Compiling the Thesis

Beyond the particular regulations and institutional cultural differences, in advising a candidate there are challenges beyond those expected of a conventional PhD.

For example, a conventional PhD thesis can demonstrate the entire recorded process of study from proposal, through research design and analysis, to the final outcomes, and can be explicit about the original contribution to knowledge as well as strengths or weaknesses in the work, and give pointers to any subsequent future work yet to be done. Indeed, this explicitness may be seen as a model of best practice that is expected in many PhD programmes (Durling, 2002) Similarly, though non-written work (designed artefacts for example) might form a significant point of reference in a conventional PhD, in the interests of explicitness such work might be accompanied by a

meta-narrative detailing the research component and its outcomes. The research design may be purposely formed around providing evidence for such a narrative making explicit the investigative process and what was found. However, evidence of these aspects of the study may not be readily available through previously published works which may have arisen over many years around a diffuse theme or themes, and may not be the product of such a narrow well focused study.

It would seem therefore that the contextual statement, rather than simply introducing the work and setting it in context, is crucial in demonstrating the originality in what may be a loose collection of publications around a general theme, or an otherwise undocumented investigative approach that the researcher has undertaken over some time, possibly a lifetime.

Regulations are often vague about the contextual statement. For example, the then current regulations governing the award which is the subject of the case study below, make the following points. The whole submission is made up from the candidate's publications "...and a context statement undertaken... under supervision." The context statement should be between 10-30,000 words. There is a requirement that the publications and the context statement "...together are of the requisite standard...". The duties of the supervisor are to consist in "...assisting the candidate in selecting the publications or other public domain works for the degree, in formulating the scheme and rationale of the context statement, and in advising on any further reading."

In balancing the variables inherent in these regulations, perhaps particularly in respect of whatever it is that is equal to a conventional PhD, the interpretation of regulations made by the supervisor becomes crucial to the candidate undertaking the right amount of work on the contextual statement in order to introduce the publications and explicate the theme of the PhD. But compared with a conventional PhD, the supervisor may be dealing with a new qualification with few established exemplars of best practice, and regulations that can be ambiguous or opaque.

It follows that there are also as yet relatively few examiners with experience of PhD by Publication.

Against this background, in the case study below, we introduce the actors and their expertise, demonstrate the principles adopted, and outline the results. The full illustrated 'thesis' which was completed in 2008 is also online and may be examined in full (Wade, 2008)

## **The candidate**

The candidate was at the time approaching normal retirement age as a very experienced lecturer in a post-1992 university department of art and design. He originally trained as a scientific illustrator, and for many years had undertaken illustrations of snakes which led to a fascination for the taxonomy of certain North African snakes with fieldwork centred largely in Algeria. Illustrative techniques and the visual recording of data captured aspects of the visual characteristics of snakes such as the shape, colour and distribution of scales. This experience led to an appreciation and deeper understanding of herpetological taxonomy at a time when he had increasing contact with established scientific researchers in the field, and a close association with the Natural History Museum in London. His observations and understanding led to the resolution of certain taxonomic problems, and he was able to make contributions to herpetology in which drawing was an integral part of the process.

This acquisition of a rich understanding of the general field of natural history, exemplified by long experience in the study of reptiles, led to development of a unique systematic method for processing scalation and other visible features, together with the development of a new method of reconstruction and analysis of dessicated and partial samples often obtained as road kill. This resulted in several published papers, two of which he was sole author in which a new species was discovered, and four which he co-authored in which another species was described.

The candidate's work has shown the value to science of an aspect of graphic art used as an analytical tool. The artistic output moved from descriptive recording to innovative mixed methods which have promoted novel conclusions.

## The supervisor

The supervisor was at the time experienced in supervising and examining a number of successful completions of conventional PhDs and a professional doctorate, as well as advising previously on a mildly problematic PhD by Publication. He held practice-based graduate and postgraduate degrees as well as a conventional PhD undertaken in a leading design research department. He had a particular interest in doctoral training and supervision, and had initiated or been part of several debates at national and international level. However, he came to the supervision with no prior knowledge of herpetology or related disciplines.

## The proposal

Initial discussions established a broad focus for the work that would be presented. It was clear that there were a good number of published journal papers from which a suitable selection could be made. There was never doubt about the quality or significance of the work: many of the candidate's collaborators and co-authors were among the top herpetological authorities in the world. Discreet enquiries by the supervisor confirmed that the candidate was one of possibly only a handful of persons working at that level in this topic anywhere in the world.

Initially, careful scrutiny was made of the university's regulations for the award of PhD by Publication. Several problems immediately presented themselves.

- there was limited guidance on what is appropriate. For example there were clear word limits for the contextual statement, but little indication of the required content of the statement.
- the claim was made that the award is equivalent to a conventional PhD by thesis, but it was not clear how that might be demonstrated. Given the often contested aspects of the PhD form in the art/design sector, equivalence is not certain.
- do the prior publications speak for themselves or is some commentary on the texts required, and if so how much?
- as the subject matter is at the intersection of graphic art and taxonomy science, there was a question as to the 'voice' that would be used, and for which audience? This of course is not unusual in interdisciplinary studies. It seemed that the thesis content might be of interest to both herpetologists and illustrators, but they approach the subject from very different angles and interests.

- there was a personal story to be told of the candidate's transition from observation through drawing to analysis, via what might be termed systematic drawing, and subsequent contributions to herpetology.
- the systematic method that the candidate had developed - predicated on intimate knowledge of herpetology as well as illustration - possibly needed explication beyond the published papers.
- the thesis would probably benefit from being rich in illustrations both as evidence and as a significant part of the narrative. This might also impact upon the 'voice' of the thesis and the relevance to its readers.

Finally, there was a steep learning curve on the part of the supervisor in acquiring sufficient knowledge of the scientific aspects of the study...

## **The approach**

In comparing this work with a conventional PhD, a decision was taken to try to adopt best practice from the conventional PhD and bring this to the new award.

A well received basic model of conventional PhD study seemed to be exemplified in Perry's five chapter model which it is claimed is helpful in removing "much of the opacity and unnecessary complexity that disguises theoretical, epistemological and ontological inconsistencies in many PhD theses" (Love 2001). It is reported that this model has met with success in aiding doctoral completions in good time, and is thought to be clear and transferable to design research generally (ibid.). In brief, Perry's model may be mapped as follows:

- Ch 1 - Introduction (an executive summary of the research, outlining the research problem, the methods used, findings and their implications, and the boundaries of the investigation)
- Ch 2 - Literature Review (establish prior art in the field through discussing all relevant past and current work that may impact on the study)
- Ch 3 - Theoretical Perspective (sets out the methods chosen and how they were used)
- Ch 4 - Report of Data Collection (demonstration and analysis of what was found)
- Ch 5 - Conclusions & Implications (describes how the research questions have been answered, and sets out the contribution to knowledge, limitations of the work, and pointers to any future work.)
- References (full citations of the literature referred to throughout the thesis)
- Appendices (captures all the data collected, which might include a wide range of modalities)

It was therefore decided that, as far as possible and within the constraints of a thesis comprising minimally a single context statement plus some published papers, the intended content of the five chapter model would be covered. In other words, there would be an attempt to capture the salient points that would be present in a high quality conventional PhD thesis, and to demonstrate as far as possible the kinds of process/findings that might be found in such a thesis thus establishing exemplary practice in a PhD by Publication. These points were identified initially as follows:



- in setting the context to the collected works, detail the background to how the work started.
- be explicit about the contribution to knowledge.
- tell the story of the methods that have been developed in terms of graphic analysis as well as reconstructive methods.
- finally, introduce the publications and offer reflections on their significance.

## The thesis

After careful consideration, seven published papers were chosen as representing the candidate's contributions to herpetology, as well as providing a pathway for explaining the development of his systematic methods. The publication dates of these papers ranged from 1976 to 2004.

It was decided that the contextual statement should cover the bases of the Perry five chapter model as appropriate and stated succinctly in summary. There was however considerable work in pulling together the narrative and in seeking out evidence of the research through illustrations used in the published papers. As the illustrations were a significant point of reference, it was important to trace them all, find originals, and be in a position to explain their contribution in detail.

All of this took a great deal of time, and the expectation implicit in the regulations that submission might take place within a few months of enrolment was not met. The entire process took nearer two years in total. This was not an easy option.

Much time was spent in compiling, reading and modifying drafts. This was important to get the right voice that would be understood by diverse audiences, and to make the writing succinct. The candidate naturally writes a terse form of English, so exceeding the word count was not an issue, but rather how to make it credible to scientific readers and readable to non-scientific audiences. The final word count for what became an introductory chapter was around 13,000 words therefore at the low end of the scale, though this fact masks the considerable efforts made to make the narrative as simple and clear as possible. Eventually this was distilled to just four main sections:

1. context statement (background)
2. contribution to knowledge (value of art to herpetology)
3. methodology (graphic analysis + reconstructive methods)
4. the published works (factors which led to the publications + reflections on the publications)

There were also extensive references and appendices including a carefully constructed glossary, and some pointers to future work.

Though the host university had a requirement for depositing a paper based bound thesis in its library, it was seen to be important to establish a digital version in order to make the work widely available. The detail and subtleties of the original illustrations warranted scanning at high resolution, but this produces large file sizes. The thesis was produced as a paper printed version for examination and deposition in the university library, and also produced in a compressed digital version for permanent archiving in the university's e-prints repository (Wade, 2008)

## The examination

Under the host university's regulations, as the candidate was a member of academic staff examination of the thesis and the subsequent viva voce was to be conducted by two external examiners. It was preferred that one examiner should cover the design aspects of the thesis, while the other covered the more scientific aspects. The thesis had to be credible in both spheres. Two experts were required who would be rigorous, yet comfortable with the interdisciplinary nature of the work. Choosing examiners presented difficulties. The candidate was a well known authority, so it was difficult to find a scientist with appropriate qualifications and experience who had either not worked with him at some point, or who did not know of his work. Similarly, there were difficulties in finding a designer with a graphics research background and suitable qualifications. A search for examiners with previous experience of examining a PhD by Publication proved fruitless.

Following the viva voce helpful suggestions by the examiners, some restructuring and re-wording of the written text was made, especially to clarify what was being claimed as an original contribution to knowledge, and particularly to strengthen the candidate's claim to having developed a unique graphical analytic method. These improvements were made, and the revised thesis was approved and the PhD awarded.

## Conclusions

Some findings arising from a brief review of regulations for the PhD by Publication have been given, and some ambiguities have been highlighted. It is possible to find a generic model of best practice in the conventional PhD, this has been declared through discussion of the Perry five chapter model, and the adoption of its principles mapped on to the purposes and content of the thesis described here.

Time and evidence were perhaps the greatest factors. The effort involved in pulling together a suitable narrative at this level, and providing evidence of work completed over a long period of time, is not trivial. The standard of research submitted for an award of this kind should be high, however this is influenced heavily by several factors including the advice provided by supervisors, the position taken by examiners, as well as the requirements of specific regulations.

In this particular submission for PhD by Publication, there was an attempt to produce an exemplary thesis, unambiguously of doctoral standing, and to set out some principles for the interpretation of regulations and supervision of such awards. The extent to which these aims have been achieved may be judged from the published copy of the thesis. University regulations should be clear on these points.

Overall, if it is done well, this award is not an easy option and may require a large effort of further work to get evidence into a form suitable to be submitted.

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# Down the Rabbit Hole: a situated approach to design education that facilitates socially responsible emergent designers

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**Abstract:** *This paper is centred on the progressive curriculum and sustained positive impact of the Rabbit Hole – the University of Western Sydney's Bachelor of Design teaching studio. The award-winning Rabbit Hole is a unique learning environment, incorporating participatory design methods and a work integrated learning framework that facilitates situated learning experiences, where live projects with real-world outcomes bridge the gap between academia, community and industry. Through a series of case studies, this paper demonstrates how the Rabbit Hole utilises the transformative agency of its innovative design pedagogy to inspire and empower socially responsible emergent designers.*

**Keywords:** *Work integrated learning, participatory design, design advocacy, situated learning, design responsibility, visual communication pedagogy.*

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## **Introduction**

The Rabbit Hole, officially recognised as 'Professional Design Studio', is a year long capstone unit of the four year Bachelor of Design degree in the School of Humanities and Communication Arts, University of Western Sydney (UWS). The Rabbit Hole incorporates participatory design methods and work integrated learning – an innovative and situated approach to learning and teaching. The emphasis is on studio practice that is both student-centred and client-focused, with the teaching team providing opportunities for students to work on real life design projects with community bodies and industry partners, with an emphasis on design advocacy and professional engagement. A dynamic learning space, the Rabbit Hole is considered a cornerstone of the Design program, and the studio has been awarded at both industry and university level. In 2008 Rabbit Hole students won a highly prestigious Australian Graphic Design Association award for the studio's self-branding and identity project. Additionally, in 2011 the Rabbit Hole teaching team was awarded the UWS Vice Chancellor's Award for Teaching Excellence, "acknowledged for innovative practice and problem-based pedagogy" (UWS 2012).

This paper describes the Rabbit Hole in detail, focusing on its progressive approach to curriculum design, using case studies to highlight the importance of learning and teaching studios in the context of design education in general, but also specifically within the context of UWS and its surrounding community; the Greater Western Sydney area.

## **The Rabbit Hole**

In the context of design education, the design studio can be described as a "physical space where students learn to become practitioners through 'learning by doing' rather than the more conventional transmission of knowledge content" (Shao et al. 2007). This is the principle of situated learning central to Lave and Wagner (1991), who assert that traditional accounts of learning ignore its social character. Situated learning theory advances an approach where learning is embedded in participation and action, arguing that it is through the process of collaboration and sharing in a local and social context that students learn and develop their communities of practice.

Situated learning strategies actively encourage students to develop empathy, optimism and integrative thinking – central to the "design thinker's personality profile" (Brown 2008). It is a participatory and experiential approach to design education that puts people first. As Brown (2008) argues, empathy enables designers to imagine the world from a multitude of perspectives (e.g. clients, end users, customers). Integrative thinking means that designers are able to see all of the salient and potential solutions to a design situation, often improving on or providing unforeseen alternatives (Brown 2008, 3). Integrative thinking is tied to optimism, which assumes that no matter how challenging a design problem, there is the potential for a positive outcome (Brown 2008, 3).



*Figure 1. The Rabbit Hole design studio. Source: Author's own photograph.*

The Rabbit Hole is the University of Western Sydney's Bachelor of Design teaching studio, operating from a purpose built space at the Werrington South Campus (Figure 1). By definition, the Rabbit Hole is a learning space that reflects a pedagogical move towards developing magnetic physical and online learning spaces that respond to the radical shift in student learning cultures (Oblinger 2004). Typical of a design studio, the space is equipped with the physical stuff that is essential to design practice – technology, tools, and furniture that facilitates independent and collaborative work, and socialising. However, what characterises this learning space apart from the others used to teach design at UWS is the prevalence of design artifacts and ephemera that fill the corners and crannies of the studio. The artifacts represent design tradition, including iconic design posters, books, and equipment used to inspire and make design, and ephemera evidences the studio's past and present activity, including student murals, print samples, packaging experiments, test images, paper remnants and typographic graffiti. Suggesting that these material traces of design and designing are as important as the physical elements of the learning studio environment, a research study about the Rabbit Hole conducted in 2010 found that students described this material as place-making. According to the study, Rabbit Hole students saw the studio as a cornerstone of the UWS design program, symbolising the accomplishment of 3 years of prior study, and a place to anchor down in their final year before heading out into the professional sphere.

Significantly, students perceived the Rabbit Hole as a kind of 'clubhouse' for their community and a place where they can play, rest and shelter... an active, noisy and messy place – where learning and doing design occurred in a social environment, and where friendships were formed or consolidated through collaboration. (Sandbach 2011, 154)

In addition to its physical and material qualities, key to the Rabbit Hole are its people. This includes the teaching team, students, clients, industry guests, alumni and technical staff who converge to make possible the 'live briefs' at the core of Rabbit Hole

curriculum. In particular, Rabbit Hole graduates are encouraged to maintain links with the studio, and many return to guest lecture about their practice and career to the current cohort. In addition, the teaching team maintains strong industry networks drawn from their collective professional experience in graphic design, art direction and photography. Industry partners provide internships for our students, and also ensure that the Rabbit Hole remains on the pulse of industry practices in order to develop teaching practices that reflect current industry issues and trends, enabling the teaching team to provide diverse and engaging learning experiences.

## **A living curriculum**

Coordinated by Edwards-Vandenhoeck since 2007 the Rabbit Hole has facilitated opportunities for students to work on real projects with actual clients, bridging the “gap between theory and practice, academic and industry expectations” (Edwards-Vandenhoeck 2012). Wenger (1998) describes a “living curriculum” that connects people, enables interaction, dialogue, and a sharing of knowledge. This is the approach to learning and teaching used in the Rabbit Hole which is also informed by principles of work integrated learning, social responsibility and participatory design.

The Rabbit Hole curriculum is mobilised by the studio’s ‘live briefs’, which are design projects that have budgets, deadlines, and deliverable outcomes with real world implications for the studio’s clients – a mix of internal clients within UWS and some from the Greater Western Sydney community, for example, the UWS Equity and Diversity Department and Western Sydney Transport Users – a not for profit organisation which aims to support public transport users living, working or residing in Western Sydney. The live brief framework enables students to have engaging, relevant and meaningful learning experiences that give them insight into the complexity of design practice in a dynamic and changing world. This is work integrated learning that “challenges traditional notions of academic work and the university constituency”, with the main objective to develop ‘work ready’ and ‘employable’ graduates (Smith et al. 2008, 60), an important concern for Australian universities, government, employers and students (Graduate Careers Australia 2007).

At the commencement of each live brief and in negotiation with the teaching team, students nominate their preferred projects based on their existing skills, strengths, and aspirations, and they work in these teams for the duration of the project (typically a term or a whole semester). As individuals, students are asked to create a position description that specifies their role within a project so that there is a clear and mutual understanding of learning outcomes and professional expectations. This form of personal assessment asks students to reflect on their existing competencies, using critical analysis to determine their own strengths and weaknesses, and consider where they may be best placed, ideally in a project that allows their strengths to flourish while also strengthening their weaknesses. As a team, students then develop mission statements, design research, strategies, budgets, client pitches, timelines and production schedules. In both contexts, students are encouraged to develop their awareness of the value of design and social responsibility is taught to foster in students an understanding of how designers create value and meaning in people’s lives, and how their actions may impact on their immediate community and the larger world (Papaneck 1984; Margolin 2006).

Many of the live briefs nurture individual student engagement in a collaborative environment, such as ‘The Difference Design Makes’ project, which brings into focus

the role that individual designers have in shaping the future. As these students are about to enter the workforce as visual communicators, this live brief allows the student time to pause, reflect and consider their role as an agent of change, as well as the power of design advocacy and information design to challenge the status quo through targeting social, economic and political issues. As Eriksen 2012 observes, “design advocacy is an educational trend garnering much attention for its ability to introduce design students to real-world issues and allows them an opportunity to develop a design solution.” Erikson (2012), goes on to argue that “often times, design courses focus on solutions for fictitious scenarios, and while the lessons are important, they lack real-world implications”. The Rabbit Hole’s live briefs challenge the norm by providing students opportunities to work on design projects that have immediate, real world outcomes.

The range of live briefs on offer are multifaceted, engaging with contemporary design issues, industry trends, and cross-institutional design pedagogy, with clients and stakeholders participating in the design process at different stages, depending on the project at hand. Participatory design involves those affected by design decisions in making some of those decisions with the basic premise of “open dialogue, communication and trust” between participants and designer/s (Sanoff 1990, 1).

The majority of Rabbit Hole live briefs involve participatory design. As an exemplar, the Bachelor of Music Festival branding project engages with the actual performers, who define their expectations, aspirations, and needs in order for the Rabbit Hole team to construct the design brief. Another example is the UWS Equity and Diversity project, where the client is literally in the studio, very hands-on and involved in briefing, concept development, design direction and final selection of works. This is crucial in creating momentum and achieving the live brief deliverables, which in turn enables students to develop their professional communication skills. In the specific context of the Rabbit Hole live briefs, participatory design is a deeply enriching and satisfying experience for those involved, often resulting in powerful and meaningful design that exceeds student and client expectations.

## **Case studies**

Live briefs integrate design pedagogy, industry trends and community needs, and generally fall under these three categories:

- Corporate and commercial briefs
- Social advocacy and community based projects
- Exhibitions, competitions and design industry engagements

The wide range of live briefs draw on different skills and aptitudes of our students and are run in the Rabbit Hole throughout a semester, with the aim to:

- Provide students with a professional experience that furthers their understanding of the relationship between design research, conceptual thinking and specific client needs
- Bridge the gap between theory and practice, academic and industry
- Provide students with an understanding of the transformative agency of design
- Equip students with the literacies and confidence to traverse a range of graphic design contexts to impact real, sustainable change in their communities of practice



A member of the teaching team oversees each project and functions as the creative director, facilitating the design process and client interactions, rather than intervening and making design decisions on behalf of the student design team. As such, the onus is on the student design team to take responsibility and be mutually accountable for the design approach, the effectiveness of the outcomes and to develop professional standards of practice, simulating a real life studio scenario. This participatory approach also encourages students to develop confidence in presenting their ideas and designs in an informal yet professional setting supporting their independent learning, while challenging them in a real life context, fostering the professionalism, positive attitude and integrative thinking expected of them as design graduates.

### *Case Study 1: The Difference Design Makes*

#### THE BRIEF

Running annually since 2007, the aim of this live brief is for students to critically evaluate their personal position on design, and what design means to them as an emerging creative practitioner. The project explores issues of social responsibility and personal accountability in the field of graphic design, with students developing an informed opinion of where they stand within the profession, and also as a global citizen. This project rests on the premise and belief that designers have the potential to become agents of change and it is possible as a designer to stand up for something they believe in. Specifically, students explore the question 'What is the Difference Design Can Make?'. This brief also provides students with the opportunity to attend the AGIDEAS International Design Forum in Melbourne, to engage with the international design community, and experience a range of viewpoints on visual communication that inform their own creative response to the brief. Through cross-institutional collaboration students are also able to exhibit their work in a public space, network with other emergent designers, industry representatives, and immerse themselves in the design mecca that is Melbourne.

#### DELIVERABLES

- Written design manifesto
- Visual design manifesto poster
- The 'Difference Design Makes' zine

Individually, students conduct research on design responsibility as a basis for writing a position statement on where they stand, and what they stand for as an emerging designer. They are encouraged to outline and share their view on the difference design can make through brainstorming and mind mapping sessions, and how best to achieve a balance between commercial outcomes, responsible and sustainable practice. Individually, students visually represent their written manifesto as an A1 poster, and are encouraged to be innovative and experimental with the objective of communicating a clear message (Figures 2-5).

As a team, UWS students collaborate with students from the external institution in collating and developing new content for a zine. Each student is allocated 2 spreads that comprise of their written manifesto, visual manifesto, and a new spread that expands on both. Each student must also pitch a cover design concept, which is decided by the group through a pitching and voting system. As a team, students are required to co-design the layout, complete the final artwork, and manage the deadlines and print production. Ultimately, the zine is displayed at the annual MCA Contemporary Arts Zine

Fair, Sydney. This stage of the brief involves an event design to showcase the zines and must incorporate a way to generate feedback from the general public who are encouraged to interact with the zine and its embedded social emphasis. Project zines are exchanged in kind for comments or feedback relevant to the project topic.

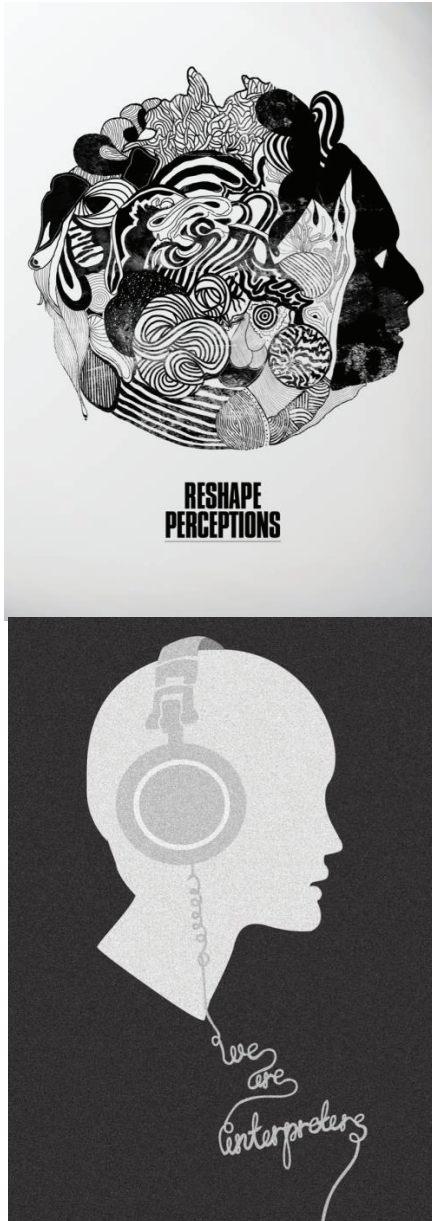


Figure 2. Visual Manifesto – “Reshape Perceptions”. Extract from Written Manifesto “Within a world intoxicated by image, text and sound, the concept of ‘design’ as being a discipline with depth and meaning has become overshadowed by an increasing desire to produce, sell and market. It is my belief that as a discipline, design enables people to challenge their perceptions of the world through utilizing their own experiences as a mould for new ideas and concepts. As a result, purposeful design must aim to encompass the beliefs and thoughts of a range of people, whilst adhering to each of their values. Through utilising this mindful frame, design can then be seen as a powerful tool for change through the way in which it aims to create informed citizens and reshape the way we interact with our environment.” Permission to reproduce work has been given by student.

Figure 3. Visual Manifesto – “We are Interpreters”. Extract from Written Manifesto – “Good design is both clear and clever. Know where you stand and have your beliefs. It will make you a better human, and in turn a better designer.” Permission to reproduce work has been given by student.



Figure 5. Visual Manifesto – “We Live in a Designed World.” Extract from Written Manifesto – “We not only need to understand and respect the importance designers have to play in our changing world. We have a duty to the consumer to provide them with visual communication that maintains an ethical standard of design. As a community we can discuss how to establish codes of design to incorporate ideas about sustainability, conscious consumerism, healthy body image and recycling. Individual pieces of a puzzle cannot communicate the entire message but when you put them together we can create a picture of a newly designed world that promotes a message of hope.” Permission to reproduce work has been given by student.

Figure 4. Visual Manifesto – “Jamming the Signal”. Extract from Written Manifesto – “We as designers must widen our frequency, transmitting the new issues that threaten our sustainability, in hopes to override the consumer message that has dominated our practice and social beliefs. Through our influence on society we can influence ourselves through social change in trends, this is where the difference can be made. So be creative, be daring, be defiant, but above all else, be informative.” Permission to reproduce work has been given by student.

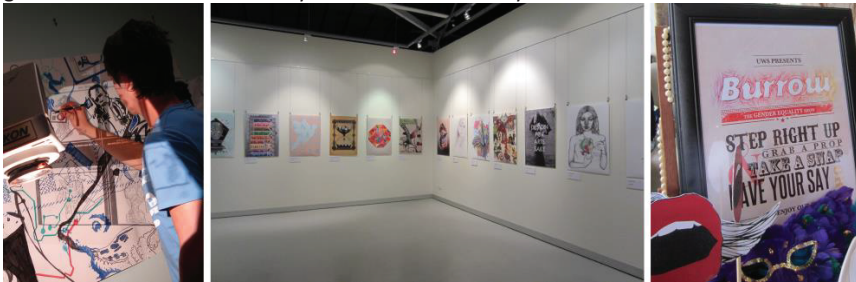


#### EVALUATING THE OUTCOMES

This live brief comprises three sequential and interrelated phases and outcomes, incorporating designed deliverables, cross-institutional collaboration and industry exposure. The combined learning and visual outcomes of this project are embedded, interwoven and inseparable – ultimately enabling students to individually shape their position as emergent designers. Through research, reflection, and writing the manifesto, and then developing it into a poster design, students widen their understanding of design's potential to function outside of its typical commercial domain. The scope of the brief and its design deliverables is a timely reminder for students that not all creative work is produced on a computer, that the written form, reflection, experimentation and innovation are important parts of the design mix.

The exhibition and zine fair outcomes exemplify the benefits of collaboration and sense of pride, ownership and responsibility over producing something from concept to print and then presenting it in the public sphere. Critically, students increase their understanding of what construes design responsibility, and build the foundations of their own personal and professional ethics. Engaging with their peers and the design public, knowing that their work is going to be exhibited publically results in high quality, innovative, insightful and mature results every year (Figure 6).

Importantly, it enables the students, as future creative practitioners, to re-imagine themselves as active participants rather than passive artworkers, who can become an influential public voice and resource to the community and its leadership in support of good design. The design and promotion of this publication also provides students with an opportunity to expand, reflect on and exhibit their work, and gives them exposure in their design community of practice, while also raising the public profile of the UWS B. Design degree. Ultimately, what these experiences afford students is the opportunity to see themselves within the context of the industry more broadly and in relation to design students from other tertiary institutions nationally.



*Figure 6. (L-R) Collaboration in process, RMIT, The Works Design Studio, 2007; The Difference Design Makes Exhibition, Australian Academy of Design, Melbourne, 2012; The Burrow Zine display at the Museum of Contemporary Art, Zine Fair, 2012. Source: Author's own photographs.*

## Case Study 2: Off the Wall

### THE BRIEF

This annual project involves the design and production of a suite of strategic visual communication materials, including individual mural panels, and the organisation, management and promotion of a collaborative design mural event and barbeque at the Rabbit Hole. The purpose of the project is to introduce the Rabbit Hole to Bachelor of Design students in years 1-3 of the degree, and also create a range of murals that are installed in the studio to inspire future Rabbit Hole students, as part of the studio's ongoing place-making activities.

### DELIVERABLES

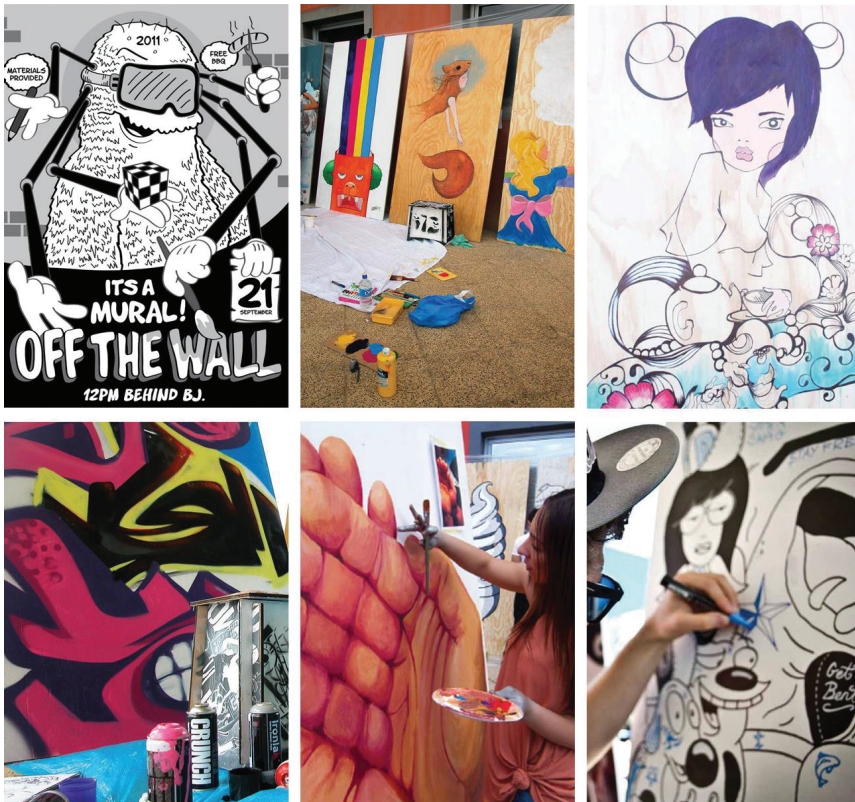
- Mural theme
- Mural design
- Promotional strategy
- Event management
- Reflective journal
- Video documentary

As a team, students must brainstorm, develop, and decide on an overarching theme that will guide all design work and promotion. Individually, students conduct visual research, experimentation and planning, then develop and execute in final a large-scale mural panel that can incorporate, but must not rely exclusively on digital design methods. Individually, students must develop and pitch a promotional poster design and an invitation that is decided on by the team through a voting system. As a team, students devise a media strategy and write a press release for internal and external media, which is sent out to UWS journalism students, local press and television stations. The team must also manage the day-long event that occurs at the end of the semester, as the culmination of a semester's work on their individual panels and strategic communications campaign. This includes budgeting, inviting guest artists, liaising with support staff, catering, set up and pack down. The event musters B. Design students across the degree, the broader UWS community as well as local media to cover the event. As a team, the event must be documented through photography or film, with the aim of a curated (photo exhibition) or produced (film) outcome exhibited on the Rabbit Hole website to provide further internal and external exposure for future 'Off the Wall' events and the Rabbit Hole program as a whole.

### EVALUATING THE OUTCOMES

The 'Off the Wall' live brief is a multifaceted design project that leads to an enriching participatory design event which connects students across years of the degree. Significantly, it is also the last time fourth year design students are gathered together in one physical place before their final exams and assessments, ahead of the graduation exhibition. As such, it is an event run at a heightened period of stress for final year students who are in the process of completing their final portfolio works. Therefore, 'Off the Wall' provides a pivotal moment for students to reflect on and share their experiences, antidotes and aspirations. The collaborative panels on the





*Figure 7. Documentation of the Off the Wall: It's a Mural event 2007-2012. Permission to reproduce work has been given by students. Source: Author's own photographs.*

day encourages spontaneous collaboration and creates a sense of community on campus, which succeeds in breaking down the traditional divides that exist between students across different years of the program. The student team must interact with journalism students from the Communications degree who report on the event for their own assessment purposes, as well as Television Sydney (a local community television station) who film the event and interview students. It provides students with public speaking and civic engagement experience, as well as raising the profile of the design program as a whole to the Greater Western Sydney area. In 2010, the Penrith Press reported "The University of Western Sydney's annual mural painting event thrived this year, showcasing what may be the best talent in its four years."

'Off the Wall' demonstrates that design is not just on the computer, it can happen live and low-tech, and that collaboration is rewarding. The resulting mural panels are thought provoking, surprising and inspirational – engaging with a range of mediums and modes (e.g. stencils, paste ups, acrylics, sharpies, aerosol cans, markers, pencils), with subject matters drawing from the spirit of culture jamming, character design, social commentary, sustainability and creative freedom of expression tied to the annual theme (Figure 7). Importantly, the digital archiving of outcomes enables the teaching team to extend the learning experience beyond the lifespan of the current project. Film and still recordings go on to become participatory design tools that enrich future student work on the same project in following years. It is a unique form of capturing,

exhibiting and preserving temporal Rabbit Hole learning experiences for future reference. The Rabbit Hole website updates – [www.commart.s.uws.edu.au/rabbithole](http://www.commart.s.uws.edu.au/rabbithole) – are circulated to all students in the degree to motivate, inspire and engage them with design practice early on. Filming their experiences and seeing their work exhibited online also gives current Rabbit Hole students a sense of ownership, pride and achievement while design, filming and installation of student themed murals to personalise the spaces, thereby transforming them into more magnetic learning environments. ‘Off the Wall’ enables students to exercise their individual creative interests, collaborate, and then make a positive impact and leave their visual legacy in the learning environment, as each year’s murals are hung for the subsequent year’s duration.

### *Case Study 3: Television Sydney (TVS) rebranding*

#### THE BRIEF

A western Sydney-based community television station located on the Werrington South Campus at UWS, TVS required new visual branding that reflected its shift in philosophy and direction. TVS wanted to effectively communicate through its corporate and on-air collateral that it broadcasts quality local content that is often under-represented in the mainstream, to a diverse audience. The aim of the project was to refresh the brand, inform stakeholders of its future direction, and increase public understanding and commitment to TVS.

#### DELIVERABLES

- Brand strategy
- Visual identity design
- Concept prototypes

As a team, students conduct a competitor audit and situation analysis then develop a positioning statement and tagline for the TVS brand identity to guide subsequent creative work. Individually, students conduct design research and develop brand identity design that reflects the team’s brand strategy. This includes typography, colour palette, secondary graphics, and image treatments that can work with the existing corporate logo. Each student must develop 2-3 visual directions. Individually, students must develop concept prototypes for a series of corporate and on-air collateral, including stationery, building and vehicle signage, website design, iPhone application and screen titles.

#### EVALUATING THE OUTCOMES

The teaching team observed that having the client engaged in the process, by coming into the Rabbit Hole studio to meet with the students and participate in design decisions being made (e.g. colour palette, image choices, type treatments and logotype developments), at regular interim stages rather than in formal presentations, helped the designs move quickly and enabled the students to feel as though they were making progress through an iterative process that responded to the client’s constructive critique. Working through a range of conceptual directions as part of a design team, students also become familiar with the collaborative nature of studio practice, experiencing the benefits of working alongside people from a range of disciplines, rather than in solitary way they were accustomed to. One of the TVS rebranding outcomes was to be a screen advertising campaign that promoted the new TVS brand,

positioned as ‘a different view’. This process involved working collaboratively with TVS advertising representatives and cross-disciplinary discussions with students on the design team who had sub-majors in advertising, marketing and media production. The students succeeded in conceiving a series of integrated communication strategies that were empathetic to the home grown brand aspirations of TVS, without resorting to clichés and staid outcomes often associated with low budget community television (Figure 8).

The TVS rebranding project has led to a range of other TVS design briefs for the Rabbit Hole, increasing the studio’s capabilities and reputation, as well as crystallising a mutually beneficial relationship with a real client. The TVS project resulted in high calibre, innovative, professional and industry standard designed outcomes. Ultimately, the student’s response to this design challenge have been conceptually rich and confident in the choice of media/execution and demonstrate the value of the transitional teaching methods embedded in the Rabbit Hole curriculum. Students have worked in a design studio – moving from a University student-centred method to a responsive client focused approach – so highly regarded and required of practising design professionals. The effectiveness of this ongoing partnership has also led to paid internships being offered to Rabbit Hole students who worked on the project.



Figure 8. One of the TVS rebranding and advertising campaign live brief outcomes. Permission to reproduce work has been given by students.

### Case Study 4: Final Sessions

#### The brief

Final Sessions is an annual student-run night of music held at Penrith’s Joan Sutherland Performing Arts Centre, in the Greater Western Sydney area. It is a celebration of the end of Autumn semester and an opportunity for UWS musicians to



showcase their emerging talents and perform their music to a live audience. This event represents an ongoing collaboration between music and design students, and an engagement with the Western Sydney community. The project involves a competitive pitch, whereby two teams develop concept prototypes to present to the client (a representative from the UWS Music department), who then decides on which team progresses with the project.

#### DELIVERABLES

- Event theme
- Brand identity
- Concept prototypes
- Design campaign
- Event management

As a team, students conduct a competitor audit and situation analysis and then collaborate on the event's theme and positioning strategy. Students also design a survey to garner feedback from UWS music students, who may perform on the night. The survey responses inform the design direction. Individually, students develop the visual brand for the event. As part of an iterative design process, each student develops 2-3 concept prototypes that are pitched internally to the team. The team votes on the strongest visual strategies and each student moves forward to develop these further. This process often involves working with other student's ideas and design artwork, media and so on, encouraging them to challenge notions of authorship in a collaborative design environment. At this stage both competing teams make their pitch to the client, who decides on the final event theme and branding. The chosen team then goes on to revise their roles to design and produce the final campaign elements (Figure 9). The team must also liaise with the venue, local press, performers, and technical staff in the lead up to and during the event.

### *Evaluating The Outcomes*

Final Sessions is the brainchild of the Rabbit Hole and has been running since 2007, growing in popularity in terms of attendance, calibre and range of performers, as well as student participants from other programs within the School of Humanities and Communication Arts. As part of this live brief, Bachelor of Music students are invited to perform to a local audience and Bachelor of Communication students cover the event for TVS and local press. In 2012 it was an enjoyable and enriching event attended by over 100 people that brought creative talent, UWS and local community together. Edwards (2011) describes how Final Sessions attendees have been surprised that an event of such high standard had been organised by students. She also believes that the event is something that UWS design students enjoy being a part of, stating, "...they love it. They are really contributing to something the university encourages outside real life projects like this" (Lipman 2011).

Final Sessions enables the student design team to gain valuable experience in areas related to design practice that they haven't otherwise been exposed to, for example, competitive pitches, event management, public relations, public speaking and broadcast design. An important outcome is that students see and experience the impact of their design work and the potential for design to make a contribution in their communities. Final Sessions also situates the performers in a professional context while allowing them to rely upon the expertise and experience of the Rabbit Hole teaching

team. Final Sessions exemplifies the positive outcomes of the Rabbit Hole’s situated learning approach, and also demonstrates the studio’s positive influence on learning communities, inspiring students to participate, learn and work together as part of a multidisciplinary team in a real world context.



Figure 9. Collaborative Promotional material produced in the Rabbit Hole for the Final Sessions music event held at the Joan Sutherland Performing Arts Centre, 2009-2012.

## Critical design pedagogy – a ‘WIL’ way forward

Endorsed by Farivarsadri (2001), critical design education, such as the situated and reflexive pedagogical framework outlined here, defends a kind of student-centred and client-focused work integrated learning where students become “moral citizens” through the fostering of personal accountability and mutual responsibility for the process and its outcomes. In the Rabbit Hole this is in part achieved through the alignment of the learning outcomes that underpin the curriculum, with the live brief

projects. While the 4 case studies presented here afford essentially different design responses, visual strategies and media outcomes, the construction and alignment of learning outcomes with assessment criteria ensures that the projects are scaffolded with the appropriate content, context, opportunities, people, learning contracts and ideologies to ensure that there is a measureable relationship between the real life work the students are involved in and the aims of the program, in terms of what we aspire to produce – socially responsible emergent designers, who are ethical and culturally aware. Our graduates leave the Rabbit Hole able to apply problem solving, integrative thinking and appropriate media to ‘real life’ design situation. Moreover, they are articulate and confident design professionals who are able to work independently and/or collaboratively, reflective of information, knowledge and ideas.

Importantly, what binds all of the Rabbit Hole live briefs together (not just the case studies), is the fact that they negotiate “uncertainty” which encourages the students to “build collegial, creative and sustainable communities” in an ontologically unstable world (Franz 2007). This ensures that they are adaptable, positive, flexible and resilient in the face of rapidly changing design practices. The challenge for the future will be to measure how the Rabbit Hole experience has impacted on its students, in the long term and in their future communities of practice.

## **Conclusion**

The case studies discussed in this paper demonstrate what is achievable through a dynamic curriculum that synergises situated learning, participatory design and design advocacy.

The overarching aim of the Rabbit Hole teaching studio is to foster responsible, engaged, and professional emergent designers with the skills and confidence to effect change. Through providing students with the opportunity to work on ‘real world’ community-focused design projects with real clients, the aim is for students develop an understanding of how their actions may impact on the community and the larger world. As discussed, the live brief framework enables students to have meaningful learning experiences where they hone their creative capacities and develop their professional skills, ultimately making them more employable than they may have been before entering the Rabbit Hole. The effectiveness of the Rabbit Hole’s ‘living curriculum’ is also demonstrated by industry recognition of students’ design work, and academic recognition of the teaching team. A number of live briefs have also been transformative for students, giving them first-hand experience of how they can make a positive contribution to the local community and the broader design industry, and in some cases, live briefs have led to internships and paid employment for students.

While studio teaching is a key and indispensable characteristic of pedagogy in art, architecture and design, the studio teaching programs of many Australian institutions for many years have been under threat due to lack of resources, such as funding, teaching spaces, technology, and staff workloads (Zehner et al. 2009, 8). The effectiveness of the Rabbit Hole and its situated design pedagogy is a testament to the incredible value of studio teaching in design education. In agreement, Shaughnessy (2009, 12) argues that it is impossible to understand contemporary graphic design without also understanding how studios function. Extending on this, the outcomes presented in this paper demonstrate that approaches to design education which unify design practices and professional engagement in an authentic real world multidisciplinary studio environment – such as the Rabbit Hole – can result in

responsible, inspired, work-ready emergent designers with an understanding of how their actions can positively impact change in their communities, and the world at large.

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# Social Networking as a Mentoring and Engagement Tool Between Design Alumni and Early Design Students

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**Abstract:** *In graphic design education, there is an increased need to integrate design thinking, with less focus on the designed ‘object’ and more focus on its message. Realities of the contemporary profession mandate the development of broad thinking skills; students need to begin viewing themselves as problem-solvers first, image-makers second. The Alumni Mentor Initiative was devised to introduce beginning graphic design students to design thinking as it manifests itself in practice. Using the LinkedIn website, 80 alumni from the university’s graphic design program were identified and asked to participate in an online mentoring program. Each was matched with one beginning student, who posted three questions to a discussion forum. In this phase, 240 questions and responses were collected. This is phase one of a research initiative. In this phase, the questions and responses have been analyzed based on the following questions: 1) Will experienced design practitioners reinforce the need for abstract thinking skills? 2) Does discussion with alumni help students to understand the groundwork we are setting for advanced communication challenges? 3) Can students better integrate textbook knowledge of theory and methods through conversation with practitioners?*

*Keywords: Mentoring, social networking, design education.*

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## The problem

In the field of graphic design, there is an increased need to integrate thinking in education, with less focus on the form of the designed 'object' and more focus on its purpose and message. Realities of the contemporary graphic design profession seem to mandate the development of broad thinking skills, since graphic designers are increasingly asked to design innovative solutions that go beyond the boundaries of print and web-based media. It is vital for design educators to prepare the graphic designers of tomorrow to view themselves as problem-solvers first, and image-makers second. When learning to create the objects that are traditionally associated with graphic design (logos, websites, signs, books, etc), the students need to learn to consider not merely the aesthetics of the object, but its purpose and function for both its client and its user. An understanding of the relationship of design and business will be fundamental to their educational experience. Similar demands are being made in all of the design disciplines, where traditional boundaries are being blurred due to the complex design problems that need multidisciplinary solutions.

Ideally, this new emphasis would begin at the earliest stage, once students are admitted into a graphic design program. This can be challenging, however, since there remains a need for the students to learn fundamental skills of composition, typography and image making before the more comprehensive studio projects can be introduced. In addition, there are technical skills required for the creative manipulation of software. Thus, the introductory year in graphic design is filled with form and technology basics, with little opportunity for design thinking in its broadest sense. The preliminary studio projects at this level don't seem to be the right place for integrated thinking; assignments with complex marketing challenges are best introduced after the students have attained a level of basic skills. New methods need to be found for advancing integrated thinking at earlier stages of the graphic design curriculum, concurrent with the studio fundamentals, to better prepare students for the profession.

## Responding to the Challenge

This study involves a two-phase initiative that begins to respond to these concerns in a large graphic design department within a university setting. The graphic design program is situated within a college of design, which itself has been looking for ways to better prepare students for their potential to impact change on many levels and across many disciplines.

Previous assessment of upper level students within the graphic design department showed that they have difficulty perceiving their roles as problem-solvers rather than form-makers. Even with a curriculum that integrates liberal arts, design process, and writing within the curriculum, students are still enamored with the many superficial, style-conscious designers saturating the web. When asked to create innovative solutions that respond to complex client needs, they are intimidated by the abstract thinking needed for such an assignment.

One response to meet these curricular needs was the recent development of a lecture course taught concurrently with the studio coursework. In this course, such topics as communication theory, design thinking, and branding strategy are introduced a year before they are explored in studio projects. Theoretical content is delivered in the lecture format that can set the groundwork for advanced studio coursework. Graphic design can now be presented within the context of business, and viewed as a



problem-solving methodology. While this course is clearly a positive step, the students still have a difficult time weaving together the theoretical and strategic issues from lecture class and the form-driven concerns of studio class. They also have an extraordinary level of anxiety at this level of the curriculum, due to factors such as competitiveness, intensive workloads, and uncertainty about the profession as a whole.

With a campus location that is several hundred miles from any large cities, the students have little exposure to major design firms, and have few opportunities to interact with design practitioners. While many students *do* find their way to urban centers on their internships, the beginning graphic design students are still two years away from that opportunity. They crave information about the business of graphic design, and immediately look to the web for such exposure. Unfortunately, while browsing they will gravitate toward the websites of graphic stylists; these sites display graphic work that is flashy and fun, but doesn't accurately represent the complexities or communication mandates of the profession.

## **The Alumni Mentor Initiative**

In response to this situation, the Alumni Mentor Initiative was devised as a mechanism to introduce beginning graphic design students to design thinking as it manifests itself in current practice. Many alumni had previously expressed a desire to 'give back' in some way, in gratitude for what they believe was a quality education. It was determined that alumni would be an ideal 'voice' for the department's new focus on problem solving and design thinking. Students have always regarded what their professors say about the profession with some skepticism; they consider instructors to be too distant from the workplace to accurately portray it. Conversely, they tend to accept the word of a practicing designer as 'truth.' If alumni professionals could help them understand the contemporary demands of the graphic design profession, it would add validity to the teaching mission and encourage them to embrace design thinking.

Using the professional networking site LinkedIn, graphic design alumni of the program were located. Current and past job descriptions are listed on the site, which helped to determine which alumni have the breadth of experience needed to serve as mentors. These alumni were then invited to participate in the mentoring program; those who accepted were then added to our online courseware as 'guests'.

## **Research Questions**

After a review of the mentoring literature and an assessment of the challenge, three research questions were devised:

1. Will experienced practitioners within the graphic design profession reinforce our beliefs about the need for abstract thinking skills in solving complex client problems?
2. Does discussion with alumni help students to understand the significance of the curriculum in setting the groundwork for advanced communication challenges to come?
3. Can graphic design students better integrate their textbook knowledge of communication theory and problem solving methods through conversation with experienced professionals?

## **Unique Aspects of the Study**



The practice of alumni mentors exists in several professions in one manner or another. There are numerous such relationships established in law schools (Boylan 2006, p. 3), nursing schools (Sword 2002, p. 427), engineering, the medical profession, business schools and others. These vary in structure, although most involve in-person meetings of mentor and student, and most of the time the degree of involvement expected is left up to the individual pairs. There is, as of yet, no published information about any alumni mentoring programs in graphic design education, and no information regarding online student/mentor discussion forums.

The Alumni Mentor Initiative uses web-based course support in an innovative way. In our technology-based university of 25,000 students, where more than 1400 courses include a web-based component, no other courses have attempted to use the course support software to create discussion groups that involve participants outside of the course itself.

Unlike other mentor relationships that might be established, the conversations between participants of the Alumni Mentor Initiative are available to all students and mentors. An individual student can learn, therefore, from 80 mentors, not just the one that is assigned to answer his/her question. This semi-public access also sets high standards for the seriousness of the questions and responses.

The ability to formulate a question (rather than answer one) requires a more active role in the learning process. Students' comprehension of/interest in the course material can be immediately assessed by the depth and curiosity of their questions.

Upon completion of the 3 posted questions and responses, students are required to contribute at least 4 intelligent comments/observations to any of the discussion threads. This follow-up question demands that the students read *all* of the posted questions and answers, not just their own. This provides an opportunity for students to share their observations with peers, and for professors to assess their comprehension even further.

Knowing that these successful alumni studied in the same program provides validation that the curriculum is strong and purposeful, and gives students the confidence that they, too, will be well prepared for a career in the graphic design profession. In addition, the common institutional background among students and alumni helps them to immediately build a stronger sense of community or in-groupness.

## Participants

There were 80 students participating in the alumni mentor match. All were enrolled in the "Introduction to Visual Communication and Branding" course, which is a required fall semester lecture class for beginning students in the BFA Graphic Design program. All had been accepted into the program the previous summer by competitive portfolio and review of grades.

In order to provide a one-to-one match, 80 alumni were identified to participate as mentors. Their work experience ranged from 2 to 30 years; all were alumni from the university's graphic design program and all had received the same degree (BFA in Graphic Design) that the current students will receive. They work in 23 cities across the U.S. These alumni work in a variety of graphic design positions in companies including graphic design firms, advertising agencies, corporate in-house departments, and web development companies. Of the alumni participants, one quarter are design firm owners.

While some of these alumni hold prestigious positions in major design firms, others do not. It was determined that any experienced graphic design alumni was qualified to answer students' questions. Students were not told of their mentors' job title or where they work, to avoid any tendency they might have toward judging the validity of a mentor's advice based on the mentor's prestige in the industry.

## **Methodology**

Alumni of the graphic design program were located using the LinkedIn website. Of the alumni that were found using this method, the ones who had been out of school for at least two years were contacted and invited to participate. These alumni were asked to participate in our new online mentoring program with a beginning student in the graphic design department. Strict parameters were established: there would be three questions to answer, these would be spaced out across the semester, and the students could all read each response. Nearly all of the alumni who were contacted agreed to participate. These alumni were then added to the course's online discussion forum.

To encourage participation, it was important to promise the alumni that their contact information would not be made available to the students. This would prevent any concerns they might have about their offices being flooded with internship requests. Alumni were offered the option of providing this information in their responses if they chose to do so; most preferred the limited access that was offered.

Each of the 80 alumni mentors was then matched with a student in the lecture course. These matches were maintained for the duration of the project: students posed questions to the same alumni mentor each time. The matches were assigned by random selection; there were no additional criteria for how the matches were determined.

Students enrolled in the lecture class were required to participate in the alumni mentor initiative by posting three questions over the course of the semester to the discussion forum. The questions were scheduled at three different times of the semester to align with materials that had been recently covered in class lectures and readings.

Upon posting of the first 80 student questions, the alumni were sent a reminder to respond to their students' questions. This process was repeated for questions 2 and 3. Alumni responses varied in depth; a few wrote two sentence responses, while most wrote three to four paragraphs. In phase one, there were 240 questions and responses collected. The discussion forum was only accessible by students in the course and the alumni mentors. All students and alumni mentors were able to read all of the questions and responses.

## **Preliminary Analysis of Collected Data**

Student questions were not open-ended; they were guided toward a range of specific topic areas, to prevent the predictable obsession with "how will I get a job?" questions (past interactions with students and professional designers has shown this obsession to occur if guidance is not provided). They were asked to formulate questions on the topics of design process, research, communication theory, branding, design business, and other topics relevant to the course itself.

The most common themes across the students' questions had to do with the design process and the process of branding. When asking about the design process, students showed the most curiosity about methods of ideation.

In addition to direct responses to the students' topics (listed above) other prominent themes within the alumni responses included client relations, problem solving, working within restrictions, listening as a design skill, and the significance of sketching. These responses can be grouped and studied according to the research questions previously established:

### *Research question 1:*

The first question asked: Will experienced practitioners within the graphic design profession reinforce our beliefs about the need for abstract thinking skills in solving complex client problems? The alumni mentors consistently supported the notion of graphic design as a thinking profession throughout their responses. One especially interesting theme was shown in the alumni's frequent re-directing of the students' questions from those of a limited scope (for example, questions of software) to a broader focus on communication objectives. While they seem to empathize with the students' limited exposure to the profession, they repeatedly tried to broaden the students' current narrow definition of graphic design as a technical profession to one that is more about thinking and problem solving. An example of this occurs in the following exchange,<sup>1</sup> where the mentor attempts to de-emphasize technology in order to prioritize the fundamental thinking and problem solving skills:

- Q) What computer design programs do you find yourself using most frequently?  
A) I often use these programs as a way to visualize the thought process and rationale behind the new services, products, and systems we're creating. The tools we use are going to change repeatedly through our careers. While it is important to have a small arsenal of tools that allow you to fluidly and intuitively express your ideas/concepts, to me it is by far most important to deeply understand the formal and communication components that underlie good visual design: e.g. color, typography, composition, etc. I think it is very easy for a young designer to become more focused on learning a new script, programming language, or software program and neglect to master the basics of good design. This can be a big gamble: software and technology will quickly become obsolete, understanding great design will not.<sup>2</sup>

Building on this answer, another mentor responds similarly:

- A) Marnie is right. While at Iowa State, take every effort to focus on learning the basics of good design - typography, hierarchy, composition, etc...And the best tool of all - learn to sketch...By forcing yourself to translate concepts and phrases into visuals, it will better prepare you as a designer to approach any project or situation, because in the end, that is all you are ever doing...It will be the best design tool you could ever learn -- and it will never be out of date.<sup>3</sup>

Likewise, in the following exchange, the mentor rejects the question of media, instead presenting a case for the importance of conceptual thinking:

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1. To preserve anonymity of the participants, students are not identified throughout the paper. Only their job titles and the dates of their responses identify the alumni mentors.

2. Alumni mentor, design researcher. September 30, 2012.

3. Alumni mentor, multimedia designer. September 28, 2012.

Q) In today's Graphic Design careers, is it more important to have knowledge in web design or print media?

A) I think in today's design world, having a strong creative foundation of design is what is important. The vehicle of web design vs. print media have different challenges and are different media, but to be successful at either you need to first exercise and execute creative ideas. Communication and hierarchy principles apply to both media...I can't stress enough the importance of learning how to create strong conceptual ideas and being able to communicate the concept or story.<sup>4</sup>

In a similar exchange, another mentor plays down the importance of technical skills:

Q) I was wondering if you think it is more important for a successful designer to have a lot of creativity, or if it is more important for a designer to have a lot of technical skills?

A) Creativity is much more important. If you can combine the two that is the best of both worlds but I believe it is more important to first have the capacity for creative thought. Graphic design is a bit of an anomaly in the creative world in that the best designers can use both sides of their brain. I don't just see the code. I see how the code makes my vision come to life. But it always starts with the vision.<sup>5</sup>

Another mentor responding to a similar question has this to say:

Oftentimes, designers are more focused on the design look and not enough on communicating what is important in a compelling way. And they make false assumptions about what the audience already knows. Think of yourself as a problem solver more than a designer. Think big and be inspired by others who are doing great things both in the design world and out.<sup>6</sup>

### *Research question 2:*

The second question asked the following: Does discussion with alumni help students to understand the significance of the curriculum in setting the groundwork for advanced communication challenges to come? Beginning graphic design students have pre-conceptions regarding the technology of graphic design; they think it is a methodology rather than a tool. This makes them skeptical about the value of sketching by hand, or any other activities that are done without technology. Many of the mentors offer reassurance that hand drawing is not an outdated approach. For example, one explains, "Sketching is a form of thinking and visual note taking...Sketches are a tool; they are not an end in themselves. Or put another way, it is not about the sketches, it's about the ideas."<sup>7</sup>

The following excerpts are from conversations addressing similar concerns:

Q) Before starting the first year of graphic design courses, I thought that I would be doing almost all, if not all, of my work on the computer.

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4. Alumni mentor, design firm owner. October 7, 2012.

5. Alumni mentor, design firm owner. October 5, 2012.

6. Alumni mentor, design firm owner. October 8, 2012.

7. Alumni mentor, associate creative director. September 27, 2012.

A) I think the sketching you're doing is teaching your mind how to think visually while also communicating a message. You need to learn this in order to be a great graphic designer.<sup>8</sup>

Q) In your personal experience, do you start your projects with hand drawn sketches or do you sketch on a computer?

A) I almost always sketch out the project on paper first...It is important that in each project, you identify the overarching message that you wish to achieve. From there, hand sketches can quickly help identify which elements are best suited to achieve this.<sup>9</sup>

Q) Is there something that comes through working by hand that cannot be achieved through graphic renditions?

A) I think [sketching] is still a valuable process that every designer should learn to do and practice when possible. In present time, even with the technology available to create compositions and ideas quickly, sketching provides a way to expand the thought and creative development in ideas that may not come out if a designer goes straight to execution. It is a process that allows you to quickly test many ideas on paper so you can pull more out of your mind in a short amount of time.<sup>10</sup>

Students asked many questions about the design process, which had been covered in class lectures, and experienced first-hand in studio classes. They are most concerned about how to get started, and they hope to be pointed to an inspiration source outside themselves for this assistance. Their alumni mentors point back to the designer instead:

Q) From where do you get the best inspiration (websites, books, etc) for your designs?

A) I think if you can eliminate all preconceived ideas and get to the root of the problem it will give a greater foundation for the next step, which is the actual creative exploration. What is it supposed to do, what effect does it need to trigger, how can it better connect with the audience...If you allow yourself to quickly explore more creative directions, you can eliminate what is not working based on the root of the problem. Sketch, doodle, clip and create mood boards as much as possible early in the process to get to the root - after that begin creating as much as possible, as quickly as possible, as tight as possible (as in computer comps) to explore how it "could" come to life.<sup>11</sup>

Other process questions are answered with a similar emphasis on the 'root' of the problem to be solved:

Q. Does the process or how you start a project depend on what you are designing?

A. In all scenarios...I'm thinking in terms of design from start to finish. This goes beyond "pretty pictures." So when you ask 'does the process...depend on what you are designing?' the process might change as I have to adapt to different customers or situations but I'm always going into any scenario, whether it's my own concepts or a customer's concepts, thinking in terms of a designer. That is to problem-solve

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8. Alumni mentor, design firm owner. September 27, 2012.

9. Alumni mentor, graphic designer. October 9, 2012.

10. Alumni mentor, associate creative director. October 8, 2012.

11. Alumni mentor, design firm owner. October 7, 2012.

a situation, visually communicate what I've solved and make sure my resolution is the final product.<sup>12</sup>

Students are also curious about why they are expected to produce so many ideas for each project; the alumni mentors consistently support this expectation by explaining the importance of the iterative process:

Q) I feel like sometimes when I do more it helps but sometimes when I do the same amount it starts making it worse.

A) Design is about iteration. The reason why you are being asked now, to do what may feel like a ridiculous number of sketches, is to get you in the habit of iterating. Getting you used to putting things together, seeing the visual relationships that you are creating, breaking them apart again and trying something completely different...In graphic design, "it's all about the message." If you can't clearly see/feel/know the message immediately after looking at your solution - you're not done. When you can, you're done.<sup>13</sup>

Q) When working on a project, is there ever a point when it isn't helpful to go over your work and try to improve again?

A) Design is a strange beast. Unlike most professions, there is almost never a 'right' answer, only a range of hundreds, or even thousands of possible solutions of varying effectiveness. That means rarely we *might* have a great concept right away, but statistically that is not very likely at all—and the best execution of that concept will never come without fully exploring a range of solutions...Iteration is one of the most important elements of the design process...<sup>14</sup>

Q) I know everyone is telling us not to go with our first idea for a design...How do you convince yourself to move on from those ideas and keep coming up with more and better ideas?

A) Try to think of that first idea like you're covering your bases. If you've got a "safe" idea in the bag, then you've really got a license to try and push solutions into new and unexpected areas. That freedom can really help you grow as a designer and a thinker. *Have you asked all the right questions? What if you came at the problem from a completely different perspective?* You may still end up back at that first idea, but at least you'll have done your due diligence and challenged yourself.<sup>15</sup>

The following are mentor responses to questions about idea generation:

Q) What are some of the ways that you come up with ideas and where do you find your inspiration?

A) Probably the simplest way to put it — is to be a sponge. Keep your mind open and take in everything you can around you. Things you see, experience, hear about, listen to, etc. (try to get outside of your world of interests, too). When you brainstorm with a group, having a mental library aides in the give and take process of developing ideas with others.<sup>16</sup>

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12. Alumni mentor, environmental graphic designer. October 2, 2012.

13. Alumni mentor, multimedia designer. October 2, 2012.

14. Alumni mentor, graphic designer. October 2, 2012.

15. Alumni mentor, design director. October 8, 2012.

16. Alumni mentor, creative director. September 28, 2012.

Q) I often find myself getting caught in routines. I was wondering if you had any tools or exercises to help you think outside the box and create more diverse designs?

A) First and foremost, we are looking to meet specific communication objectives. These serve as the foundation for the design solution...we work to gain as deep of an understanding about the client's culture. I'm not sure that is always "inspirational" but it is critically informative...<sup>17</sup>

Q) What are some activities, or some inspirational resources you visit when trying to trigger a brainstorm?

A) I think there are a million great places to find inspiration, but I've realized over time that I can't wait until a deadline or a specific project to use them...I need to make time in my schedule for inspiration every day. Like gathering nuggets of inspiration... I'm constantly getting sparks of ideas from things I see that take me in totally new directions. Movies. Concerts. Reading the New York Times. Simply keeping your eyes open in your daily life.<sup>18</sup>

Other conversations regarding the design process occurred; for example:

Q) Which aspect of the design process (if not all) would be the most important to "master" in order to create better designs both in the academic world and the professional world?

A) I would emphasize the beginning stages in setting up the entire process for success. Thorough development and meticulous technical creation are key aspects to any successful campaign but without a solid idea to push the design, it will always be lacking...You can't put form before function in the design world. I think that is a skill that is important to hone as you make your way into the professional world.<sup>19</sup>

### *Research question 3:*

The third research question asked: can graphic design students better integrate their textbook knowledge of communication theory and methods through conversation with experienced professionals? Years of experience in the profession have given the alumni mentors strong opinions about what's really important in visual communication; these opinions are consistently shared in response to students' questions:

Q) What is the client's involvement in the design process?

A.) Clients are vital to the design process. Without them, you wouldn't have a job! The client's needs and budget set the parameters of the project...Building strong, good lines of communication with your client is how you ensure that they understand and are agreeable to the design you are doing for them.<sup>20</sup>

Q. How do you personally go about starting a new project?

A. When approaching a new project...I have found that the most crucial step in the whole design process is the initial conversation with the client or account manager. Communication between client and designer is critical to understanding their

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17. Alumni mentor, design business owner. October 28, 2012.

18. Alumni mentor creative director. October 7, 2012.

19. Alumni mentor, graphic designer, September 25, 2012.

20. Alumni mentor, design educator. October 2, 2012.

needs...You deliver design that speaks to its intended audience, which is your number one goal as a designer.<sup>21</sup>

Q. What steps do you usually take in this research stage of a project and how influential does this become to the rest of your design process?

A. I generally start by identifying some basic information to help me frame a project...Research is very influential to my design process. Research helps me identify and understand the parameters of a project and guides me in creating a design solution that is relevant – relevant in its representation of the client, relevant to the problem it's intended to solve and relevant to the intended audience.<sup>22</sup>

Q. In real world situations where timelines, budgets and numerous opinions influence the outcome...do you feel your designs are improved or compromised by these constraints?

A. I consider constraints that come with all projects to be part of the inherent challenge that needs to be solved through your design and management skills...I don't think these constraints compromise a project, they just help inform what kind of solution is best.<sup>23</sup>

Q. What questions do you ask in order to best understand their vision and how to make their dream a reality?

A. Helping clients realize their dreams is a multidimensional exercise in listening and offering professional advice and expertise...Listen to your clients. They are coming to you for your expertise. This doesn't mean you need to treat them like they know nothing, just work together and make an incredible team!<sup>24</sup>

Q. In your experience do clients usually bring a lot of ideas to the table? How much do you factor in their vision?

A. Sometime factoring in their vision may mean reading between the lines a bit and always presenting your ideas that may have been inspired by their idea...It's our job to listen, rework, and make that idea better, while also presenting ideas that solve the problem they may not have realized could even exist.<sup>25</sup>

Q. Do you think it is better to have more restrictions that the client puts upon you, or do you like more freedom?

A. Not all limitations established by a client are negative, sometimes they can be helpful to the efficiency of the design process and the effectiveness of the solution...These restrictions can force innovative solutions that may not have presented themselves with total creative control. I personally love the challenge of "making the desert bloom," so to speak, and I would say that some of my very best work has been projects with many limitations.<sup>26</sup>

### *Sense of Community, Encouragement and Empathy*

While not considered in the research questions, an additional observation can be made from reviewing the discussions: the alumni felt an immediate camaraderie with the students, due to their shared alma mater. They expressed this through encouraging

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21. Alumni mentor, graphic designer. October 2, 2012.

22. Alumni mentor, creative director. October 2, 2012.

23. Alumni mentor, design firm owner. October 17, 2012.

24. Alumni mentor, senior designer. October 10, 2012.

25. Alumni mentor, design director. October 8, 2012.

26. Alumni mentor, senior art director. October 1, 2012.



remarks meant to bridge the gap between beginner and expert. One alumni mentor, for example, provides the reassuring remark, “You’ll learn, you’ll get to know polished from overworked...”<sup>27</sup> They remember what it felt like to be insecure in one’s abilities: “Just remember that everything takes longer when you’re first learning.”<sup>28</sup>

In other comments, the mentors poke fun at themselves or find other ways to equalize the relationship, as expressed in the following excerpts from their responses:

A) It’s amazing how much of a badass designer I remember being in college, looking back at the work though doesn’t support my memories. It wasn’t bad, just crazy to see how much you and your design skills grow over time.<sup>29</sup>

A) I saved a few things, but only...to remind myself that I’m always a work in progress, as my skills have grown/changed significantly since my college years.<sup>30</sup>

As designers we all fantasize about showing clients something that’s amazing yet different than they wanted—causing them to drop to their knees in gratitude and write a blank check for all of their future work. That hasn’t happened yet. But occasionally you find some middle ground, and that’s progress.<sup>31</sup>

Even projects you love on the due date might be improved by a great idea you have the very next day. Don’t let this discourage you—embracing this process of perpetual improvement is the way a project and its designer achieve greatness. The best end products come from the best and most thorough uses of the design process.<sup>32</sup>

Even in the rare situation when a student’s question drifts outside of the course lectures to ask, “does your work get in the way of your personal life?” the mentor offers friendly reassurance: “Do you really like what you’re doing? Are you having fun? Are you learning things? Then it doesn’t really seem like work, it just seems like life.”<sup>33</sup>

## Limitations of the Methodology

The study was limited to one university in the Midwest United States. Students didn’t yet have any studio experience with the topics they were inquiring about, and had only recently begun to learn of them in lecture class. This may have resulted in some of the alumni mentors’ responses being too abstract or advanced for the students to comprehend.

The use of only alumni as mentors presented some inherent limitations to the range of responses. Since all mentors studied in the same program (albeit over a 30 year range), their design philosophies and approaches may be narrower than the graphic design profession at large.

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27. Alumni mentor, multimedia designer. October 2, 2012

28. Alumni mentor, design firm owner. October 21, 2012.

29. Alumni mentor design firm owner. September 30, 2012.

30. Alumni mentor, senior recruiter. October 8, 2012.

31. Alumni mentor, senior art director. October 1, 2012.

32. Alumni mentor, graphic designer. October 2, 2012.

33. Alumni mentor, design firm owner. October 28, 2012.

## Implications of the study and future research

This is phase one of a larger research initiative. This phase validates the process of pairing early design students with a social network of alumni in the design profession. At this early stage, the benefits of an alumni mentor program of this type cannot be fully assessed, although the students do show a higher order of thinking than past groups. Phase two will examine future students of this course through a pre-test and post-test in order to assess the degree to which online mentoring and engagement affects the early design student's level of understanding of the design profession. Further progression of these students into the 3<sup>rd</sup> and 4<sup>th</sup> year courses will provide an opportunity to assess their abilities to integrate strategic thinking, design process and communication factors into their studio coursework compared with previous student groups. Additionally, the alumni responses will be assessed to determine how well the department's curriculum is aligned with contemporary practice, and the program's effectiveness in preparing broad-thinking professionals.

In future research, the mentor initiative could serve as a pilot for a more comprehensive alumni mentoring program, where advanced students would continue to ask questions of increasing sophistication of the mentors, as relevant to their advanced course assignments. A three-year sequence could then provide extensive data for assessing how well learning objectives are being achieved at each level.

## Conclusion

Phase one has shown the Initiative to be one effective way to introduce design thinking and to promote the view of graphic design as a problem solving discipline. The mentor/student relationship provides unique opportunities to reinforce and validate the graphic design program's increased focus on strategic thinking. When experienced design practitioners reinforce the importance of design thinking, it seems likely that the students will more easily accept the broadening definition of graphic design. Their high regard for the mentors' opinions ensures increased respect for such things as ideation, iteration, sketching, process, and listening as important skills for graphic design. Professors can continually attest to the importance of these things, but their claims will never carry as much weight as an alumni mentor's.

Fortunately, after years in the graphic design profession, the alumni have concluded much the same thing: this is not merely a profession of form making; it is one of ideas and solutions. As described in one mentor's response to a student question, "You are correct in calling it the 'ideas' stage of the design process. However, ideas should be at the center of every step in the design process. It is our job to manifest those ideas into visually compelling solutions, but that solution is still about the idea."<sup>34</sup>

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# Social Network as a Tool to Develop Personas for User Research: An Exercise from Design Education

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**Abstract:** *This study focuses on a brand new type of user research as a part of a design project conducted in 2012 Summer School Project Studio in the Department of Industrial Product Design at Istanbul Technical University (ITU), Turkey. Students are required to get information from an open Facebook profile by concentrating on its demographics (age, gender, and nationality), descriptive attributes, mottos, likes, dislikes, hates, beliefs, activities, work attitudes, holiday attitudes, socializations and favourite objects etc. They are expected to propose some keywords and concepts to describe the persona after learning from the Facebook profile. By depending on these keywords, they are required to develop mood boards to summarize, abstract the data to generalize the persona to represent a real user group. This is supported by an exercise in which students fill a fictitious shopping cart of the persona according to the so-called buying habits of him/her. Finally, they are expected to act as the persona they developed in a role playing session in couples to enliven the persona and enhance the degree of empathy. This paper benefits from persona forms, mood boards and video recordings and aims to question whether new sources of social network such as Facebook is helpful as new and progressive tools for design research and education.*

*Keywords: Social network, User research, Persona, Design education.*

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## **Background**

### *Facebook*

In today's world, Facebook influences almost every single person's life. According to the recent statistics, there were 901 million monthly active users at the end of March 2012 (Facebook 2012a). Approximately more than 300 million photos uploaded to Facebook per day in the three months ended March 31, 2012.

According to the key facts on Facebook, "people use Facebook to stay connected with friends and family, to discover what's going on in the world, and to share and express what matters to them" (Facebook 2012a).

Socialbakers.com declares that in Turkey there are 30.771.500 Facebook users, which makes it 6<sup>th</sup> in the ranking of all over the world (Socialbakers 2012). About 9 users of 10 internet users in Turkey have active Facebook account, which means that Facebook is fairly popular in Turkey.

Facebook offers a personal web page for the users, which includes a considerable amount of personal information such as birth date, e-mail address, hometown, demographics, hobbies, relationship status, favourite movies, music, books, online, activities etc. In addition to the profile pages, all users have a "wall", where they and their friends can leave messages or declarations. Therefore, Facebook can be considered as a platform where people try to reflect and emphasize their identities (Zhao et al. 2008, Smock 2010).

### *The issue of identity*

A self-identity is formed in a public interaction, including "identity announcement" and the "identity placement". While the former one refers to asserting an identity by the individual, the latter one is related to approving the individual's identity by others. The identity is founded when "coincidence of placements and announcements" is formed (Stone 1990, p. 143). It is "the process by which people convey to others that they are a certain kind of person or possess certain characteristics" (Leary 1996, p. 17).

Whereas people use their clothes, hair, language, belongings etc. in physical world as they are reflecting their identities, they are identified by their writings, and preferences in virtual world. Even though the virtual and physical worlds have similarities in the sense of social interaction, "the virtual world is much more self-controlled and self-constructed" (Estoisia et al. 2009). Moreover, self-presentation on social networking sites differs from physical interaction since people may "inspect, edit and revise" (Walther, Slovacek and Tidwell 2001, p. 109) themselves in virtual world.

### *Ethical issues*

In the context of this study, the use of personal data in Facebook is considered from the privacy and ethical points of view. According to legal terms in Facebook:

When you publish content or information using the Public setting, it means that you are allowing everyone, including people off of Facebook, to access and use that information, and to associate it with you (i.e., your name and profile picture) (Facebook 2012b).

Depending on this term, in the process of the project, personal data is used educational purposes only and it does not violate the agreement given by the rules of Facebook. Also, in the selection of the profiles, only the open profiles were selected to share in the class and in the paper. In addition, names and identifiers of the Facebook

profiles are not shared and the faces in the mood board examples are blurred in this study.

### *The method of persona development*

'Personas' are fictional characters first appeared as a tool in marketing, extensively examined in Alan Cooper's book "The Inmates are Running the Asylum" (Cooper 1999). It is defined as "hypothetical archetypes of actual users" (Cooper 1999, p. 158). Even though they are unreal, they have to be determined thoroughly and precisely. Cooper (1999) posits that designing a product for general users is problematic. Instead, designing for a single person has to be used while designing a product. In short, "the more specific we make our personas, the more effective they are as design tools" (Cooper 1999, p.163).

Personas are not only powerful tools for assisting designer to better understand the needs of the users, but they also make designers not to design selfishly and enhance communication between design and marketing processes.

Considering methods in creating persona, "photographs and considerable supporting information is provided for each of a handful of Personas used in a project." (Pruitt and Grudin, 2003, p.313). Likewise, Long (2009) suggests to use photographs instead of sketches and illustrated storyboards and scenarios. Another important issue in creating persona is to give the persona a name. According to Cooper (1999), a persona without a name is useless since a nameless persona will never be a concrete individual in anyone's mind. Moreover, Cooper (1999) gives clues on developing personas and making them more realistic by proposing:

To make each persona more real to everyone involved in the product creation, I like to put faces to the names and give each persona an image. I usually purchase, for a small fee, faces from stock photo libraries on the Web. Occasionally, I've used sketched caricatures. You can cut them out of magazines if you want. (p. 163).

Finally, as a design tool, "it is more important that a persona be precise than accurate" (Cooper 1999, p. 166). In other words, it is more crucial to describe the persona in a detailed way than in a correct way. According to Goodwin (2002), personas are depended mainly on ethnographic user data, where focusing on what users do is used rather than asking users what they want.

Goodwin (2008) suggests some keys as guidelines to enhance personas in his article titled "Perfecting your Personas":

1. A good persona description is not a list of tasks or duties; it's a narrative that describes the flow of someone's day, as well as their skills, attitudes, environment, and goals.
2. You should have only the minimum number of personas required to illustrate key goals and behavior patterns.
3. Your marketing and sales targets may not be your design targets
4. ... it's easy to focus too much on a persona's biography. Personal details can be the fun part, but if there are too many of them they just get in the way. To avoid this problem, focus first on the workflow and behavior patterns, goals, environment, and attitudes of the persona—the information that's critical for design—without adding any personality.
5. Each persona should have three or four important goals that help focus the design.
6. Personas must be specific to the design problem

The use of persona does not mean eliminating scenarios or any other methods related to product development. Instead, it is a basis on which to generate scenarios and data collection (Grudin and Pruitt 2002).

As opposed to the idea of using persona, Portigal (2008) asserts that the use of persona is dehumanizing. The personas he defines have senseless names, unrealistic photographs from photography sites, and characteristics based more on the product and sales goals of the development team than the reality of real users' lives. Therefore, according to him, the use of persona is artificial and superficial.

All these characteristics that determine the creation and life-cycle of persona have great parallels with the quality of the data presented in Facebook profiles. These can be summarized as:

- Both have a certain name
- Both show a “flow of someone's day, as well as their skills, attitudes, environment, and goals” (Goodwin 2008).
- It is easy to focus too much on a persona's biography. Personal details can be the fun part, but if there are too many of them they just get in the way. To avoid this problem, focus first on the workflow and behavior patterns, goals, environment, and attitudes of the persona—the information that's critical for design—without adding any personality (Goodwin 2008).

So all these kinds of biographical, demographical, personal, social and behavioral data needed for developing a persona are readily visible and readable in Facebook profiles. This reveals an easy-to-reach kind of information; however a deep-dive critical analysis of the profile is crucial to make decision on what kind of information, or -more correctly- “clues” extracted from the profile to be useful in design ideation, also to generalize the specific data peculiar to one person to represent a social group.

So, this is an initial examination or implementation of a process where the outcomes of the analysis of the Facebook profile connected to the creation of persona as a source for design, in the context of design education and design research.

## **An Exercise from design education**

Considerations on the potentials of developing a persona to use in design process connected to the profile information in Facebook resulted in an experimental project based on user research conducted in 2012 Summer School Project Studio in the Department of Industrial Product Design at Istanbul Technical University (ITU), Turkey.<sup>1</sup>

### *Description of the process*

The process of the project has 3 major phases; creating persona from Facebook profile, developing mood boards and role playing. After the implementation of the project, students fill out the course assessment form to get their opinions about the project. They are required to assess the project research phase by stating which part they like most, which part is the most beneficial for their education and the most boring (see Appendix 2).

#### **CREATING PERSONA FROM FACEBOOK**

The process starts with developing persona from an open Facebook profile especially, to meet the ethical standards for the research. Students are expected to fill

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<sup>1</sup> The authors of this paper are also the tutors in the project.



persona form (see Appendix 1), depending on the written and visual data on the profile.

In the first section of the persona form, students are required to get information from a Facebook profile by focusing on its demographics (name, age, gender, nationality), descriptive attributes, mottos, likes, dislikes, hates, beliefs, activities, work attitudes, holiday attitudes, socializations and favourite objects etc. They are expected to propose some keywords and concepts to describe the persona after learning from the Facebook profile.

In the second section, students are required to prepare a fictional shopping list for the persona to specify and direct the research into design choices, also as an exercise to generalize the specific person as a part of a social group. This is a session of brain storming about the syntax of the objects he/she uses to start building up the persona. They have to suggest different products/services that will fit the persona's preferences and include product category, price, brand, technical specifications, source and photographs. They also explain why they choose this product for the persona. This is a process where the persona development is started, rather than just reporting what the Facebook profile contains.

Most of the students enjoyed choosing products for their personas. This made them to think on behalf of somebody else, have empathy and compose a conceptual product range for their personas. Their comments on preparing shopping list part support this:

"Shopping list is the most enjoyable part. It is really interesting experience to decide on behalf of different person."(D. Bektaş)

"When I was choosing products for my persona, I considered my persona's potential necessities, similar products that she owns at her home and the brands that she has liked on Facebook."(M. Alioğlu)

"I really enjoyed when I was preparing shopping list. Since my persona's budget was available, it was not difficult to shop for her. I felt like she was real."(Ö. Kenar)

#### DEVELOPING MOOD BOARDS

Mood board serves as "a powerful tool to communicate users' emotions, experiences, aspirations, and perceptions to designers" (McDonagh et al. 2002, p.236). Moreover, it makes designers to "communicate" and "express" themselves without being limited to words (McDonagh et al. 2002, p.236). In the light of these, by depending on the keywords that students generate during the first part, they are required to develop mood boards to summarize, visualize and abstract the data to specify and differentiate their personas.

It seems challenging for students to generate mood boards since an abstraction of data from Facebook profile is needed. However, most of them think that this part is beneficial in their process. Moreover, Garner and McDonagh-Philp (2001) state that mood boards are especially beneficial for students since their skills are in development phase. Similarly, most of the students agree with the benefits of this phase:

"This part was most beneficial. I think this part includes many details about all the process." (A. Varlık)

"Developing mood boards was very useful because there is a necessity for feeling the mood from a visual."(B. Akın)

"Mood board helped me to understand persona and facilitates to choose products for shopping list."(G. Altınçekiç)

However, the general standard of the mood boards was not so successful because the collage of the images was mostly the compilation of the images in the Facebook profile, rather than a brand new composition to further the analysis. It worked as a tool for summarizing the whole data collected, rather than as a helpful tool for analysis (Figure 1).

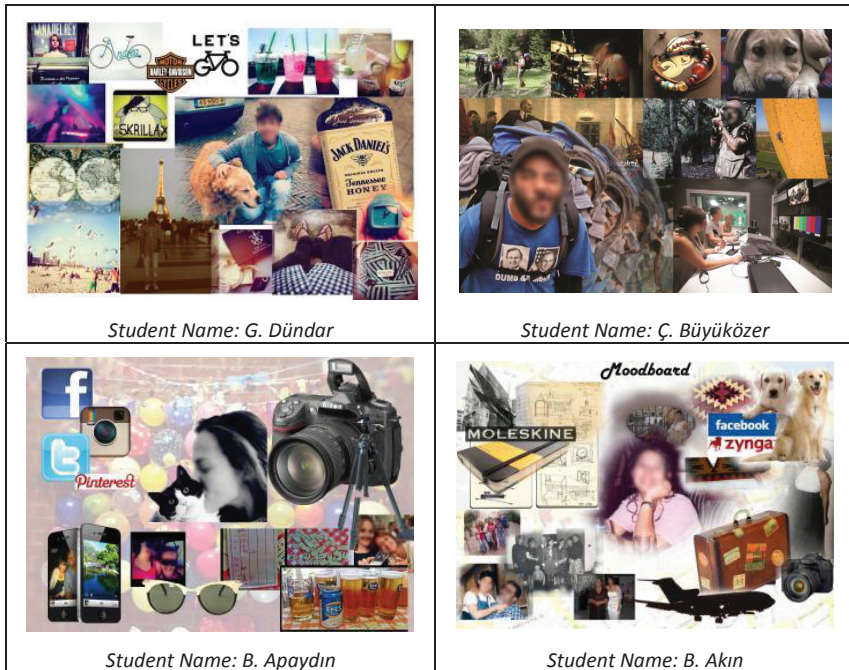


Figure 1. Examples from mood boards – faces in the mood boards are blurred by the authors

#### DEVELOPING SCENARIOS AND ROLE PLAYING

To establish more empathy with the personas and to understand them thoroughly, students are expected to develop scenarios and role play according to their personas. For this part, they worked in pairs, create scenarios together and acted as if they were in their personas' place. They played a short performance together with their partners.

According to Carroll (1999), scenarios are stories, which have a setting, agents or actors and a plot or sequence of actions and events. Likewise, scenarios, which are stories about the personas using the future product or service, highlight additional needs. In the language of product development, these needs are expressed as requirements (Goodwin, 2009).

Scenarios can foster reflection during design process, they are tangible but changeable. They can be examined from multiple perspectives, abstracted and classified (Carroll, 1999).

For this part, it was apparently observed that students enjoyed while they were role playing according to their personas. For instance, one of the students expressed that "I liked the role playing part most, because it makes me think and act as the persona" (B. Akin). Moreover, spontaneity of this part increased the motivation of the students for the following parts of the project. In other words, they tried to act like their persona

and play with the persona they have while interacting with the other persona chosen randomly by the tutors.

It was also observed that this part was a positive crack for most of the students who could not integrate and involved into the project. As they associated themselves with the persona, they felt more eager to go on designing for the persona they developed. It was also a process that tutors and students turned back, referenced and acted to personas again and again in the following discussions and critiques (Figure 2).



Figure 2. Stills from the role playing

In Figure 3, last stills from the role playing videos are seen to show how students had fun and then motivated from this part of the process.



Figure 3. Last stills from the role playing videos

### Outcomes

Even if this study seeks to focus on the method rather than the outcomes, some examples from the design ideations are presented in order to draw attention to advantageous parts and some drawbacks of the project, from the perspective of design.

First of all, almost all of the students had problems in design phase since they had difficulties to make analysis and reach derivations from their research outcomes to the end product. They preferred to use explicit design cues in their products, which made the end products immature and not refined. One of the reasons for this also was the limited time left for the ideation and finalization compared to the time for the research and analysis in the time plan.

For instance, one of the students (A. Varlık) used references from his persona's daily life and hobbies. Especially in this case, there was a significant gap between the student and his persona in terms of gender, age, socio-cultural situation and preferences. (The persona was a middle aged woman married with a prosperous husband with two children). Therefore, in the beginning of the project, he had difficulty in establishing empathy with the persona. Throughout the process, he managed to understand his persona thoroughly and reflected this to the product (Figure 4). He developed a pencil and brush box for his persona who is an amateur painter and likes ornamented, floral decoration.

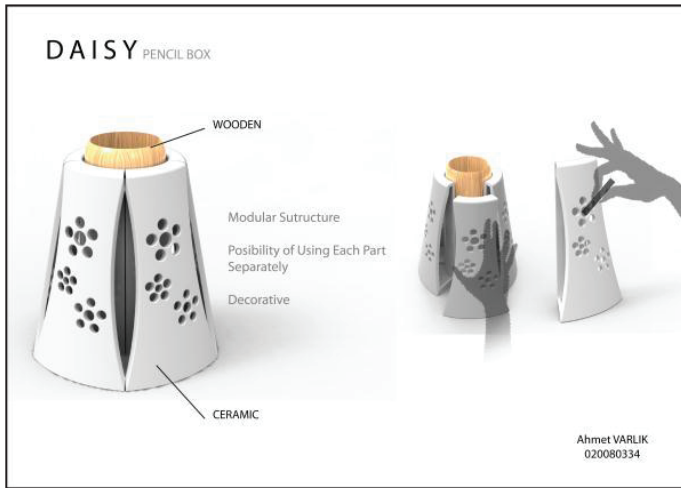


Figure 4. A. Varlık's project – Pencil box

In another project, H. Şişman combined different information that she got from her persona. She used direct references of the character *Sponge Bob* –which her persona likes to use its products- in a functional way. Hence, the hollow parts in the product referring to the material and pattern of the character were used as storing units and the product used as a space separator. Together with the functional benefits, this product had a cosy style which the student thinks that it matched with the persona's lifestyle (Figure 5).

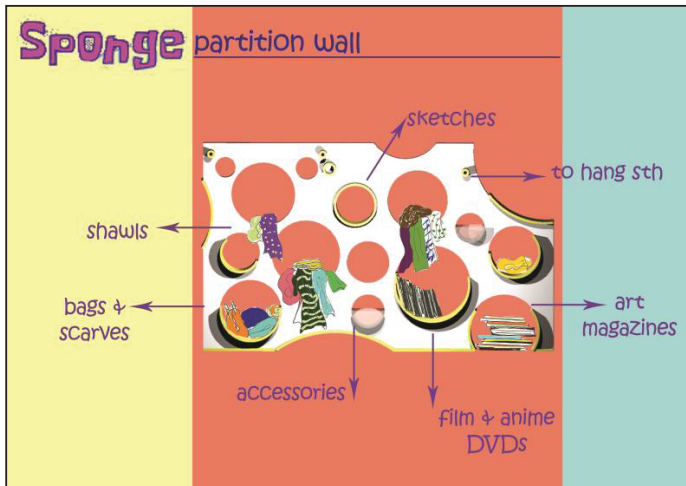


Figure 5. H. Şişman's project – Partition wall

The last project is an example for using direct visual references about the persona. G. Altınkeçiç developed a shelf for her persona by a direct resemblance to a soccer ball in her modules, because her persona was a big fan of soccer. It was somewhat similar



to Sponge Bob project, but with less reference to the life style, rather only on the shape itself (Figure 6).

However, it was a one further step forward from another project stick to the use of bright colors just for her persona likes this. This kind of approach shows a rather shallow interpretation of the data, since it does not regard the persona as a holistic figure just by picking one aspect of the whole character.



*Figure 6. G. Altınçekiç's project – Shelf*

This process can be regarded as a contribution to the design education in terms of generating specific and unique solutions for an intended user group. By the help of the unique process of the project, students could develop specifically designed products.

Whether or not there is a perfect match between the persona created and the product developed for that persona, the process was a good test of the combination of new methods. Also, the result of the product ideations was so original that, students state it was not possible to develop such concepts and products in another process.

The effect of drama, among other methods, was so clear and had a great impact on expression of the students as a person and as a designer. It was again seen that, interactive approaches are the best solution to warm up the hard processes.

## **Conclusion and Discussion**

In summary, in this project there were three main phases that was examined in previous sections; creating persona from Facebook profiles, developing mood boards and role playing. Facebook was used for data gathering that is necessary for creating personas. In the process of analysis, mood boards were prepared to abstract and generalize the data and share them with the class. Role playing was the final part where students acted like their personas and had a close association with them.

In the classical process of creating personas, conventional techniques are mostly used; interviews, surveys and other methods taken from ethnography. The use of the

data gained and analysed from Facebook, seems to be an original and fruitful source for designers. Rather than trying to find out data from the scratch, Facebook is a ready-made source, however waiting to be analysed and made use of wisely. So the quality and the nature of the analysis become critical here, because the data gained and distilled should be suitable and well implemented both for the concept creation and ideation of a new product design.

This paper aims to explore the use of social network in the context of design education and design development in general. In this study, the research phase of the project was longer and more dominant; however, it is also possible to conduct a process with a more design focus, also with reflections from the persona him/herself.

The quotations from the students' reflections support the focus of the study as they learned more in terms of method rather than product development itself. One of the students states that:

"...It is both enjoyable and informative to get information from Facebook profile. Analyzing the photos, "likes", comments and "shares" makes me to develop ideas. Continuing with mood boards and developing personas teaches me new ways to get information."(Y. Avci)

The use of new media as a design research source was also interesting for the students. One of the students declares that:

"This project contributes to my educational improvement, in which I developed a persona that I did not know before by using an online source."(Ö. Kenar)

It is also observed that, using social network for research is exciting and easy to motivate for the students because it became almost natural to perform this kind of research for especially young people, as a daily habit because it is the basic form of interaction in social media.

***Acknowledgements:** Thanks to our students who took Summer School Project Studio 2012 and participated in this project. We would also like to thank to our student Suhendan Eroglu for recording role playing session voluntarily.*

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**Appendix 1.**

Summer School 2012 – Studio Class

Date:

Student Name:

Student ID:

Demographics (Name, Age, Gender, Nationality etc.):

Descriptive attributes:

Mottos:

Likes:

Dislikes/Hates:

Beliefs:

Activities:

How to spend a day:

Work attitudes:

Holiday attitudes:

Socializations:

Favorite objects:

Fanatisms:

Keywords:

**Selected Photographs from his/her Facebook profile**

<i>Description</i>	<i>Photograph</i>

**Shopping List**

<i>Product Description</i>	<i>Photographs of the Product</i>
Product Category: Price: Brand: Technical Specifications: Source: What makes you choose this product?	
Product Category: Price: Brand: Technical Specifications: Source: What makes you choose this product?	
Product Category: Price: Brand: Technical Specifications: Source: What makes you choose this product?	

## **Appendix 2.**

### **Course Assessment**

The first phase of this project consists of 5 parts:

1. Learning from Facebook profile
2. Determining keywords for your persona
3. Developing mood boards
4. Roleplaying
5. Preparing Shopping cart
6. Studio Critics

Considering the first phase of this project;

1. Which part do you like most? Why?

.....

2. Which part is the most beneficial for your education? Why?

.....

3. Which part is the most boring? Why?

....

4. Any suggestions for further parts?

....

# Materials Selection: from technical to emotional material properties

Marta GONZÁLEZ\* and Javier PEÑA

Elisava Escola Superior de Disseny i Enginyeria de Barcelona

**Abstract:** *Materials now have the ability to transform energy, to adapt to the environment and to mimic effects only previously possible for nature. They change their properties with external stimuli and provide different perceptions depending on environmental conditions. This dynamism then converts the materials into pure mechanism, pure machine, pure image and pure feeling. The relationship of the person who works with the material, engineers, designers, etc. is no longer so direct. This connection based on experience, on a physical and perceptive knowledge of the materials is today mainly abstract. This fact hinders material selection, as it focuses on the technical characteristics, missing their sensorial inherence. Considering this, a working methodology has been created combining the selection based on technical and sensorial properties. For the selection based on technical property, databases such as CES Selector, MatWeb, CAMPUS, etc. are used. While for the selection based on sensorial properties have been worked with Materfad, Materials Centre of Barcelona and its physical database that permits to know, touch and feel 4000 innovative materials samples. These have allowed the proposal of a convergence between both criteria and introducing the material selection in the beginning of the product design and development project and thus prevent the student from postponing the selection to the final phase.*

**Keywords:** *Materials Selection; Functional Materials; Sensorial Properties.*

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## Introduction

Today, the engineer/designer's relationship with the materials is no longer direct in most cases. Due to the large number of materials, the projectors' knowledge of them is generally abstract. There are a large number of materials databases that allow technical information to easily and quickly be obtained on them (Ramalhete, 2010). However, there is difficulty in interaction and direct experimentation. This makes selection difficult, as it is principally based on the technical characteristics and in many cases fails to take into account the inherent sensorial properties. Therefore students (later professionals) choose the material in the final stages of the product design and development process.

In recent decades, a new category of *functional* or *smart* materials has appeared. These are capable of transforming energy, of adapting to the environment, of changing their properties in the face of external stimuli. In addition to their passive function, these materials produce an active action like changing shape, colour, physical properties with rises in temperature, when an electric or magnetic field is applied or when the pressure is changed, etc. Some examples are shape memory materials, electro and magneto-active, photoactive and chromo-active materials (Peña, 2008). It is difficult to standardise the properties of these materials and the information the designer requires to select them and use them generally comes from experimentation, the reality of the project (Burman, 2000). This makes the selection process difficult and in many design projects, the use of functional materials does not go past the conceptual phase. Experimentation with functional materials has been performed, among others, to investigate their use in the active disassembly to aid recycling of consumer electronic products (Chiodo, 2002) or to examine the applicability of shape memory alloys in different kinds of actuators (Tammi, 2007).

In this work, we propose a singular combined teaching model from Elisava Escola Superior de Disseny i Enginyeria de Barcelona (Elisava, 2012) based on experimentation with the different structured databases to know the materials technical properties. At the same time, the sensorial properties and knowledge of the functional materials are worked on through Materfad, Materials Centre of Barcelona (matériO Barcelona) and its physical database of more than 4,000 materials (Peña, 2008), and by experimentation through laboratory practices with piezoelectric and shape memory materials (Materfad, 2012).

### *Digital tools for materials selection*

Today there are more than 160,000 materials available. Of these, most of those we use today were developed in the last hundred years (Ashby, 2007). There are different databases, but MatWeb (MatWeb, 2012) is the one that offers most information (principally physical, mechanical, thermal, optical and electrical properties) and the largest number of materials, approximately 74,000 (Ramalhete, 2010).

An important selection tool is the CES Selector software (Cambridge Engineering Selector) developed by Ashby along with Granta Design and Cambridge University (CES Selector, 2012). This database starts with the universe of materials, subdivides into families, classes and ends in the subclasses. It allows graphs to be made of the relationships between different properties, which facilitates the elimination of materials that fail to meet the necessary requirements. It gives us information on physical, thermal, electrical, optical, durability and environmental qualities and

applications of more than 3,700 materials. It also allows information to be gained on processing methods and suppliers. Other databases are CAMPUS (CAMPUS, 2012), which offers information on the plastics industry and has a database of more than 4,200 materials, and eFunda (eFunda, 2012), in which it is possible to simply look for information on composites, metals, polymers, glasses and natural materials. Material Explorer (Material Explorer, 2012) is software that suggests a different methodology for selecting materials, not based only on an objective search, but also on experimentation and inspiration. It allows properties to be sought by smell, hearing, touch and sight.

In 1998 Material ConneXion was founded (Material ConneXion, 2012), which is a materials consultancy and a library of innovative and sustainable materials. It is intended to help companies to innovate, to create new opportunities to optimise and develop product and to use their experience to guide towards more responsible environmental solutions.

In 2001, *matériO* was created in Paris (*matériO*, 2012). It is a network devoted to materials and new technologies. It offers a digital and physical library in which materials can be selected by their visual and sensorial characteristics and their probability of innovation. It is formed by a team of experts located in different European cities (Paris, Barcelona, Prague and Anvers).

### *Importance of sensorial and emotional properties*

A product's functionality is not the only factor that determines its consumption today, but there is increasing interest in the more intangible side of the product, such as its emotional properties (modern, feminine, sophisticated, etc.) (Karana, 2009). Between different alternative products made of different materials of similar technical properties, people may prefer one over another on the basis of the intangible characteristics of materials. The origin triggering a material's emotional properties are its technical and sensorial properties. One example is metals, which are cold and can connote precision as they seem lasting and robust. Designers can therefore use them to stress the high level of a product's engineering. The fundamental requirements of designers in the materials selection process has been established in the following order: sensorial properties (vision, touch, sound, smell and taste), intangible characteristics (emotions, associations, cultural meanings, etc.), technical properties (manufacturing processes, cost of production, etc.) and design notes (design limitations, joining, etc.) (Karana, 2008).

The existing sources for selecting materials provide useful information on the technical properties (physical, quantifiable). However, only some of them bear in mind the sensorial properties in combination with the technical, such as Material Explorer and Materfad (*matériO* Barcelona), for example. These properties are those which describe the interaction between the material and the user through the five senses.

The technical properties of a product's material must meet the functional requirements for a certain use and the sensorial properties must attract the user's senses, while reinforcing the materials' functional part. Therefore, designers are responsible for considering both types of properties in choosing the right material for each application. The frontier must disappear, the functional will be sensorial and the sensorial will be technical.

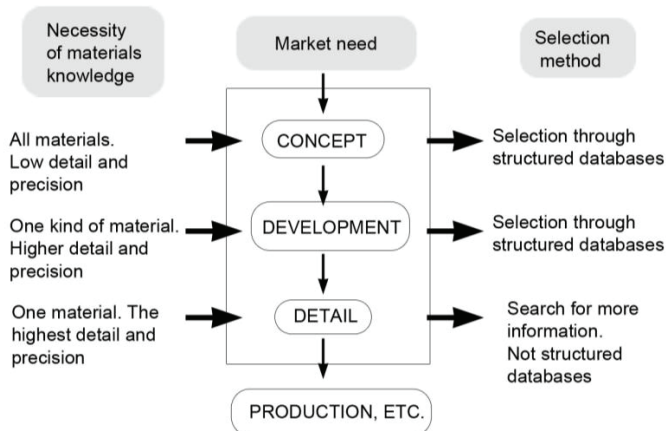
## Objectives

In this work, we suggest starting with certain functional qualities of some materials to cause inspiration and therefore new product conceptualisation. In a certain way, the intention is to focus the material selection process on the initial need posed in the concept of the product and inspired by these new materials. The objectives of this work are:

- To suggest a teaching methodology that allows students to confront product conceptualisation synergically with the properties of the new materials.
- To work on the skill of designing and selecting both functional and structural materials bearing in mind not only their technical but also their sensorial properties.
- To ensure that students achieve the necessary experience to be able to discern between types of materials based on the function they will have in the product.

## Methodology

Traditionally, the materials selection process is that presented in Figure 1.



**Figure 1.** Needs for materials selection in the design process.

It starts with a new idea or a market need and commence the conceptual design phase. In this phase, knowledge is necessary of existing materials, information which can be sought in the structured databases (technical sheets, specialised selection software, etc.). The following stage is the product development phase, in which it is needed knowledge of one type, a list of candidate materials. The information will once more be sought out in the structured databases. Then comes the detailed stage, which finishes with the preparation of the product specifications sheet. In this stage, it is necessary to know the information concerning a selected material as precisely as possible. To obtain

this greater information, the search is extended to the non-structured databases (webs and other information systems).

The teaching methodology has focused on three aspects:

- Digital tools for materials selection
- Physical tools for materials selection
- Experimentation with functional materials

The theory of materials has been explained and work has been done with the digital tools that students have within reach in selecting materials in product design. As a physical selection tool, a visit was paid to Materfad and here the functional materials were put into the context of the innovative materials. Finally, the students experimented in the university laboratory with functional materials (piezoelectric or shape memory) so that they might apply their characteristics to a real product. Work was done with second year students on the Industrial Design Engineering Degree at Elisava. There follow the details of each of the aspects on which the proposed teaching methodology has focused.

### *Digital tools for materials selection*

The working methodology consisted of performing selection exercises of the most suitable material for a certain product. We therefore defined the objectives, requirements and properties that the ideal material must have. The exercises were resolved by requirement weighting tables and/or by selection index. The selection was based on graphs (material maps), also known as Ashby maps, in which the properties of the materials are related in pairs. As digital selection tools, work was mainly done with MatWeb, eFunda, CES Selector and Materfad. The selection was made based on the technical properties using the first three. The last one was used to work on the selection based on the sensorial and emotional properties.

### *Physical tools for materials selection*

The image of the material and the numerous references to some of its properties is not sufficient. There is an unmet need for the materials to be touched, felt, handled. This learning and experiencing of the sensorial and emotional properties was worked on in a visit to Materfad (Materfad, 2012). On the visit, the skill of the need to design for the senses was transmitted. Students did not simply look at a technical sheet or a photograph, but were rather able to experience the value of having a physical sample, feeling its weight, its texture, its temperature, hearing how it sounds, etc.

Students were able to feel the pleasant touch of polyurethane gel and experience the impact resistance of the material used in comfort applications (Figure 2a). They smelt the polymers with fragrance which contain additives that provide them with different smells (Figure 2b), which might be used, for example, in smell marketing (smell associated with a brand, packaging, etc.). They also saw the importance of smell in fabrics with aroma microcapsules. They experienced the extraordinary lightness of aerogel, which contains approximately 98% air, and its feel and high transparency, as it has a refraction index very close to that of the air, so it does not distort the images that we can see through it (Figure 2c).



Figure 2. Experimentation with the sensorial properties of materials at Materfad, Materials Centre of Barcelona. (a) Polyurethane gel (touch properties), (b) Fabric with aroma microcapsules (smell properties) and (c) Aerogel (visual properties). Photos courtesy of Materfad.

### Experimentation with functional materials

Experimentation with functional materials was done with Materfad and through laboratory practice. In Materfad the students worked with materials with shape memory properties, which are deformed at a certain temperature, and when we heat them beyond a characteristic temperature, they recover their shape. The students saw samples of their applications in implantology in a cranial seal and muscular wires used as actuators in the car industry. They were shown photoluminescent gresite, which is used as an indicator on emergency exits, or in the floor of swimming pools, which charge up throughout the day and light at night (Figure 3a). They were shown thermal colour pigment applications, pigments composed of microcapsules in which the colour changes reversibly or irreversibly with temperature (Figure 3b). They were able to see the flexibility of a sheet of light emission organic diode (Figure 3c), whose potential applications include folding and roll-up screens.

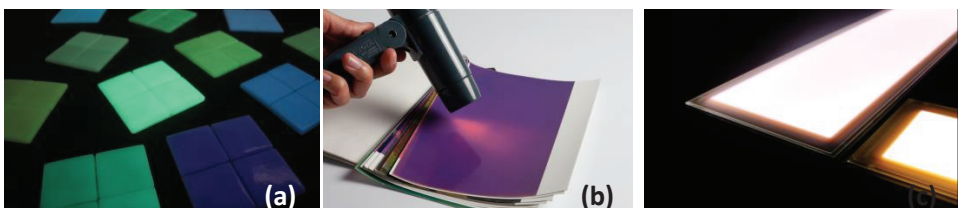


Figure 3. Experimentation with functional materials at Materfad, Materials Centre of Barcelona. (a) Photoluminescent gresite, (b) Thermo colour pigment and (c) OLED. Photos courtesy of Materfad.

In order to complete the experimentation with functional materials, laboratory practice was done with piezoelectric materials and materials with shape memory. Work was done by welding an LED to a commercial piezoelectric ceramic disc 20mm in diameter and between 3 and 30V of alternating working voltage (Figure 4a) and it was observed that when a mechanical pressure is applied to the piezoelectric part, an electric potential difference is generated, which is capable of lighting up the LED (Figure 4b and 4c). The advantage of producing electric energy from piezoelectric discs is that it is an alternative, renewable energy source which allows pupils to acquire sensitivity to environmental needs.



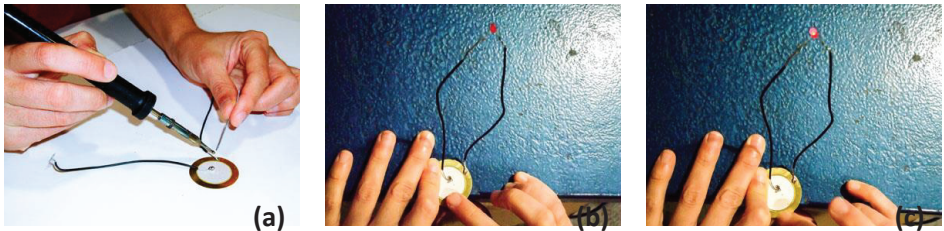


Figure 4. (a)Welding the LED to the piezoelectric material, (b) Mechanical deformation of the piezoelectric part and(c) LED lit.

In experimenting with shape memory materials, work was done with springs, muscular thread, sheet and nickel-titanium and martensitic wire. The main characteristics of the springs is that they can deform up to 30% and recover their initial shape when they are heated above a characteristic temperature of the material. The muscular thread has 3-5% of recoverable deformation. In both cases, the material does not only recover its shape, but, having recovered it, is capable of doing a job.

The wire and the martensitic sheet remember the shape that they have been given. Figure 5 illustrates the process used to give the martensitic wire the shape of a flower. First of all, the model was built with conventional steel wire. Then the martensitic wire was placed following the shape and was fixed by rolling it with the conventional wire (Figure 5a). Finally, it was placed in an oven at 500°C for 3 minutes (Figure 5b) and was tempered in water at ambient temperature (Figure 5c). When the wire is stretched, and the ends are connected to a power source, it is heated (Ohm's law) and recovers the shape into which it was moulded.



Figure 5. Experimentation with materials with shape memory. (a) Construction of the model, (b) Heat treatment and (c) Tempering.

## Results

A reaction of surprise can be beneficial both for the designer and for the user. The benefit for the designer is that they can draw attention to the product (Derbaix, 2003). The benefit for the user is to be able to interact with it and to learn something new. The functional or smart materials are used very little in ordinary day-to-day products, though they have the capacity to surprise. This is because they have new, unknown characteristics, because they favour user-product interaction and cause new visual and/or tactile sensorial experiences. Their implementation may be a strategy to distinguish products on the markets (Hekkert, 2003, Lindgreen, 2003, Ludden, 2003). Another of the advantages in the use of functional materials is that the number of mechanical components in the actuators using these materials is considerably lower

than the number of mechanical components of conventional electromechanical actuators (Burman, 2000).

The results of the products proposed by the students were presented in the form of a model, and five of them are shown below. Three of the products use piezoelectric materials: a tile generating electricity, a wind generator and a box with a security code. The other two use shape memory materials: car with smart ailerons and a toy dog that walks.

#### A. THE TILE

The tile for energy-generating floors consists of a square platform containing a layer of piezoelectric materials connected in series to a battery. The battery stores the power produced when these materials are subject to a mechanical force, which in this case will be the weight of the person (Figure 6). It is connected to an LED lighting system so that when the switch is turned on, the stored energy passes to the light emitting diodes and lights them. The students have learnt the relationship between the electrical and mechanical properties of these materials, and also the need to interact with the material so that it performs the function of generating electrical energy. Once more in this example, we see the need to experience, feel and touch the materials, and especially the functional or smart materials, to see how they transform the energy and react to cause a visual change, which might be powering an LED lighting system.

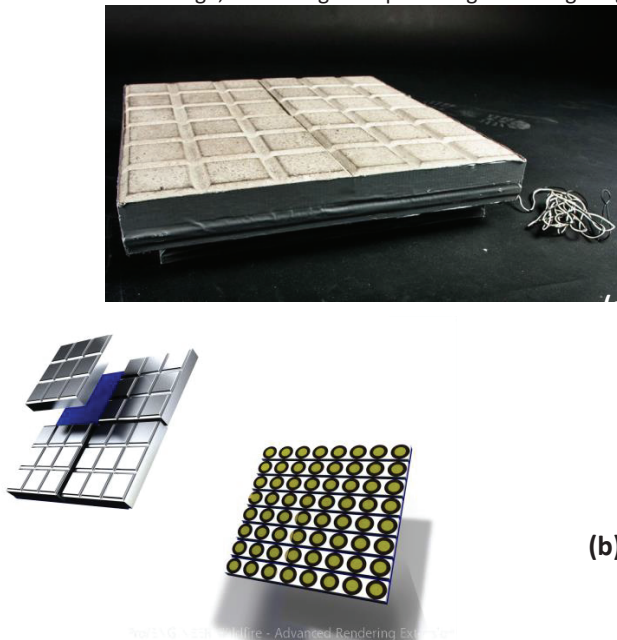


Figure 6. (a) Tile for energy generating floors and (b) Diagram of the layout of the piezoelectric disks inside.

#### B. THE WIND GENERATOR

The wind generator (Figure 7) generates wind energy from the movement caused by the wind when it interacts with the blades. It has piezoelectric ceramic disks connected

in series to a condenser. When the wind blows, the blades of the windmill turn and deform the piezoelectric materials, which turn the mechanical energy into electricity. This energy is stored in the condenser, and a switch is turned on to light up several LEDs whenever required. The students experimented with the mechanical and electrical properties of these materials and made estimates of the energy produced by the wind generator. The wind generator may be used, for example, in isolated houses in rural areas.

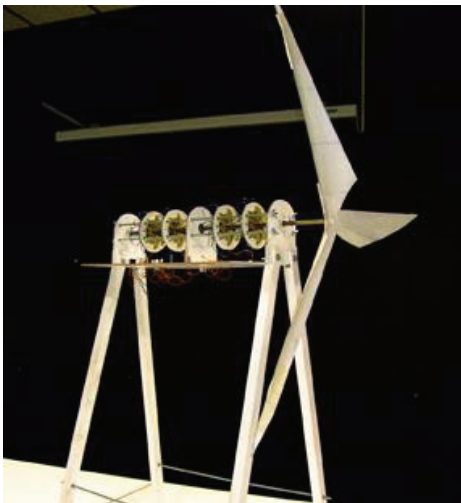
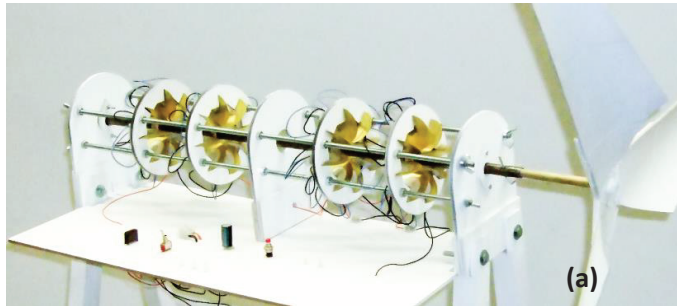


Figure 7. (a) View of the wind generator with piezoelectric materials and (b) View of the unit.

### C. THE SECRET BOX

The box with a security code is activated by a tapped-in code (Figure 8). It has a piezoelectric disk that acts as a tapping sensor and is connected to an Arduino plate. Arduino is a free electronics platform based on easy-to-use software, created for artists and designers to be able to build interactive objects. The plate is programmed for the box to open when the sensor is tapped with the pulsations code that has been programmed as correct. When this happens, a green LED lights up and the box opens, whereas when it is incorrect another red light comes on. The piezoelectric material becomes a mechanism, a machine, for a mechanical stimulus applied by the user on the

material becomes an electrical stimulus, and then a visual and mechanical stimulus to open the box.

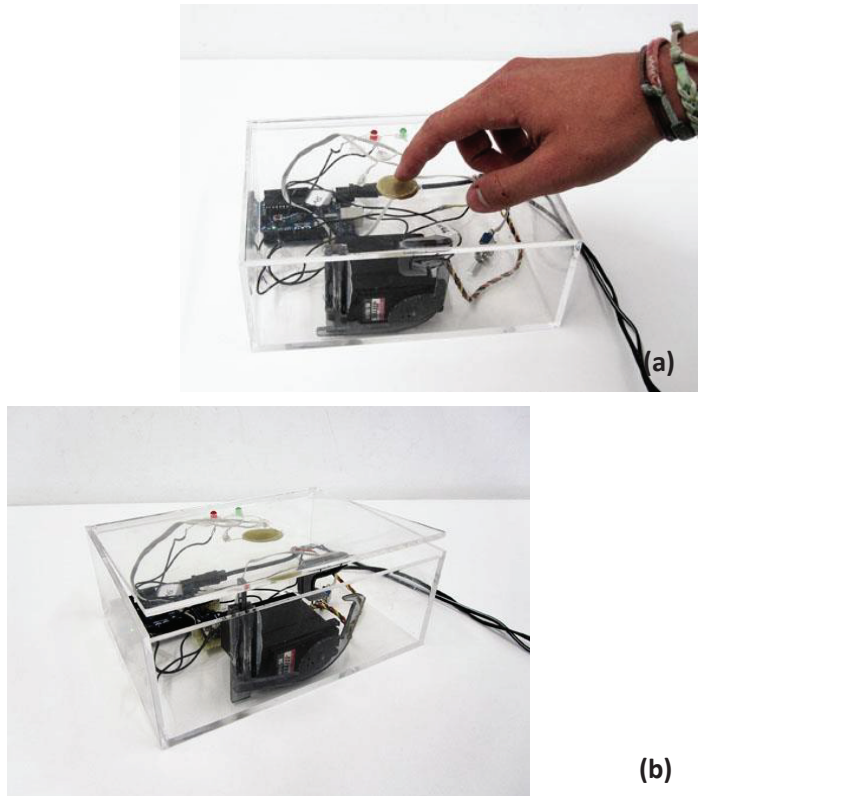


Figure 8. (a) Entering the security code to open the box by tapping the piezoelectric sensor, and (b) Opening of the box.

#### D. THE CAR

The ailerons allow the car to take bends at high speeds, but brake the vehicle in the straights, due to the aerodynamic resistance they provide. The ideal thing is that they should do the work in the bends but should not be there on the straights. This can be achieved with moving ailerons. The vehicle's front and rear ailerons shown in the model in Figure 9 achieve the required movement thanks to a shape memory sheet which opens when the current passes through it. This movement contributes to the vehicle's aerodynamic efficiency. In this case, it is also essential to know the technical properties of the material, to experiment with it to know its reaction speed, the voltage needed to activate it, the weight it is capable of moving, etc. By experimenting with the material, students feel the emotional surprise when they see how the material changes its visual properties (its shape) and its tactile properties (the material heats up when a current is passed through it). The material becomes a machine once more, a device generating a job.

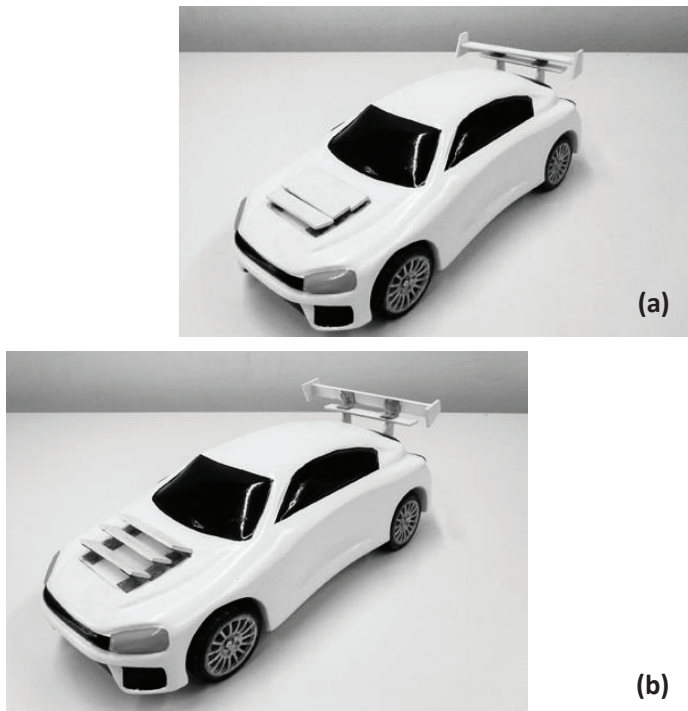


Figure 9. (a) Car with smart aileron activated by material with shape memory sheet before and (b) after activation.

#### E. THE TOY

The toy shown in Figure 10 is a dog that walks activated by Nitinol muscular threads. These threads have the capacity to stretch by 3-5% and to recover their initial shape when the current is passed through them. The toy's movement is activated with a glove that has metal plates at the end of the fingers. When the forefinger touches with the thumb, the current is passed and the left thread is activated, and when the thumb and middle finger touch, the right thread is activated. Students have calculated the electrical consumption and have determined that the most suitable battery for the product is a 4.5V. In this example, the material expresses the meaning of “toy”, for it acts as a machine, as a device, once more transmitting excitement and surprise.

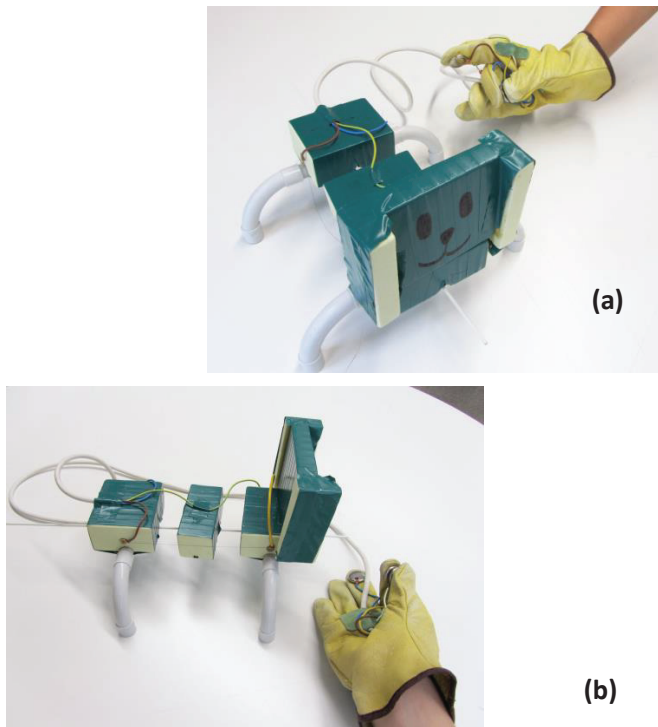


Figure 10. Toy dog walking activated by muscular thread. (a) Front view and (b) side view.

## Conclusions

A teaching method has been proposed that belongs and is singular to Elisava, which has allowed students to conceptualise and develop a product from the functionality of a new material. Students have been able to physically see new functional and structural materials and have been able to work directly in the laboratory with the functional (piezoelectric and shape memory).

Using this proposed working methodology, students have achieved the necessary experience to be able to use them in their design projects.

This direct experimentation along with the digital tools for selecting materials has allowed students to acquire the skill of designing and selecting materials bearing in mind the technical, sensorial and emotional properties of the materials, and to treat both property topologies synergically in the development of the design project and the product development. To apply this model to other institutions it is recommended to experiment directly with samples or to try to create a materials library to touch and feel materials, to consider both the technical and sensorial properties in the selection process.

Finally, students have been given a methodology to enable them to use their knowledge of materials to suggest new product concepts.

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## Adapting the Front-end of Innovation to its context: a methodological approach.

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**Abstract:** *The Front-end of Innovation (FEI) is the innovation process phase where new products are defined prior to development. The outcome of this process is of great importance for the innovation and design phases that come after the FEI (Backman et al., 2008). The FEI is a lightweight process with a huge impact on the New Product Development (NPD) process that follows the FEI. Still, the FEI is considered a difficult to manage process, both in industry and academia.*

*Although FEI is mainly considered a strategic process, it could benefit from a more design driven approach where divergent thinking is implemented on different levels throughout the innovation process. The results of this research provide more clarity on the concept of exploration and exploitation in the FEI and point at possible improvements in the approach of the FEI, starting from a model where abstraction levels are clearly defined and possible sub-phases can guide the approach to search field generation and idea generation. That way, the early phases can be approached as a creative activity where both divergent and convergent thinking are involved, and where the process can be adapted to the specific context.*

**Keywords:** *Front-end of Innovation, design methodology, exploration and exploitation.*

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## **Introduction**

Whether you look at innovation from the perspective of innovation management, design management or product development, the importance of innovation can never be underestimated. Innovation is a key capability and in order to obtain a long-term competitive advantage for the firm, the successful deployment of this capability is essential.

The innovation process, in general, can be divided in three major activity domains: The Front-end of Innovation (FEI) where future products or services are defined prior to development, the New Product Development (NPD) phase, where the products are actually being developed and the product launch phase, that focuses on bringing the newly developed products or services to the market (Koen et al., 2001). Firm activities largely depend on the success of the innovation activities in the FEI. Prior research has pointed at the importance of the early stages of the innovation process (Gupta & Wilemon, 1990; Smith & Reinertsen, 1992; Cooper, 1994; Murphy & Kumar, 1997; Khurana & Rosenthal, 1998; Reid & de Brentani, 2004; Langerak, Hultink & Robben, 2004). The outcome of this process is of great importance on the innovation phases that come after the FEI. Different scholars argue that the FEI holds many opportunities for improvement (Backman et al., 2007; Cooper & Edgett, 2008; Verworn, 2009).

Different interesting studies have proposed models for the FEI (Koen, 2002; Sandmeier et al., 2004, Buijs & Valkenburg, 2005). These models propose sets of activities that would guide the FEI process and support the innovation capability of the firm. Some of the early activities have a strategic component, such as the definition of the strategic positioning of the firm and the definition of search fields (Buijs & Valkenburg, 2005; Buijs 2012). Other activities can be considered to be more on an operational level as they are executed by staff of the development team: product idea generation, product definition, ...

From a design point of view, FEI's main deliverable is the design brief that would guide and inspire the design phases during the development cycle. Poor FEI processes lead to poor design briefs. Approaching the FEI as a strategic design process, with early divergent and convergent thinking opens possibilities for improvement.

## **Exploration and exploitation**

It is certain that the radicalness or the newness of an innovation pursued, influences the way FEI processes are organized. There are different ways, however, to interpret this aspect of newness.

Wheelwright & Clark (1992) define derivative projects, platform projects and breakthrough projects. The two dimensions used in their model are the product newness as such and the degree of change in the manufacturing process. The more these two dimensions are renewed the more breakthrough the new product development process can be considered.

Garcia and Calantone (2002) provide us with an overview of the literature on this matter. They make important distinctions. First of all, if innovativeness of a product is the subject, the perspective from which to look at newness is important. A product can be new from the perspective of the entire world, the customer as such, the industry the firm is operating in, the company itself.

The degree of discontinuity on market or technological level is an important measure for innovativeness (Garcia & Calantone, 2002). Discontinuous change on the

firm's level means that existing resources and competences are no longer usable. These existing resources could be process facilities, technology, but also tacit knowledge.

Nevertheless, defining the innovative level of a product can have different outcomes according to the typology used. The typology of Abernathy & Clark or the typology of Kleinschmidt & Cooper could label an innovation differently.

Garcia & Calantone define an innovation typology in three major categories:

- Radical innovations are innovations that cause marketing and technological discontinuities on both a macro (the world, market, industry) and micro level (the firm, the customer).
- Incremental innovations occur at a micro level and cause a discontinuity in one of the domains: either technological or market.
- Really new innovations are in between the two extreme. They combine several possibilities of discontinuity on the dimensions of market and technology, and on the two different levels: macro level and micro level.

The resource-based view on innovation makes a difference between exploration and exploitation as two approaches to the innovation process. Innovation based on the existing competences is regarded as exploitation. In pure exploitation, companies use both existing technological and customer competences (Daneels, 2002). Exploration requires the building of new competences in both or either one of the fields.

It remains unclear how the radical/incremental paradigm and the exploitation/exploration paradigm are related one to another. In the existing models on FEI (Murphy & Kumar, 1997; Khurana & Rosenthal, 1998; Koen et al., 2001; Sandmeier et al., 2006) no distinction is made between an approach to radical or incremental innovation, or to an exploring or exploiting approach. Li, Vanhaverbeke & Schoenmakers (2008) point at the fact that it remains unclear whether exploratory or exploitative search processes lead to radical or incremental innovative outcomes.

This observations leads to the conclusion that the existing FEI process models should be better defined in function of the different innovation trajectories or that the existing models are not adequate enough to this major difference in the innovation approach. If FEI is considered a difficult process for practitioners, the need may exist to provide activity models that fit the specific innovation need. Moreover, adapted process models could provide more clarity on how to proceed through the FEI.

## **A three-phase model for the FEI.**

In order to guide the research process and to be able to compare different front-end processes in different cases, a framework was composed that uses objective criteria to define whether or not an activity makes part of one of the specific clusters of activities. The framework is based on the different prescriptive models from literature (Buijs & Valkenburg, 2005; Sandmeier et al., 2004) and brings the FEI activities together in three major clusters:

- Search field generation & opportunity scouting
- Idea generation
- Project & product definition.

Each cluster of activities provides an output that can be regarded as the input to the next level. The level activities evolve from more abstract to more concrete statements about the product to be developed.

As such, the framework is based on the level of detail (or the abstraction level) one reaches on the way to defining a product. Values and needs are reflected in the first stage, key functions in the second stage, sub-functions and characteristics in the third stage. Materialization of the product is considered New Product Development (NPD). Although this framework shows many similarities with existing models for FEI, we preferred not to adopt an existing model, as they follow a more prescriptive and process-oriented approach. That would possibly interfere with our approach to define each sub-phase based on abstraction levels.

For practical reasons, we propose our framework in a linear and sequential way although we know that this is hardly the case in reality. Iteration and looped activities are more close to reality (Cooper, 2008; Buijs & Valkenburg, 2005).

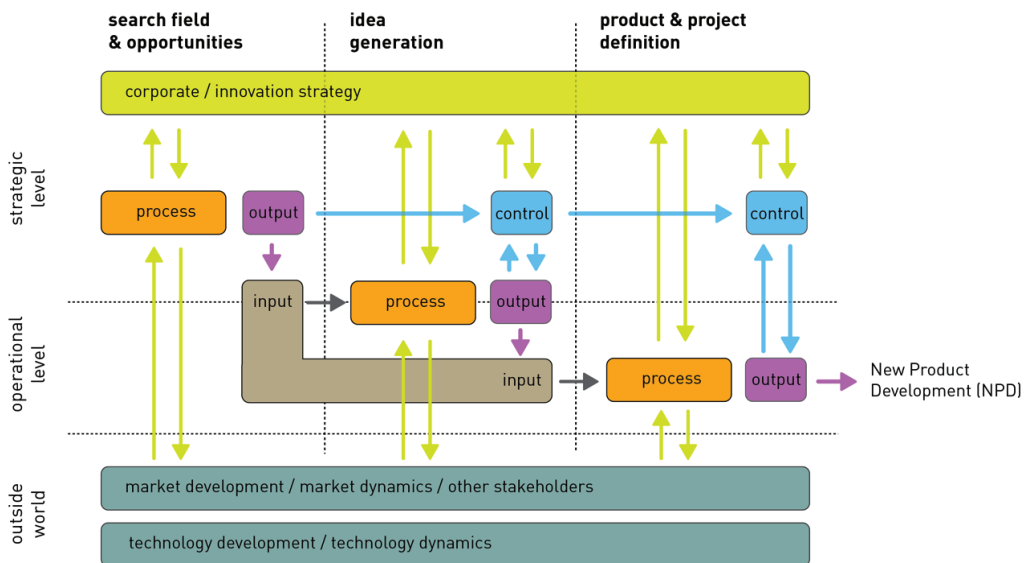


Figure 1. The FEI framework consisting of three distinct sub-phases

An activity belongs to the idea generation cluster when the outcome of the activity defines a new idea. That is, a new product idea, a new service idea or a new business idea. Ideas describe what a product or service actually will do. They describe mainly the function of this product or service that is to be developed.

We consider outcomes or activities belonging to the idea generating process when they have the purpose of bridging the three different relevant aspects of a new product: the function (what it actually should do) the technology (how it actually will be done) and the market (whom it is meant for).

That is consistent with Danneels (2002) who argues that new products are created by linking competences related to technologies and customers and de-linking

competences from current products. Re-linking of current competences to new products is a key aspect of new product development.

Hence, the basic product idea consists of a product function, a target market and a technology. One of these elements is supposed to be new in order to define a new product idea (Braet & Verhaert, 2007). Once those three elements are connected in some way in a new proposal, we consider this proposal a new product idea.

From a product point of view, this is the abstraction level of functions and high-level requirements.

Whenever defining activities or decisions lead to only one of those three elements, we consider the activity to be part of the search field generating or opportunity scouting activities. The definition of a new technology as a starting point for new innovation can be seen as being part of this first kind of activities. Defining a new market need, or scenario building for scouting future needs falls into this same activity range. Opportunity scouting activities lead to some kind of innovation domain in which the future ideas need to fit. From the product abstraction level point of view, this is the pre-function level. This is the level where needs or certain values are defined.

An activity belongs to the search field generation or opportunity scouting cluster when the outcome of the activity can be regarded as a predefined innovation field, consistent with the definition of Salomo, Talke and Strecker (2008): "an innovation field consists of multiple thematically related innovation projects". In their article they analyse innovation field orientation in terms of four elements: focus-area specification, resource commitment, organizational formality, and stimulation of synergies. The three latter can be seen as organizational elements. The first one is definitely connected with a front-end activity: it defines an area along certain specification criteria on which to concentrate its innovation activities.

In contrast with the idea generating phase where bridging between functions, markets and technologies is essential, the opportunity and search field generation phase typically focuses on only one of these aspects. Defining a technology to start from or a specific market need, or a specific functional area are the possible outcomes of such an initial phase.

Adding specific sub-functions and requirements (required characteristics) to a new product idea, brings the process a step further in the range of product defining activities. At this point, a full definition is being prepared in order to provide input and guidance to the upcoming New Product Development (NPD) process that comes after the FEI. Product and project defining activities lead to a full description of the future product (or service) and project.

At every level of this process, interaction with corporate or innovation strategy can be existent. The innovation or corporate strategy can provide input to the synthesis activities within each cluster or it can be addressed for feedback and control. The interaction, therefore, is bidirectional.

In the same way, process activities at every level may (and should) interface with the outside world, regarding market, technology and stakeholders of any kind. This includes also the interactions with customers and future users of the products and services.

The outside world, again, provides the basic and essential information to guide innovation and, on the other hand, to challenge any decision that has been made throughout the FEI. This could be through verification and simulation of any kind with the outside world.

Every outcome of a distinct phase of this framework could theoretically be considered to be a gate, and every gate could lead to go/no-go decisions based on the output produced at that level. The output at every sub-phase could be considered the input of the following sub-phase.

At every sub-phase, the output can be challenged against the strategic targets of the firm and all other relevant criteria as discussed earlier.

## Research approach

Starting from a literature research, the theoretical framework for the FEI was composed that would lead to an objective means for comparison between different FEI processes in the firms. The further research was built on a qualitative and a quantitative study and is to be considered as an explorative research.

In first instance 23 semi-structured interviews within 13 larger and small to medium enterprises (SMEs) in the Flemish region have been executed and analysed. The scope of this research phase was theory testing and the possible development of new theoretical concepts regarding the framework and methodological approaches in the FEI.

Firstly, it was essential to compare the occurring FEI processes in firm's cases against the framework of FEI. The framework is based on literature research and is therefore empirically grounded. However, the specific set-up of the rationale for this framework requires that cases should be challenged against this framework.

Secondly, our aim was to focus on the contextual parameters that influence the FEI process, such as the difference between exploration and exploitation and the different kinds of radicalness pursued in the innovation process. The approach through multiple case studies explored the FEI in function of these specific aspects with the intention to understand the actual problems that impede efficiency and effectiveness in the FEI.

**Table 1. Research units in the multiple case study**

(Fictive name)	Exploring Activities	Exploiting Activities	Firm scale	Interview with
Case 1: Bm	Yes	Yes	Large (>1000)	Chief product management, innovation manager
Case 2: Bc	Yes	Yes	Large (>1000)	Product manager, market director
Case 3: En	Yes	Yes	SME	CEO, innovation manager
Case 4: In	No	Yes	SME	CEO, R&D manager, chief designer
Case 5: Ag	Yes	Yes	Large (>1000)	Business development manager
Case 6: Re	Yes	No	Large (>1000)	Business development manager, Innovation manager
Case 7: Bo	No	Yes	SME	CEO, chief product development
Case 8: Pg	No	Yes	SME	CTO
Case 9: Ea	Yes	Yes	SME	CEO, innovation manager
Case 10: Al	Yes	No	Large (>1000)	Chief R&D, Innovation facilitator
Case 11: Pm	No	Yes	Large (>1000)	Product manager, Chief product development
Case 12: Ba	No	Yes	Large (>1000)	Innovation manager, product manager

In the quantitative part of the research, an Internet survey was sent out to 600 respondents of which 61 responses could qualify for analysis. In this larger sample, the preliminary conclusions of the first phase have been worked out in order to obtain validations. The nature of this research part is still explorative.

The survey questioned a set of independent variables regarding the specific innovation context, formalization, strategic guidance and strategic feedback in the FEI. These independent variables were analysed against a multi-dimensional set of dependent variables measuring performance in the FEI.

The questionnaire focused on following aspects:

- Relevance of the respondent and the firm
- The nature of the innovation process
- The degree of formalization and organization
- The output of the innovation process at every stage
- Personal perception of respondents
- FEI performance

The samples of the quantitative research were first analysed in a descriptive and comparative way, in order to explore the data with relevant information on the research question. Secondly, the data set has been analysed through visualizing the correlations between the independent and dependent variables. This approach provided an explorative indication as to how patterns would reveal themselves.

Conclusions are drawn from both the qualitative and quantitative study with regard to the research question. The collection and analysis of both qualitative and quantitative data is often referred to as a mixed method approach to research (Leech & Onwuegbuzie, 2009).

Although we use a mixed approach, we cannot describe the research approach as an integrated mixed method approach but rather a 'quasi mixed-method' approach as there is no real integration on the level of research or analysis (Greene, 2007). Both methods are used in a sequential way, and could be considered more as a method triangulation rather than a mixed methodology.

## Findings

### *The product definition process*

Although the research aimed at drawing conclusions on specific FEI themes, it was necessary to challenge the FEI framework against the real FEI context.

Both the qualitative study and the quantitative study reveal that the three-phase framework is only partially supported. The real product definition activities as from sub-phase 3 are the most formalized activities. Several of the cases organize their first formal milestone in that specific sub-phase. Although tacitly performed, opportunity scouting, search field generation and product idea generation activities are less formal organized. They are merely the responsibility of a specific team or individual. As a result, it remains often unclear how ideas are generated and how opportunities are scouted. Although the generation of product ideas is considered less problematic than

the process of evaluating new product ideas, there is a need to manage the early stages prior to product definition. Search field generation, opportunity scouting and idea generation are time consuming activities and they can't be managed unless they are visible to the organization.

The cases also reveal that the transition from a search field's milestone to product ideas is a difficult one. Differentiating between those two abstraction levels is difficult and requires deep-rooted knowledge regarding on product abstraction levels in product development. This knowledge is not available on every level of the firm.

### *Exploration and exploitation in the FEI*

#### MIXED CHANNELS AND PARALLEL STRUCTURES

The results reveal that in many cases no formal distinctions are made between exploration and exploitation activities. The innovation teams are both responsible for defining new products based on existing competences or starting from completely new competences.

An important observation is that in both approaches (exploration and exploitation), stakeholders often use the same terminology and refer to the same kinds of activities.

In some cases, the processes are strictly and distinctly organized with the intention for either exploration or exploitation. Especially in the larger firms, parallel structures exist to extract innovative exploration from the daily routines of the business units and to imply innovations that don't rely on existing competences. That could lead eventually to new business opportunities for completely new business units. This happens less formally as well. In one case, the firm (SME) is organized for innovation. The CEO of the firm takes the responsibility to start really new innovations on his own. He represents a parallel innovation circuit by his own.

Nevertheless, in both kinds of cases, whether or not the process has an explorative or exploitative nature, the practitioners mention opportunities, idea generation and product definition as activities throughout the FEI. No distinction is made.

In relationship with our FEI framework, the research does not reveal that innovations that have a more radical intention start the process at a different entrance point, that is, earlier in the process. The theoretical model could suggest that the more radical the more opportunity generating processes are implemented. That is not the case. Product idea generation and opportunity scouting are mentioned both in an exploration and an exploitation setting.

#### CONFUSION

Throughout the research we could observe that both kinds of activities interfere with each other. In some cases, both exploring and exploiting activities follow the same procedure. Opportunity generating activities and idea generating activities are being performed with the sole intention to do something new. In some cases, there is no strategy on the newness required for the innovations. That leads to a situation where ideas that have a more radical nature are compared to ideas that have a more incremental nature. Hence, the confusion that exists in the firms with regard to decision-making and comparison.

#### FORMALIZATION IN THE FEI

The third observation is that either way, opportunity generating activities and idea generating activities remain very informal. The first formal steps in an innovation process can be found most of the time on the actual product defining activities.



Building a business case or a specification list is often the first milestone in the FEI. This is the case for both exploring as exploitation innovation processes, although they are being performed on different product abstraction levels.

#### TOWARDS A TWO-DIRECTIONAL PROCESS MODEL

According to their specific needs, companies install routines in order to innovate with new products. These routines consist of procedures with different milestones or different formal meetings around new product ideas. On paper, these processes are well organized but through the case studies we found that inside those processes, a lot of confusion and fuzziness remains. This is mainly caused by mixing exploration and exploitation activities and assessing outcomes with different abstraction levels by the same criteria.

Trying to refine the FEI-models in function of exploration and exploitation could possibly yield some clarity in the way to proceed.

## Conclusions

As from the beginning of this research it became clear that exploration and exploitation activities have such a distinct nature that they can hardly be compared. Nevertheless, the existing literature revealed no distinct approaches for exploration and exploitation activities.

It could be explained by the fact that previous research starts from the premise that only exploration-based innovation would fit the FEI logic and that innovation based on adaptations and incremental enhancements is regarded rather as NPD than FEI. However, our research points at the fact that both in an exploration and an exploitation context, distinct FEI activities can be spotted. Hence, we concluded that both exploration and exploitation activities have an FEI component.

Alternatively, one could state that exploration activities cover a wider range of FEI activities than exploitation activities. From that perspective, exploration activities start with the search field generation and opportunity scouting activities, over idea generation activities to product definition activities. Exploitation activities, however, as they build on existing product/market combinations, enter the framework as of the product definition activities. These innovation activities start from existing product ideas (according to our definition) and mainly lead to new product attributes: new requirements, new specifications, new sub-functions, ...

Still, similarly as in the first perspective, the qualitative study reveals that even in the context of exploitation, respondents perceive new search fields, opportunities and product ideas as the input to new product definition processes. In a way, this means that there are inconsistencies in the use of definitions and there might be terminological confusions. A product idea from the perspective of exploration or exploitation doesn't necessarily mean the same thing. The first use of the word 'idea' refers to the integration of a new product function with a target market based on a specific technology, perhaps on base of a new business model. The latter use of the word 'idea' refers more to new sub-functions, features, specifications or architectures.

Nevertheless, even then, it might suggest that our framework is perhaps consistent with the proposed definitions, but hardly useful and relevant to the firm's reality.

We redefine the framework in function of the exploration/exploitation paradigm (Figure 2). This redefinition is important because our qualitative research reveals that

exploration and exploitation activities could be clearly separated as they follow a different logic and might generate confusion when integrated.

The vertical lines in figure 2 make a distinction based on the level of detail the statements reach in the process of product definition throughout the FEI (product abstraction levels). Opportunity scouting and idea generation in an exploitation context are mainly based on existing products. As a consequence, product ideas and opportunities in the exploitation context can be considered as ideas and opportunities regarding sub-functions, features, characteristics, requirements and specifications of existing product/market combinations.

Innovation search field generation, opportunity scouting and idea generation on the level of product functions can be considered more as exploration activities as they would not necessary result in innovation on existing product/market combinations. These activities could result in complete new product functions for new markets, based on new technologies.

However, there is a close interaction between exploration and exploitation. Activities that start with the intention to generate radical new innovations in an exploration context could eventually lead to incremental innovations and vice versa. Hence, the possible interactions in the framework diagram at every level between exploration and exploitation, between the horizontal and the vertical flow.

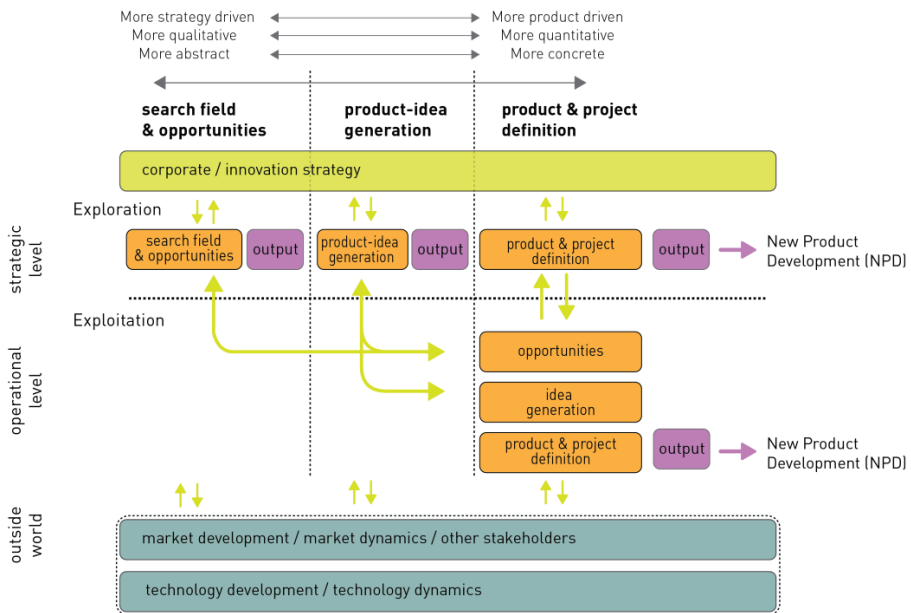


Figure 2. The FEI framework in function of the exploration/exploitation paradigm from the perspective of the abstraction levels of products.

What is the relevance of dividing the framework into two distinct approaches towards product definition? A framework is a framework. Its function is primarily to understand the rationale of the process in order to be able to refine prescriptive models for FEI. The adapted framework diagram suggests that depending of the nature of the innovation, a more abstract or concrete approach is required, the first being more strategy oriented and depending on more qualitative methods and tools. The

second being more products oriented and depending more on quantitative methods and tools. Exploration activities and exploitation activities are not necessarily separated activities using parallel channels as the case study revealed. However, confusion is a possible barrier to efficiency and effectiveness in the FEI. Even though it is not necessary to organize the activities in parallel channels, a good understanding of the differences in approach and the fact that exploration ideas cannot be compared with exploitation ideas is essential for an effective process. Treating both kinds of processes distinctly might even enrich the FEI as exploration and exploitation can both reinforce one another.

Regarding formalization, the adapted framework might provide the basic understanding to install different routines in the FEI. The ability to manage FEI processes and to assess outcomes at different sub-levels with dedicated criteria could add efficiency and effectiveness to the FEI process in general. In addition, through the installation of specific approaches for exploration and exploitation with more specific milestones, the process could benefit from a more creative approach. Every sub-phase holds the opportunity for divergent and convergent thinking if the outcome for that phase is well defined.

Managing innovation and designing new products sometimes are treated as two distinct activities. However, our research points to the fact that a better understanding of the FEI would bridge a gap between design and strategic management. Organizing the FEI according to a clear set of milestones provides the opportunity for a multidisciplinary approach, including the design specialist, to deliver state-of-the-art design briefs.

## Limitations and further research

This research is based on a limited number of cases. As a result, there is no ground to generalize these conclusions to a wide range of firms. Nevertheless, the findings suggest that from a process point of view, further research is necessary to make a clear distinction between an exploratory and exploitative approach to the FEI. This might provide insights in the way to proceed throughout the FEI and could have an effect on the confusion that we could observe with regard to FEI processes.

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# Students as choice-makers: developing altered consciousness as an aspect of design and global citizenship literacy

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**Abstract:** *Choice, as an aspect of existence, may be taken for granted or it may not exist at all. Choice may be complex, simple, false, or not apparent. Choices can be quantitatively and qualitatively different. There are ironies of choice in that profusion of choice can mean confusion of choice. Equally, and perversely, those who have choices can also enjoy the privilege of not choosing – itself a choice. Design is a site of choice-making – not only within the nuances of design processes but also for the role it plays in identity formation, social being, politics, and global interactions. This paper aims to address the significance of choice not only for focussed design and technology education but also for the general education of all students in their preparations to become fulfilled and engaged global citizens. The paper: a) explores choice from philosophical, social, political and consumerist perspectives; b) presents the student as both person and player in, and on, the world; c) offers two illustrations of curricula considered supportive of choice education for design and citizenship literacy; and, d) discusses ‘pedagogies of choice’ which can contribute to the growth of ‘altered consciousness’ through design education.*

**Keywords:** *Choice, choice education, altered consciousness, design literacy, curriculum, citizenship, design and technology education.*

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## Introduction

Choice, as an aspect of existence, may be taken for granted by some while for others it may not exist at all. Where it occurs choice may be complex, simple, false, or not apparent. Choices can be quantitatively and qualitatively different. There are ironies of choice in that profusion of choice may mean confusion of choice. Equally, those who have choices can also, perversely, enjoy the privilege of not choosing. Thus, one may have a choice by right but one may also have a responsibility to choose. Ultimately, values are at the core of much choice-making. Given such considerations, education about choice matters and such an education can be well articulated as a component of design literacy. In turn, design literacy can be a key partner to citizenship literacy.

This paper aims to draw attention to the significance of choice not only for good practice in focussed Design and Technology education but also for the general education of all students in their preparations to become fulfilled and engaged global citizens. The paper opens with a discussion of the concept of choice, the several ways in which it can be understood, and the kinds of contexts in which it can be found. The student is then presented as both person and player in, and on, the world.

We then take two examples of curriculum policy – those of Scotland and South Australia – as illustrations: of the kind of curriculum that enables, rather than inhibits, choice education; of how choice can be richly present in design curricula; and, of how, in turn, choice as a component of design literacy can simultaneously contribute to general education. We then develop a discussion of what we call ‘pedagogies of choice’ which can contribute to the growth of ‘altered consciousness’ intended both to enhance students’ engagement with design, with current issues, and to strengthen their capacities to shape preferred futures.

## The concept and contexts of choice

There are several ways that the concept of choice can be considered, from the everyday to the philosophical and the political. In an everyday sense to choose might simply mean to pick or to select. A choice may be from one of a set of possibilities – for example: of foods; of ideas; or of actions - thus, respectively, an apple, a birthday gift, or a means of travel. To have a choice implies ‘more than one’ and we may apply a hierarchy – first choice, second choice, etc. Faced with abundance we can be ‘spoiled for choice’ or enjoy choice as a luxury. Conversely, there may ‘no choice’ when we react instinctively to avoid danger or when Henry Ford offers us ‘any colour so long as it’s black’.

There can be situational differences too. Picking a card from a pack of cards is different from picking from a variety fruits. Within such choice-ranges there could be quantitative and/or qualitative factors to consider. When we can’t see the cards yet we can see the range of fruit, the *kind* of choice differs. Whether we are the only chooser or for what purpose we are choosing can also affect our choice-making. We may even choose not to choose.

Choosing what to wear may be a cultural matter. When voting, one may have a narrow range of choice on the political spectrum – if any. One might ‘choose not’ to vote for candidates or to choose to vote for the ‘least worst’ candidate. In many situations, choosing amongst options may be limited by our imagination, our finances or the availability of appropriate knowledge.

In this last case we talk of making an 'informed choice' and Weatherford (1995) discriminates between choosing and deciding when he suggests that a choice can occur without deliberation whereas a decision calls for it. Thus, when we consider a complex concept such as design literacy we engage with multiple aspects and possibilities related to choice. Design literacy is (hopefully) about *reasoned* choice-making at multiple levels and stages – from concept to consumption.

Thomson (1999), in her discussion of decision-making, points out that being clear about what choices or options are available is one thing but that there is also a need to work out the implications or *consequences* of such choices. One may need more information to support decision-making and, ultimately, one is *evaluating options* to assess the most preferable. Thomson thus identifies four important components of decision-making – options (choices), information, consequences and evaluation (Thomson (1999, 92). Clearly choices do not happen in isolation of values and the weighing of competing values amounts to a kind of ethical decision-making – a case of: 'What is the *right* choice?'

From what has been said so far, there is both a knowledge dimension and a values dimension when choice is under consideration.

### *In the consuming world...*

While everyone has choice in their lives the reality is that, globally, there are huge differentials in the number and nature of choices available to people. In a materially rich minority world relative wealth expands choice-making possibilities. For these people, not only are the necessities of life well met but there is abundance of choice. As Hamilton and Denniss (2005) put it:

The explosion of choice serves a crucial function: it spreads affluenza. It does this by creating desires, intensifying the feeling of deprivation, and hastening obsolescence. People suffering from affluenza do not know what they want, yet want everything. More choice helps create new desires by highlighting the range of products consumers could have.

(Hamilton and Denniss 2005, p.40-41)

Here the ironies of choice begin to emerge where, within the economic model, consumer choice is avowed as a virtue or is even positioned as some kind of democratic right in the name of 'market choice'. In the mass market, whilst the *quantity* of choices is increased, the *qualitative differences*, within the range of choice, narrows. There are potentially hundreds of toothbrushes to choose from when all do basically the same job. With more complex products such as insurance, internet provision, energy supply and airline travel not only are the offerings fewer but the qualitative product differences are nuanced and difficult to arbitrate. In the world of confusion marketing, similarities are disguised and minor differences are afforded undue attention. In the (designed) marketed world of confusion where illusions of choice are created, actually making a choice itself becomes confusing and consumer resignation or apathy can set in.

There is a substantial literature spanning half a century that points to how lives, communities and societies have been shaped by product-push (see e.g. Packard 1962; Schumacher 1973/1986; Whiteley 1993; Suzuki 1997; Hamilton 2004; Hamilton and Denniss 2005; Nye 2007). In the consumer society we may *perceive* a range of choices within categories of products but there are also choices *in principle* to be made – lifestyle choices. Such choices may seem difficult but they are possible.



### *Ethics, determinism, existence...*

The powerful psychological and social perpetuation of the idea of choice at a cultural-consumerist level is something which many people are simply born to and uncritical of. However, alternatives exist where choices at a meta-level of principle are made as when the Amish assess a product's potential to enhance or erode their way of life (Kraybill 1989/2001; Sclove 1995; Nye 2007). Such questioning illustrates what Singer calls an 'ultimate choice', that is, one which exists between two fundamentally different ways of living – between ethics and self-interest. He points to two kinds of choices and these inform our discussions of design and technological choice-making: 'Ultimate choices take courage. In making restricted choices our fundamental values form a foundation on which we can stand when we choose. To make an ultimate choice we must put in question the foundations of our lives' (Singer 1995, p.5). We can juxtapose Singer's position with two questions posed by Palmer:

Do we inhabit a world already formed by technological choices so complex that many seem almost invisible (e.g. the pencil, the telephone, the washing machine)?  
Do many technologies appear before us as autonomous and beyond choice (computers at work, videos at home, cars to go between them)?

(Palmer 1994,p77)

In considering both Singer and Palmer here, the philosophical concept of determinism emerges. Any framing of design and technology education directed towards good choice-making (a value-laden term, we acknowledge) must take account of this influential doctrine which challenges the idea of free will and whether we can, or have, any influence over how technologies develop. While serious scholars of technology (see e.g. Mumford 1934; Winner 1977; Smith & Marx 1995; Feenberg 2002; Ihde 2002) now largely resist technological determinism and its fellow travellers 'neutrality' and 'progress', this is not yet the case in the public realm.

Enlightenment thinking (Postman, 2000) still pervades Western culture and this is promoted strongly by advocates of the free market. Faith in progress (usually of a quantitative-instrumental kind), belief in the neutrality of technologies as tools without values, and the belief that all technological development is inevitable ('that's the way things are going') all contribute to a form of dogma and a disenfranchisement of persons. Thus, in such a regime, we might have limited, localised, personal design and technological choices but their general determination is beyond us. Determinism of this kind eschews critical thinking that questions technologies and it embeds acquiescence towards them. Individuals feel, and may be deemed, impotent to act.

However, the matter is not a simple dilemma of submission to circumstances versus assertion to enact change. Feenberg (2002) applies critical theory in his rejection of an everyday either-or of technology studies of the 'Do we follow technology or does it serve us?' type. The issue hinges around the notion of progress grounded in positivist claims of technological neutrality and determinism versus a humanity-centred argument of defence against technological dominance. Feenberg rejects this 'dilemma' and argues that '... the real issue is not technology or progress per se but the variety of possible technologies and paths of progress among which we must choose. (And, he adds) ...if alternatives do exist, the choice between them will have political implications' (Feenberg 2002.v).

Like Ihde (2002) and Sclove (1995), Feenberg points to multiple possibilities for technological options. He joins Rybczynski, (1983), Palmer (1994), Sclove, (1995), and Winner (1995), in advancing the study of our technology-politics relationships and showing how our technological and design choice-making (in free, limited, or non-existent forms) can shape the kind of society and world we create in both enabling and disabling ways. Sclove (1995) discusses technology as both enabler and disabler of democracy and points to the potency, or otherwise, of the individual in society. When such political-democratic issues are explored, matters of individual and collective choices arise about lifestyle, environment and, importantly, education.

The philosophy of existentialism is one that puts choice-making about life, self, and identity at its core. As Young puts it:

Existentialists from Kierkegaard to Sartre have proclaimed that to be fully human is to make radical choices; that is, choices that are not determined but choices for which no rationally persuasive support can be offered. Only by making such choices and eschewing all talk of excuses can we make ourselves responsible agents (Young 1993, p.537).

This foregrounding of human agency and efficacy in opposition to determinism is borne through by Franklin (1990/2004) who addresses determinism in the light of intergenerational perspectives, saying: "...our artifacts will reflect our values and choices, as artifacts have done throughout the ages" (2004,p.113). She uses history as the context to "...help expand our discourse and our social imagination. Technology is not preordained. There are choices to be made and I, for one, see no reason why our technologies could not be more participatory and less expert-driven" (2004, p.115).

Once we see that choice-making matters in so many ways: in the designed and technological world; as a core human capacity and behaviour; as key to democratic process; in fact, throughout our personal and social being, then we also see the significance of ethics to the discourses of choice.

Warnock (1998) argues that ethics implies choice and is thus apparently incompatible with determinism or, conversely, that 'choice' is illusory for determinists. She argues the centrality of ethics to life and shows that moral value cannot 'be' without a human and asserts the necessity both to value, and pass on, from one generation to the next 'the idea of ethics' through moral education (Warnock 1998,p.109). She also (1970) describes existentialists' focus on human freedom and the exercise of will (as against determinism) and how "(t)hey are all of them interested in the world considered as the environment of man (sic)...because of his power to choose his own courses of action" (Warnock 1970,p.1).

Thus, she signals our interdependence with each other, with environments, across the planet and across generations. Her argument also applies to our technological decision- and choice-making which is so much a part of these inter-relationships. As persons, humans, citizens we are players in the technological complexities of the world. It is easy to say that we are powerless and that, alone, we may not be able to alter or affect decision-making (in hindsight or with foresight) about designed technological developments and that this is really a matter for 'others'. However, in democratic life we have both a right and a duty to participate and to influence. Key to facilitating this is an educated citizenry that is able to engage with issues and questions concerning preferred futures.

## The student as person and player in, and on, the world.

Students, like all people, find themselves in particular sets of life circumstances. As members of families and communities (eg local, school, sport) they play their parts and they have their lives and identities shaped. But identities are also formed by the students' interactions with the technologies (products and systems) of their worlds. However, while some interactions merely happen, others are actively engaged by young people. Students' choice-making around engagements with others and with technologies is what contributes to a student's own, conscious identity formation. At a further level, students begin to understand that they can actually accept and reject (choose) particular ways of acting in, and on, their world.

In these circumstances it becomes possible to recognise that *efficacy* is a disposition that can be appreciated and nurtured. Efficacy is one outcome of conscious choice-making especially when it overcomes passive acceptance and generates a questioning of the actions and effects of people, advertisers, products and environments alike. The self that develops in relation to others is the ethical self – the self formed by choice-awareness and by choices made. In the context of the so-called developed world being able to choose is a luxury that on the one hand students may not realise they have, while, on the other, is a privilege the majority world cannot enjoy. Increasingly, the 'designed self' and the 'chosen world for self' project multiple possibilities and beg considered responsibilities towards self, others, and the planet. Against our sketch of some of the senses of 'choice' and 'choosing', drawn from the everyday to the philosophical, we turn to the perspective of the student in the designed and technological world. Not only is the formative 'being' of students shaped by the choices made by others but it is further shaped by the choices the students themselves come to make.

We have tried to show that choice-making is a phenomenon of human existence and that it happens in multiple contexts (e.g. cultural, ethical, social, political, religious) and multiple forms (technical, aesthetic, personal, quantitative, qualitative). Further, we can engage choices or, as a choice, disengage - actively or passively. Given such a rich scenario, what are the conditions that can facilitate a rich education in, and for, choice-making through design activity? Are there ways that choice education can apply to the general education of all students and be for the benefit of society as a whole? We believe so.

## Choice education for and through design literacy – two curricular illustrations

Two curriculum policy approaches – those of South Australia and of Scotland – illustrate how choice education in design and technologies can be served both through specific and through general curriculum practices. In presenting these two curriculum examples, we stress that their full richness cannot be portrayed here and we would encourage deeper exploration of them by readers interested in the ways curriculum can positively enable choice education. Both curricula are *frameworks* articulated through eight *Learning Areas*. As such, the final determination of the delivery of the curriculum is left to the professional judgement of the teachers. In Scotland, the Learning Area is 'Technologies' while in South Australia, it is 'Design and Technology'.

## SOUTH AUSTRALIA

The South Australian Curriculum, Standards and Accountability Framework (SACSA) (DETE, 2001) Learning Area of Design and Technology (D&T) is articulated through three Strands – Critiquing, Designing and Making. Interweaving the whole curriculum are five Essential Learnings: Communication, Futures, Identity, Interdependence, and Thinking.

Design and Technology in this curriculum is conceptualised around a three-dimensional expression of technological literacy. The interdependent dimensions are the *operational* (learning to use and do), the *cultural* (learning through technology) and the *critical* (learning about and how to be with technology). Four of the eight aims of the D&T curriculum are:

(T)o develop in all students:

- ethical, critical, enterprising and futures dispositions towards their own and other people's designed and made products, processes and systems
- capacities to identify and critique the values underlying the intentions, design, manufacture and consequences of any technology
- capacities to consider and respond to the needs of diverse cultures in relation to developing technologies
- capacities to apply their design and technology learning to other Learning Areas, to life in the wider community, to the virtual community, and in accessing further education and training.

(DETE 2001, Band Introduction p.3)

As this is a curriculum *framework*, teachers are to develop the three strands and the essential learnings according to their own professional judgement. To support this there are outcomes (standards) given at two-year increments for the students. Common to all levels is a statement (approx. one page) on each strand. The Critiquing strand's opening paragraphs include:

Critiquing involves making judgments – not only about technologies in some passive or impersonal form but also very much about the thoughts and actions of self and others as designers, makers and users of products, processes and systems...

...(Students) interrogate: the intentions and values at the very conception of a technology; the principles used in designing; the methods and resources used in manufacture; and, impacts and consequences. Critiquing often exposes ethical, cultural and social contradictions brought about by designed products, processes and systems. Through critiquing, students deconstruct the meanings behind and power relationships between people and the built and created world. The act of critiquing ultimately involves presenting a defensible case outlining the merits or otherwise of the whole or parts of a product, process or system.

(DETE 2001, Strand: Critiquing)

Meanwhile, at its outset, the Designing strand states:

Designing is, of essence, about change and about choice-making. To design is to change one set of circumstances into another and, in doing so, choices have to

be made. The decisions faced when designing involve complexity and holistic thinking as there are many factors to consider. As students gain confidence as designers, they realise that they can personally effect change.

Designing involves *imagination and creativity* to make proposals and choices about new ideas for products, processes and systems

(DETE 2001, Strand: Designing)

Two illustrative standards are:

4.1 Critiquing: (The student) explains the decisions and choices made in designed and manufactured products, processes and systems and identifies alternative possibilities.

4.2 Designing: (The student) integrates design skills to create personal strategies for designing culturally and socially defensible products, processes and systems.

#### SCOTLAND

Since 2002, Scotland has been transforming the educational landscape for 3 18 year olds with an all-encompassing, inter-agency initiative, 'Curriculum for Excellence' (CfE), in which the central place of choice, decision-making and responsible citizenship becomes apparent. The overall purpose of education in Scotland aims to help children and young people develop specific personal capacities: 'successful learners', 'confident individuals', 'effective contributors' and 'responsible citizens' (Scottish Government 2004) and each Learning Area contributes towards developing these capacities. CfE is based on a model of change which allows teachers greater scope for professional decision making about how they plan, develop and present learning experiences. They are guided by a series of policy frameworks such as Building the Curriculum 3 (Scottish Government 2008) which applies these principles of curriculum design to matters of organisation and educational location:

- Challenge and enjoyment
- Breadth
- Progression
- Depth
- Personalisation and choice
- Coherence
- Relevance.

Teachers, regardless of subject specialism must also take cognisance of interweaving 'themes across learning':

- *Education for Global Citizenship* (which includes sustainable development). Teachers are to plan for experiences which encourage learners to take thoughtful and responsible action locally and globally.
- *Enterprise in Education* intends to help the learners develop skills and attitudes to cope with an unpredictable future, to be able to deal with setbacks and disappointments in a positive way, and to continue to learn for the rest of their lives. This includes problem solving, decision-making and evaluating risks.

Furthermore, there are 'responsibilities for all': Literacy, Numeracy, and Health and Wellbeing, promoting "confidence, independent thinking, and positive attitudes and

dispositions” (Scottish Government 2008). Teachers are responsible for helping learners to make informed decisions in order to improve their mental, emotional, social and physical wellbeing. Learners are entitled to a supportive learning-environment where they can reflect on their strengths and skills to help them make informed choices when planning their next steps and setting learning goals.

The ‘Technologies’ Learning Area seeks to: “(E)nable(s) children and young people to be informed, skilled, thoughtful, adaptable and enterprising citizens” and four of its eight main purposes are for learners to:

- develop understanding of the role and impact of technologies in changing and influencing societies
- contribute to building a better world by taking responsible ethical actions to improve their lives, the lives of others and the environment
- become informed consumers and producers who have an appreciation of the merits and impacts of products and services
- be capable of making reasoned choices relating to the environment, to sustainable development and to ethical, economic and cultural issues

(Education Scotland 2009a)

‘Technologies’ comprises ‘Technological developments in society’ and ‘contexts for developing technological skills and knowledge’, the contexts being: ‘computer science’, ‘food and textiles’, ‘business and enterprise’, and ‘craft, design, engineering and graphics’. Although the value of engaging young people through practical and authentic challenges, which include making, is acknowledged and encouraged, the focus of learning activities in Technologies is not solely the realisation of product outcomes. Below is a sample of statements from the ‘experiences and outcomes’ which are used to guide progression and determine capabilities of the learners (Education Scotland 2009b):

TCH 1-01c By exploring current news items of technological interest, I have raised questions on the issues and can share my thoughts. (approx. 7 year olds)

TCH 4-01c I can debate the possible future impact of new and emerging technologies on economic prosperity and the environment prosperity and the environment . (approx. 15 year olds)

TCH 0-02a Within and beyond my place of learning, I can reduce, re-use and recycle resources I use, to help care for the environment. (approx. 5 year olds)

TCH2-02a Having analysed how lifestyle can impact on the environment and the Earth’s resources, I can make suggestions about how to live in a more sustainable way (approx. 10 year olds)

TCH 3-02a From my studies of sustainable development, I can reflect on the implications and ethical issues arising from technological developments for individuals and societies. (approx. 12 year olds)

Examining the consequences of choice and personal actions through such a learner-centred approach is central to the curriculum framework currently being implemented.

## Pedagogies of choice

Whatever the (espoused or hidden) curriculum circumstances, the teacher and their pedagogical approach is key to the development of design and technological literacy through choice-making. Of the various meta-discourses in play around choice education, we would suggest that it is the ethical that best informs the issues at play. Thus, the general approach may be democratic in style; caring in terms of peoples, other species and environments; and, cognisant of multiple, competing values positions.

For such an approach to blossom, it is worth embracing something of the smorgasbord of understandings available to the teacher. Democratic classroom attributes of explicitness, negotiation, questioning and reflection are advanced by Boomer (1999) while Harrison (2001, p.62) reminds us of '(students') diverse personal individuality', and Kimbell & Perry (2001, p.13) of 'the learner's strength'. In curricula such as those presented, 'Essential Learnings' and 'Responsibilities for All', are affirmations that the design teacher is not alone in teaching in ways that celebrate choice-making as valid education.

Within Design and Technology classrooms students are enabled to develop identity, express individuality and explore values contradictions through their design activity. Here, rich choice-making options – and dilemmas - can become the norm rather than the occasional curiosity. The teacher can draw attention to and celebrate the constant presence of choices in design action.

While it can be said that there are numerous moment-by-moment opportunities for exploring how and where choices arise within both design processes and product realisation, there are limitations on whether true choice is happening. Restricted choices may be because of resource limitations, the student's personal development, or the perceived artificial nature of the school setting. Nevertheless, herein lies the very educational opportunity for developing the knowledge that choices: a) exist; b) can be limited; c) have consequences; and, d) can themselves be consciously taken or avoided. Thus, design teaching not only serves design education itself, but advances choice-making as valuable disposition for life in general.

Towards this end, we can look to one of Boomer's (1999) democratic classroom attributes – that of negotiation – which challenges the teacher to have:

- a commitment to children becoming more and more self-reliant and socially critical;
- a genuine belief in the child as constructor of his/her knowledge
- a genuine and demonstrated capacity to be persuaded away from certain designs after due argument; (and),
- therefore a degree of vulnerability. (Boomer 1999, p.105)

Here, as with the South Australian and Scottish curricula, constructivist approaches are embraced whereby teacher and learners are co-constructors of the learning - and choice-making is key. The teacher celebrates the richness of variables and values at play, is open to critique and discussion, and is respectful of the student both as person and learner. The teacher is manager and facilitator of choice-making and neither dictates, nor inhibits (within reason), choice as design practice. By articulating a blend of open and closed design briefs particular choice options are

enabled or (intentionally) limited. Through such learning, the weighing of possibilities and the rationalisation of choice-making becomes the norm.

Design pedagogy is therefore not about a transmission model of the passing on and receiving of packaged knowledge. It conspires, transpires and transforms to expose continuously the presence of choice options, and, once choices have been made, the learning journey continues and new choice dilemmas present themselves. This is constructivist learning at work and it celebrates discussion, critique and the exploration of possibilities beyond the status quo.

Change in education and curriculum requirements, and in societal and learner expectation often requires change in pedagogy as well as in content and learning experiences. However, Dewey (1933, p.30) cautions, "Knowledge of methods alone will not suffice: there must be the desire, the will, to employ them. This desire is an affair of personal disposition." Dispositions form the link between knowledge and action. If pedagogical shift is needed then it is the teacher's own values that come into question and new (professional and personal) choices must be made. As McLaren (1997) noted, technical teachers (D&T) preferred to focus on technical and functional issues, for example when teaching product evaluation. Here, teachers tended to encourage learners to consider products and outcomes of design activity to be neutral and value free. When it comes to confronting social and environmental questions related to their discipline, some teachers may feel more comfortable remaining in the arena of tried and tested 'technical making' master-and-apprenticeship model of Technology Education and less so with the exploration of values, consequences and global issues arising from technological developments.

Planning for teaching and learning requires an appreciation that design decisions that are acceptable for some are unacceptable for others. Developing an awareness of the significance of global inter-connectedness through values-rich learning experiences is at the core of pedagogy and curriculum for choice education. Embracing challenging issues and contradictions requires explicit processes of imagining different ways of doing things; a central tenet of designerly thinking and action. Implicitly, this requires some pedagogical and intellectual risk taking. Becoming more able to respond to social and political dilemmas; applying knowledge and skills gained in one context to another in order to resolve an issue; or Design and Technology education for responsible and informed, active citizenship; demands more than simulations of processes that perpetuate industrial systems which *in themselves* require re-examination.

McLaren (2012) suggests that a range of planned scenario, story-line, or project based Technology education experiences offer opportunities to encourage participants to make connections, deal with uncertainty, engage in critical thinking skills, contend with dilemma, apply objective evaluation and recognise subjective responses. Whichever model of planning is adopted, the challenge for teachers is in finding a balance between: a) creating experiential tasks that allow students to find authenticity and meaning, and have genuine ownership of the design decisions and process through which they arrive at a proposal; and (b) being able to foresee potential issues, learning obstacles and being ready to intervene to aid the development of their personal and collective technological, scientific, mathematical, design and engineering knowledge, values and skills.

In addition teachers must also develop the pedagogical repertoire necessary to engage learners in exploring the concept of self and their relationships with technologies in a global context of societal, economic, environmental, cultural and



ethical values. In such contexts, learned sequences of procedures and mechanical application of skills are obsolete. Instead, teachers need to plan learning experiences which make demands of the students' choice-making, action-taking and consideration of responses. The pedagogies of project based learning and design thinking offer rich opportunities for learners to embark on a learning journey which immerses them in an authentic quest. The route of the quest/ design challenge is determined by choices and selections at every juncture.

Brookes and Young (2011) examine the relationship between choice, empowerment and intrinsic motivation. They suggest teachers explicitly adopt the language of choice-making and emphasise the opportunities that are open to the learner. There is evidence that learners respond with greater self-determination, increased motivation, perseverance and learner sense of satisfaction when they have been afforded the 'freedom' of choice. Albeit the context Brookes and Young (ibid, p.55-56) discuss is not directly related to the design education, there are messages which can translate well to design studio. Any design centred scenario, user-, client- or issue-based design challenge, or indeed evaluation of the design outcomes of others, offers choice-making opportunities and demands design decisions to be made. It is important that the planning of such learning experiences states explicitly where the choice-making opportunities are for the learner, and which design decisions create ownership, direction, learner response and experience. Compromise and choice, conflict and debate will inevitably enrich the learning journey and the complexity of designing will be encountered. If learners in Design and Technology are to engage as active participants and citizens they will need to have teachers who are willing, prepared and equipped to deal with uncertainty.

### *Towards altered consciousness*

Design thinking and choice education for learners in terms of 'me, an individual, and I... as I choose to be and who I chose to spend my time with, and how I chose to present myself to others' is rich in opportunity, *so long as* the concept of self is recognised as having consequences for others. Translation of choice education theory into the pedagogical repertoire of a design and technology teacher can encourage reflection on the self-others-environments relationships and consequences. A design education can be enriched by incorporating contemporary controversial topics, emerging technologies and smart materials, consumption, and consumerism, and so on, all of which demand engagement of values, opinions and engagement through active questioning rather than passive acceptance, enables reflection, critique and design activism. Taking a 'critique stance' in any design approach will develop a higher level of awareness and articulation of choice and consequence. Inevitably, such teaching stimulates discussion on balancing personal responsibility, corporate social responsibility, public rights and individual rights, and the exploration of mechanisms to resolve associated tensions.

Case studies and critiques of designs and technologies as they relate to self, other people, other species, and to environments, develop an increased consciousness of the concept of choice and its associated constructs; of health and wellbeing - intellectually, emotionally, and physically; and of the value of reflection, respect, and empathy. Thus, what has been discussed here amounts to pedagogy of altered consciousness so far as designerly thinking and choice education is concerned.

## **Conclusion**

Design literacy, technological literacy, citizenship literacy and education for sustainable development are all defensible educational aims. However, as has been shown with technological literacy, (Layton 1994; Petrina 2000; Keirl 2006, 2007) they are all contested as to what their meaning and purposes should be. The contestation is one of values dissonance and it is at the point where values are not in harmony that choices must be made.

Choice is a phenomenon that is in many ways present on a daily basis yet it often seems illusory and/or elusive. This paper has tried to show: that choice is a concept worthy of attention *across* education; that design education is a prime candidate for facilitating choice education; and, that curricular and pedagogical policy, research and practices do exist that can inform and articulate choice education.

An education in choice and choice-making is one that is both ethically defensible and ethically necessary. Choice is a tool of ethical practice and its presence as a phenomenon of human existence constitutes a rich arena for educating about personal and collective efficacy in designed worlds for preferred futures. Choice is not a straightforward concept or practice – to choose is to invoke rights, responsibilities, reflection, critique, defence and advocacy - all of which are dispositions for citizenship. However, to be educated in, and about, design is to not only invoke these dispositions but is also to engage with a rich spectrum of values-weighting and critiquing that are the givens of design discourses.

If choice education is engaged then, we suggest, consciousness (eg personal, communal, cultural, social, environmental, political *and* ethical) can alter. It is altered consciousness – not as a single, new consciousness but as multiple-collective consciousness - that facilitates new ways of being in the world and new worlds to be in. Design education is not only in a prime position to enact this engagement and develop altered consciousness but, we argue, it has a duty to do so.

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# Art and Design Schools in Transition: The Uncertain Future of the Workshop Model

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**Abstract:** *Recent reforms in higher education promote standardization and comparability. However, the academic disciplines set the standard that the art and design schools are expected to adapt to. This new and more theoretical approach can come in direct conflict with the traditional way of teaching at the art and design schools. These schools have traditionally been teaching in accordance with a workshop-oriented method, where theory is more related to and part of practice than in the academic sphere.*

*Keywords: Art school pedagogy, Workshop model, Reforms in higher education.*

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In this paper I want to take a closer look at the modern transformation of art schools and the effect this process has on pedagogy in art and design disciplines. My argument is that the Bologna process and its counterparts in Norwegian school reforms combined with the emergence of a postmodern disapproval of authority and bureaucratic management regimes pose a threat to the traditional work shop based pedagogy which has been the traditional base for art schools for centuries.

Initially, I would like to give a short background to the recent development, with Oslo National Academy of the Arts as my primary example. Today, five national institutions for higher art education are merged and relocated on a new site in a refurbished sail-making factory. The changes, however, are not only formal and geographical. The new National Academy of the Arts also has an ambition to be a specialized University institution with research positions and PhD approval. In addition, Norway has implemented the Bologna declaration, which is part of a process within the EU to standardize all higher education in Europe. One of the chief ambitions of this process is to enable students and research staff to move between different countries and institutions.

The backdrop for the Bologna process was the realization that traditional industry was in full retreat. The European Union was of course interested in retaining and improving its competitive advantages towards the rest of the world, and wanted to strengthen European knowledge-based institutions. This point is emphasized in the EU treaty from 1999:

(...) the objective of increasing the international competitiveness of the European system of higher education. The vitality and efficiency of any civilisation can be measured by the appeal that its culture has for other countries. We need to ensure that the European higher education system acquires a world-wide degree of attraction equal to our extraordinary cultural and scientific traditions. (EU, 1999)

From the late 1990s several Norwegian reforms were constructed along the same basic principles, of which the most prominent is the Norwegian official report made by Ole Danbolt Mjøs, NOU 2000: 14. These reforms were developed in line with the Bologna process, and in many ways constitute its implementation in Norwegian higher education. They involved strict requirements for standardization and effective reporting to the government institutions in order to enhance control and promote efficiency, along the lines of the dominant New Public Management ideals. The term, New Public Management is used to characterise the programs implemented in the public sector since the 1980s aimed to modernize public organizations through the implementation of more market orientated management. A central hypothesis is that a more market-oriented public sector will insure a more effective and cost-efficient government. A concrete effect on the institutions in question was the implementation of measurable aims that should be reported on in formats that are comparable. As Marilyn Strathern, who have studied these processes in the academic sphere, found: Like other public service providers, universities were simultaneously exposed to market discipline and subjected to stricter and more transparent systems of accountability and audit (Strathern 2000).

The dilemma for the national art institutions is this: The reforms following the Bologna process affect all higher education and as most higher education is academic, the new standardization is naturally based on the academic institutions, not on the more marginal art schools. The result is that the academic teaching model is rapidly emerging as a prominent part also of the art schools. A theoretical curriculum and

written assignments have in the later years become the standard. A critique of this trend is by no means new. The most striking feature of modern bureaucracy is, according to its Max Weber, the introduction of a formal examination system (Kvale 2004, p. 156). Additionally, the art schools that traditionally have aimed at the unique and the development of the individual artist or designer, are now subjected to the same standardization. Instead of emphasizing the uniqueness of the disciplines, the focus is now on what they have in common.

So, what characterized traditional art disciplines and how were they taught? I have chosen to refer to the theoretician on professional learning Donald Schön. In his influential work "The Reflective Practitioner" (1983) he describes how practicing professionals in a whole range of practical disciplines have far more knowledge than they can verbalize. Or more correct: they possess *another type* of knowing. His book was an attempt to understand this type of knowledge and its place in the education system. And I think that his theories of practice-based knowledge offer a good description of art school pedagogy – a model I will elaborate on in order to show the differences between the workshop model and academic teaching.

[Universities] are institutions committed, for the most part, to a *particular* epistemology, a view of knowledge that fosters selective inattention to practical competence and professional artistry ... we are in need of inquiry into the epistemology of practice. What kind of knowing in which competent practitioners engage? How is professional knowing like and unlike the kinds of knowing presented in academic textbooks, scientific papers and learned journals? (Schön 1995, p. VIII)

A professional violinist can learn a lot through reading theory, but the main details of how the fingertips touch the strings, calls for another type of learning. Schön studied schools from a wide range of disciplines, from health care to architecture. He found that when a professional worker is faced with challenges within their profession, they base their reaction on a type of unconscious improvisation that they have developed through practical experience. This unarticulated and experimental process is what Schön calls *reflective practice*. When practicing professionals base their approach on unarticulated knowledge to such a large extent, their respective educational institutions are faced with specific pedagogical challenges.

... competent practitioners usually know more than they say. They exhibit a kind of knowing-in-practice, most of which is tacit. (...) Indeed, practitioners themselves often reveal a capacity for reflection on their intuitive knowing in the midst of action and sometimes use this capacity to cope with the unique, uncertain, and conflicted situations of practice. (Schön 1995, p. IX)

My argument is that schools that want to succeed in practical education have to realize that these disciplines are fundamentally different from their academic counterparts. The students have to experience the different situations they can meet as a professional. Schön is also convinced that this type of pedagogy has to be based on an experimental model, with the testing of different approaches in close dialogue with professionally trained teachers. Students have to practice continuously in order to understand and master the professional improvisation of their discipline. Schön also places his findings in a larger context, and warns his readers that fundamental knowledge can be lost in an education system that to an increasing extent it based on written knowledge. This is not only a problem for the disciplines in question, but also

for society at large, which relies every day on the services of a wide range of practical professions.

For Schön, reflection is an integrated part of practice, something the practitioner does parallel to practice. He explains this with his concepts of *reflection-in-action* - a situation where our thinking to reshape what we do while we do it and *reflection-on-action* - thinking back on what has been done to examine how one's knowledge-in-action may have helped to provide an unexpected outcome.

Schön's description of practice-based education offers a good account of the methods that has characterized the traditional art schools – according to Karen Jensen it has been dominant in formal European craft education for over thousand years (Nielsen and Kvale 2004, p. 15). Modern design, arts and craft have emerged from workshop-based pedagogy. Students have worked with concrete practical assignments under supervision and in dialogue with a teacher or master of the trade. Student and pedagogue have worked in close cooperation, discussing and experimenting, in order to find satisfactory solutions.

This is also in line with John Dewey's thoughts on the basic principles of pedagogy. As Dewey saw it, experience is the key for all learning. Learning is first and foremost an activity, rooted in the personal experience of struggling with a problem. Students are not empty containers ready to fill with information packaged and pre-digested by teachers and textbooks. Students needed to *experience* in order to understand and develop (Dewey 2004).

In the art context, Schön's approach is commonly referred to as *learning to perceive*, and is prominent in drawing and graphics as well as ceramics and glassblowing. Tutors all have a background as practicing professionals in the disciplines and were only very rarely trained teachers. Teaching has up to very recently seldom been based on a written curriculum or theoretical training.

This form of learning ensures deep-rooted knowledge and experience, but since this type of knowhow is rarely articulated in words, but through what Schön calls *experience knowledge*, this method has difficulties in defending itself in our day and age. Art schools in Europe are stepping aside from the traditional, practice-based teaching practice and instead embrace a more standardized and documentable scholastic tradition. Not because they see the need to do so by professional standards, but because it is expected as part of the ongoing changes in education politics. The art schools are moving away from a workshop-based method and instead use an increasing amount of time on theoretical training, as also noted by Nielsen and Kvale (Nielsen & Kvale 2004, 17).

The quality of the apprentice model is however seldom questioned, and Kvale refer to an interesting anecdote to illustrate this point: Within the natural sciences experimentation and testing in a workshop-like situation is one of the most common method. A study by Harriet Zuckerman of 92 Nobel Prize winners in physics, chemistry and medicine found that more than half had worked in workshop-like situations. She describes the Laureates' education to be in line with the main elements of the traditional craft apprenticeship learning (Nielsen and Kvale 2004, p. 150). Paradoxically, even academic institutions have their roots in apprentice learning, if we go far enough back in history. European universities in the middle ages were organized as craft guilds and some of the oldest universities were organized as craft schools (Nielsen and Kvale 2004, p. 149).

Today, however, the theoretical approach is the most distinct feature of many academic disciplines. Nevertheless, even though the law of higher education put equal



emphasis on practice based science and theory based science, the Norwegian Qualification Framework issued by the Ministry of Education and Research – the very tool the schools use to construct their curriculums - promotes theoretical knowledge on behalf of practice.

However, the transformation of the art schools is not only characterized by a distinct academic influence. At the same time, there is also an increased emphasis on interdisciplinary practice, although the result often is the same: distancing from practice. As the traditional disciplines merge they are substituted with a more general body of aesthetic, critical and cultural theory. The students acquire knowledge of a vast amount of subjects, but achieve less disciplinary depth. The general idea is that a designer or artist of any discipline today has to manoeuvre separate and often at a distance from production. My theory is that this is a result of the actual moving away of industrial production to distant countries in low-cost regions, but I will not dwell on this in this paper. It is significant, however, to see the effect of interdisciplinary practice on art education and pedagogy. It stresses, for example, similarities between different disciplines that really only have a theoretical framework in common. This is in direct opposition to the general principles of apprenticeship, where learning is situated in practice and not written theory.

Of course, textbooks and a written curriculum are also in use in art schools, but up to now only as a supplement to the more practical approach. Studies in art history and critical and social theory have its place in art and design teaching. Nevertheless, the new trend of emphasizing theory and ideas instead of and often at the expense of apprentice learning can prove problematic. And this development is taking place not because the art and design schools saw the need for it, but because the authorities have agreed on standardization as part of the reforms in higher education.

Therefore, academic teaching with hardly any relation to practice today occupies an increasing amount of time, especially at master levels. This is necessary because the new master programs contain far more theory - so that the students can qualify for the new PhD programmes. The guidelines for employment at the art schools still place an emphasis on practical professional background. However, this is problematic as an increasing amount of what is taught is theory. Consequently, the teachers end up teaching in a form and tradition he or she is neither trained in or part of. Does this ensure increased quality to the teaching method or profession? This question is essential to consider for anyone interested in the further development of higher education pedagogy in the arts and design.

One alternative is of course to employ personnel with a mainly theoretical background. But by doing so workshop pedagogy is diminished furthermore because the newly employed academics lack the disciplinary practice or any wish to teach it. Another and in many ways paradoxical effect of this development is this: Instead of, and often in opposition to, the modernist inheritance from the Bauhaus School which has been a characteristic of the European art schools, the academically influenced teaching brings with it a recognizable post-modern influence. Typically, this can be seen in the general discredit of authorities. Jean-François Lyotard defined the post-modern condition as *scepticism towards the grand narratives* and he describes how these narratives have lost its power (Lyotard 1984).

One of the great narratives of the art school now being questioned is the belief that quality does exist and can be crafted, acclaimed and discussed outside of a mere linguistic discourse. A discussion of quality is integral to the particular professional area, how it is constructed and how to articulate appreciation or critique of it is one of the

most important didactic discourses in art and design. Traditional workshop pedagogy is based on the transference of knowledge from more experienced professionals to trainees of the trade. From a post-modern perspective this relationship might be viewed as authoritarian and ready for history's dustbin. Furthermore, the mere existence of quality is viewed with outspoken scepticism.

I think this trend must be met with examined critically. Is the apprentice model really that authoritarian and outdated? Within pedagogic theory these aspects of workshop-based learning is questioned. According to Lave and Wegner it is the community that form the most important part of apprentice learning – what they call *a community of practice*. The teacher – or master in this terminology – is only one component:

... a decentred view of master-apprentice relations lead to an understanding that the mastery resides not in the master but in the organization of the community of practice of which the master is part. (Lave & Wegner 1991, p. 94)

Communities of practice are furthermore driven by negotiations between its participants, and by dedication and dilemmas – far from the stereotype of the general authoritarian model described by critics.

The workshop model is, if we view it along the lines of Schön's reflective practice theory, in tune with the very nature of the arts. The question is whether the art schools should build on *and develop* their workshop tradition instead of striving towards a more theoretical and academic tradition. I think this is the crucial question for the art schools. They need to articulate a pedagogical platform that is in line with the nature of their disciplines. For example: At the The Oslo School of Architecture and Design the PhD programmes are mere theoretical exercises, in line with the national requirements. I would argue that practical disciplines also should have PhD programmes that are mainly practical. This approach challenge the National Qualification Framework, but is in line with the nature of the arts. Furthermore, the art schools can argue that this is also in line with the law for higher education. The problem today, as I see it, is that the art schools do not have enough self-confidence when it comes to its pedagogical heritage. Instead, they have been influenced by the same pedagogical trends as the bureaucrats who govern higher education. Instead of developing a theory of their uniqueness, these schools have envied the theory-based tradition and sought to copy it. Today, the art schools need to take one step back and simply ask themselves: What makes a good designer? What do we expect the best ceramicists to master? I propose that Schön's description of reflective practice and knowledge of the well-established and successful workshop model is a good place to start. Accordingly, I think that the art schools should articulate a defence strategy that is in tune with the disciplines they are set to safeguard and nurture. They ought to raise awareness of the benefits of the workshop model, so that they can ensure a wider appreciation of the distinctness of their disciplines – both within higher education as a whole and among themselves. There is no guarantee that the reform wave we have witnessed in recent years is slowing down, and a conscious and deliberate strategy is needed if the art schools want to influence its future educational basis.

To conclude: Art school pedagogy is well established and has proved very effective. Today it faces considerable challenges as a result of reforms and mergers in higher education. Few articulate arguments for the relevance and importance of workshop-based teaching, neither in the art schools nor among professionals and politicians. As I see it, this transformation of the art schools poses challenges that need to be

addressed and reconsidered at length: It changes the very bases of the disciplines. This discussion is, however, not developed at the art schools or in the corridors of the responsible government. I await a wider discussion of this topic, and hope to contribute to it.

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# A methodology for appraisal and validation of User Centered Open Innovation Programs: a case study critical analysis of an energy supplier co-creative innovation program.

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**Abstract:** *Design thinking programs for innovation in accordance to a service-dominant logic (S-D logic) in co-creation with stakeholders is often described in the literature as an adequate procedure for added value and sustainability (Vargo & Webster, 2011; Mateus & Rosa, 2011; Ostrom et al., 2010; Brown, 2009; Vargo & Lusch, 2004, 2006, 2008a, 2008b). However, it seems to be absent from research robust validation methodologies. This article describes an empirically developed methodology for validation of design thinking Ideas(R) Evolution methodology applied to a User Centered Open Innovation Program for a more efficient behavior consumption of home energy. This program was developed within the framework of seven sequential workshops with a fixed panel of stakeholders (clients, community opinion leaders, suppliers, company decision makers and experts) at the University of Évora in 2012, in Portugal. The methodological validation of the innovation program was based on quali-quantitative methods, and applied through a longitudinal design by a set of self-administered instruments that diachronically collect the emotional and cognitive quantitative and qualitative measurements of the workshops. The results demonstrated that the methodological approach essayed is parsimonious, reliable and generalizable for future use, and adds accuracy to Ideas(R)Evolution methodology.*

**Keywords:** *Branding, open innovation, value co-creation, creative intelligence, design thinking, service-dominant logic, validation methodologies.*

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## Introduction

According to OECD (2011) the world economy is presently services predominant (i.e. approx. 70% of the world GDP), and subject to a service-dominant (S-D) logic (Vargo & Lusch, 2004, 2006, 2008a, 2008b; Kowalkowski, 2010) thus becoming an economic paradigm (Kowalkowski, 2010) for the co-creation of value (e.g. *value-in-use*, *value-in-context* and *value-in-exchange*) - Vargo, Maglio & Akaka, 2008, thus supports service science and the fundamental reinforcement of a new general theory of markets and marketing.

Social and economic development has become a key policy concern throughout the world, since the macro-economic recovery in the aftermath of the second world-war. Changes in political, economic and social structures have led to a number of radical responses towards social and economic development policies. Public actors have argued that development may be achieved by involving private actors, and instead of passively awaiting their participation, public actors should “bridge the gap” and establish agreements with the private sector (Argiolas et al, 2009). Kotler(2010) states that the tendency for a continued co-creation and co-participation allows brands a strong link with its clients, which facilitates valuable insights for its diffusion.

Consequently, under the service-dominant (S-D) logic - in transition and contrast with the “industrial logic” (e.g. Goods-dominant (G-D) logic, as defined by Vargo & Lusch, 2004, 2006, 2008a, 2008b) - the business exchange of goods and services are fundamental enablers / distributors of service (Kowalkowski, 2010). The value of goods (tangible or intangible) is therefore based on their service systems *value-in-use* and *value-in-context* and ultimately determined by the customer (consumer) transactions (skills and knowledge based value interactions) when *value-in-exchange* (e.g. price and money exchange) is produced (Vargo et al., 2008b).

Therefore, the understanding (and measurement) of the interactions between buyers (consumers) and suppliers is critical to fully understand their logic as the fundamental enabler of innovation and *co-creation of value* (e.g. skills and knowledge resources integration) between these parties for moving forward (e.g. harmonious developing) the global economy of families, firms, territories and countries, inserted in a highly networked world (Lusch & Webster, 2011).

In agreement with this perspective, it is postulated that each “Territory” (organization, region, place, country, etc.) depends of a continuous flux of innovation and creative intelligence for its sustainable development and survival. These innovation fluxes, in turn, depend on social relational networks, which are amplified by technology and fed by a diachronic dialogue, *Always On* (Mateus & Rosa, 2011).

Nowadays, consumers have a greater decision power conferred by WOM (word-of-mouth + word of keyboard) and by *Prosuming* (Tofler, 2006) and have planned and “tribalized” behaviors in enlarged “neighborhood circles” dependent on own perceptions, value attribution and social pressure, (Ajzen & Fishbein, 2005, Godin, 2011).

Thus, organizations and their service brands in order not to lose “attraction power” (e.g. to confer identity, prestige and trust) to the “consumer tribes” (e.g. consumer bases) establish a continuous dialog, 24/7, and therefore become “Always On with the Tribe” (Rosa, 2011, Mateus & Rosa, 2011) through activation platforms (co-creation) for innovation and creative intelligence (Mateus, 2011).

## The IDEAS(R)EVOLUTION methodology

The methodological approach IDEAS(R) EVOLUTION sets links ( e.g. activates) within organizational structures, through creative thinking tools and processes. It is a research project that has already been tested and proven efficient among some industries and territories (Mateus *et al.*, 2011, 2012). This methodological approach integrates several innovative and creative practices within businesses and social structures. It breaks boundaries and contributes in co-creating with stakeholders more flexible, innovative and competitive organizations. Such a concept is rooted in three main operational areas, namely: LAND(R)EVOLUTION - Innovating Territories; BRANDS(R) EVOLUTION - Innovating Businesses; and LEARN(R)EVOLUTION - Innovating Education. Each of these areas is proprietary of its own sets of original developed tools and methods.

The research project is based on four emerging approaches, of design thinking (Kelly 2006, Brown 2008, Martin 2009), co-creation (Prahalad *et al.*, 2004, Vargo *et al.*, 2004, 2006, 2008a), branding (Aaker 2010, Kotler, 2009) and service-science (Ostrom *et al.*, 2010, Lusch 2011) and on conceptual and scientific empirical data collected by Gomez and Mateus (2009), Mateus and Rosa (2010, 2011) and Mateus *et al.*(2012).

The IDEAS(R)EVOLUTION methodology is rooted in the most up-to-date academic design and marketing debate and management paradigms, and supported by recent experimentally collected data, as a way of developing a creative culture within territories, organizations, and educational institutions (e.g. users) in order to be innovative, more competitive and sustainable, as well as more collaborative in their organizational functions and therefore in the development and dissemination of their service resources and value (e.g. goods, services and knowledge) involving the community.

The IDEAS(R) EVOLUTION complete process can be schematically represented as indicated in figure 1.

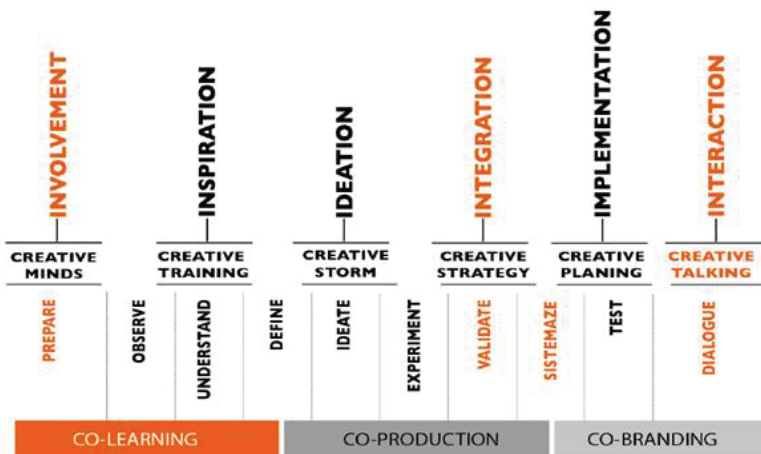


Figure 1.- Ideas(R)Evolution macro-processes: The six steps methodological process (Involvement, Inspiration, Ideation, Integration, Implementation, Interaction) and the ten sequential tasks (Preparation, Observation, Understanding, Definition, Ideation, Experimentation, Validation, Sistematization, Testing, Dialogue)

*Systematization, Testing, Dialogue*), based on DSchool Stanford. Source: UCIP Report- phase 1&2; Mateus et al., 2012.

Tim Brown declares: “Today we have the opportunity...to create a better life... by liberating design thinking power, creating new choices and new solutions for the world” (Brown, 2010).

The empirical work developed so far has proven very consistent and applicable, however it seems to be lacking a robust evaluation methodology that can fully appraise and validate its going forward in deeper scientific terms, thus allowing for its dissemination potential to be fully generalizable.

## **The case study of a co-creative innovation program**

An experimental test designated User Centered Innovation Program (UCIP) was conceived according to the original Ideas(R)Evolution - Unidcom/IADE methodology in response to a challenge by the major Portuguese energy producer and distributor to explore attitudes, motivation and consumer behavior for a more efficient and sustainable energy domestic consumption and to develop in co-creation innovative products and services supplied by intelligent networks in the high-tech pilot-region *Inovcity*, in Évora (pop 57.000) in the southeastern region of Alentejo in Portugal.

The program was designed in a sequence of exploratory observations and group dynamics (workshops), of motivation, involvement, co-participative ideation and prototype development of new products and services, seeking to obtain the consensual responses and complex/contradictory problem solving answers to the research challenge, involving a pre-selection of 45 stakeholders (see table 3) of the energy supplier company, by application of quali-quantitative methodology (e.g. individual questionnaires, Delphi rounds, In/out Innovation matrix and Triz methods; Krosnick, 2010, Altshuler, 1999; Listone & Turoff, 2002) for the construction of a shared innovation model (Cellular System Model; Mateus et al., 2010) in co-creation and continuous flux, for the identification of more efficient behaviors of electrical energy consumption and the development of new added value products and services.

The innovation test program (UCIP) was developed according to the following basic research questions and hypothesis:

RQ1 - Can motivations drive consumers to have a more rational and efficient behavior with home energy consumption in order to save and to better manage their electrical bills? These drivers can be one or more of following:

H1- More frequent information and communication within the community.

H2- Available messages focused on altruism and sense of community.

H3- Available new added value services and products (consumption alerts, personalized tariffs packs, management information systems).

H4 - Available more live interaction and multichannel energy consumption counseling from experts (energy suppliers).

RQ2 - Can it be expected that the energy supplier might motivate consumers to changing their behaviors? Mainly through:

H5- More information exchange (dialogue always on) available through gadgetry (portable meters, sms, call-center, energy audits, etc.) that convey in-use value and consumption patterns instant perception.

RQ3 - How can the energy supplier offer might contribute to motivate home energy consumers to collaborate with the company? Namely by one or both of following:

H6- New functionalities for consumption with timely management that induce involvement and convey immediate perceptions of energy savings and service value.

H7- Specifically adapted products and services to new emergent consumers' profiles (market segmentation).

The planning of the research programme is framed by three operational phases: Phase 1: Diagnostic; Phase 2: Co-creation and strategy; Phase 3: Dissemination. Phase 1 and 2 was composed of seven sequential group dynamics (workshops) with the participation of an ad-hoc fixed panel of stakeholders (clients, suppliers, employees, decision-makers, local authorities, etc.) of the energy company, and executed for a ten-week fieldwork period, in May/June 2012, at the University of Évora.

In the end of Phases 1 and 2 (Phase 3 is being developed at the moment), the results obtained were very significant, in qualitative and quantitative terms, concerning the diversity profile, quality of interaction, participation, motivation and involvement of the participants, fully corresponding to the study objectives.

Very interesting tangible proposals for the innovation of new products and services (e.g. service) were obtained that point-out solutions for: (a) domestic energy consumption behavior(s) and efficiency; (b) more intense relationship and involvement between the supplier, the client and the community.

The conclusions reveal two main consumer aspirational dimensions, or *attitudinal logics*: L1- Cooperative Dialog; L2- Services in Proximity, as the main motivational drivers for the energy consumption. Within these logics a large group of needs and desires (aspirations) are revealed by the participants.

As to L1 logic it revealed: (a) aspirations to have a "friendly" energy supplier in permanent "active listening" (dialogue) ; (b) needs to compare, learn and act in dialog with the neighbors (surrounding community); (c) desires to interact with the community (city residents) and exchange learning experiences for a better quality-of-life. As to L2 logic it revealed: (a) needs of infometrics supplied by peripheral intelligent equipment (gadgetry), easy to use (e.g. parameterizable and adapted to users' cognitive processes); (b) energy audits and certifications of domestic electrical and gas equipment; (c) dynamic and timely counseling (anytime, anywhere) for home comfort; (d) "à la carte" tariffs that can be individually adjusted to consumers' needs and consumption patterns, coupled with a choice of individual comfort&efficiency programs.

In the end an output of 14 tangible "ideas" co-created by the participants were prototyped and subsequently tested for usability having been obtained a rank of attributed importance/priority for each prototype. The results also show a consumers' predominant mindset in need of "humanized" relationships between client, supplier and community, of direct contact, personalization of service and permanent (always on) dialogue.

Thus, all research hypotheses (H1 to H7) were empirically confirmed.

## The validation method

In order to validate the empirical experiment (UCIP) a battery of quali-quantitative tests was developed according to the following research design.

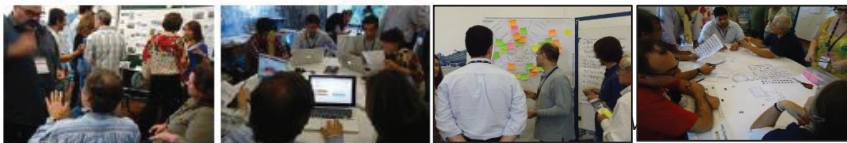
The innovation programme was constructed through seven workshops (group dynamics) with stakeholders, with the duration of 3hrs. each, on average, in Évora



University, from May to June, 2012, according to the following sequence, as described in table 1 and illustrated in figure 2

**Table 1. Programme methodological design**

Workshop #	Wks 1	Wks 2	Wks 3	Wks 4	Wks 5	Wks 6a	Wks 6b
date	2nd May	15th May	22th May	29th May	12th June	21st June	26 <sup>th</sup> June
Place: Évora/# pax	31	25	25	24	15		31
Lisbon/# pax	-	-	-	-	-	15	-
Methodology: macro-process	Diagnostic			Co-Creation		Strategy	
Sub-process	Involve ment	Inspiration		Ideation Co-creation		Integration	
objective task/tool	Prepare	Observe	Understand Experiment (usability)	Define Ideate Diverge	Ideate Converge Consensus Prototype	Validate Internal Delphi	Validate External Delphi Triz



### Characterization of participants

The workshop preparation started by the defining stakeholder’s categories. Stakeholders were defined as: All parties involved - internal or external - that are affected (have a direct or indirect relation) by an organization’s activities and efficacy practices, including clients, opinion makers, trend setters and partners (Accountability, 2011). The participants were preliminary selected from a database, received a telephone call and a later a written invitation to participate.

The initial stakeholder’s categories defined for the constitution of the participants panel is presented in table 3, as follows:

**Table 3. Stakeholders categories**

	number	freq.
<b>External stakeholders</b>		
Clients	14	31,1%
Opinion makers	6	13,3%
Trend setters	6	13,3%
Partners (independent trade professionals)	5	11,2%
<b>Internal stakeholders</b>		
Energy suppliers employees	14	31,1%
<b>Total stakeholders</b>	45	100%

The workshops participants’ profiles (gender, age and residence) were the following, as in table 2 :

**Table 2. Participants profiles**

	Wks 1	Wks 2	Wks 3	Wks 4	Wks 5	Wks 6b
	2nd	15th	22th	29th	12th	26 <sup>th</sup>
	May	May	May	May	June	June
<b>Gender:</b>						
<b>Female</b> (avg 25%)	7	7	6	6	3	4
<b>Male</b> (avg 75%)	24	18	19	18	12	11
<b>Age(years):</b>						
<b>≤ 39</b> (avg 45%)	10	13	12	13	3	8
<b>40 to 49</b> (avg 29%)	14	3	6	6	5	3
<b>≥ 50</b> (avg 26%)	7	7	5	5	7	4
<b>Residence:</b>						
<b>Evora area</b> (avg 62%)	19	16	16	13	12	11
<b>Lisbon &amp; other areas</b> (avg 38%)	12	9	9	11	3	4
<b>Total participants</b>	31	25	25	24	15	15

Workshops 1, 2, 3 and 4 had an average participation of 26 stakeholders. The overall average of *clients* in each workshop was eight ( 31 %) and of the other categories of external stakeholders was seven (27%). In total, the workshops had an average participation of 58% of external stakeholders. The average participation of internal stakeholders was eleven subjects (42%).

The large majority of participants was constant along the sequence of all workshop. Whenever absentees were noticed a procedure for its substitution was applied with success. From workshop 2 up to workshop 4, the number of participants was stable without any significant number of dropouts. Workshops 5 , 6a and 6b were intentional reduced to a lower number of participants in accordance with the methodological requirements. The participation of clients in the final three workshops was 54% on average.

## **Method for measurement of the Evaluation, Satisfaction and Behavioral Intention of participants**

The participants were divided in three proportional balanced groups. During the initial Workshop 1, a Belbin test (Belbin,2012) was applied for harmonization of the workgroups participants profiles and individual characteristics for a more efficient group dynamics, which resulted in minor adjustments and re-composition of the workgroups as from workshop 2.

At end of each workshop session, a self-fulfilled structured instrument was applied to each participant in order to identify the participants’ perceptions and attitudes. The questionnaire (see Annex 1) was composed by (a) a 2-item scales of emotional evaluation and 1 open justification question( Ekman faces); (b) a 9-item Likert scale with 5 balanced terms and (c) a 9-item attributed importance scale with 3 terms, for the discriminated evaluation of the sessions; and (d) 3-item Likert scales with 5 balanced terms, for evaluation of overall satisfaction and behavioral intention . At the end of the questionnaire profile characterization questions were collected.

The metric procedure was designed to incorporate several direct and indirect measurement components: Directly (a) an emotional dimension (Ekman, 2006), (b) a cognitive perceptual (quality and self-expressive/attractiveness) dimension (Christiaans, 2002) and (c) an attitudinal (satisfaction and behavioral intention) dimension (Cronin et al., 2002). Indirectly a set of three independent observers registered the groups’ dynamics in a structured instrument, designated “observer formulary” (see Annex 1), for latter contents analysis, for each workshop (except Wks 6a). All sessions were video recorded.

For each workshop, in agreement with the specific methodological objectives defined for each session, diverse group exercises and stimulus (tools) were applied, as referred in table 3.

**Table 3.** Exercises and stimulus applied

Exercises/ tools	Wks 1	Wks 2	Wks 3	Wks 4	Wks 5	Wks 6b
	2nd May	15th May	22th May	29th May	12th June	26 <sup>th</sup> June
<b>Belbin test</b> (profile adequacy)	√					
<b>Perceptions : Energy &amp; consumption</b>	√					
<b>Consumer experience</b> (prospection)		√				
<b>Observation of equipment use</b> (usability)			√			
<b>Definition of trends</b>			√			
<b>Ideas confrontation: divergence/convergence</b>				√		
<b>Tangibilization</b> (prototypes) In/Out Matrix					√	
<b>Consensus and solutions</b> (Delphi rounds and Triz matrix)						√

## Results

### *The exercises and stimulus applied*

The evaluation of the participants about the several tools (instruments) incorporated in the exercises was very positive, particularly in workshops 4 and 5 where stronger stimulus for creative collaborative participation were used, as shown in table 4 and figure 3

**Table 4.** Evaluation of exercises and stimulus applied

	wks 1		wks 2		wks 3		wks 4		wks 5		wks 6	
	M	sd	M	sd	M	sd	M	sd	M	sd	M	sd
<b>Tools</b>	3,62	1,01	3,78	0,52	3,78	0,99	<b>4,30</b>	0,56	<b>4,13</b>	1,06	3,87	0,52

Rating scale: Objectives (not achieved) 1 - 2 - 3 - 4 - 5 (totally achieved)

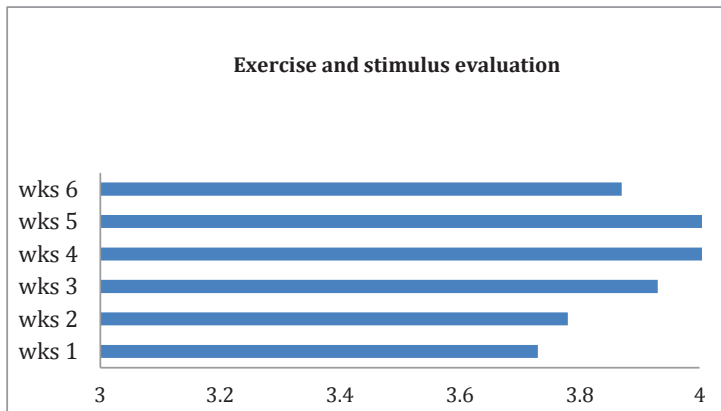


Figure 3. Exercises and stimulus evaluations. Source: UCIP Report- phase 1&2; Mateus et al., 2012.

### *The emotional evaluation*

In general terms, the individual emotional states recorded after the sessions are very positive. In average the majority of participants (58%) declare to be “Happy”; and a significant number (23%) declare to be “Surprised”. More than half (51%) of all participants report a “high” emotional intensity. The emotional “happiness” and emotional intensity grows constantly along the sequence of workshops, as represented in figures 4 and 5.

### Evolution of emotional states

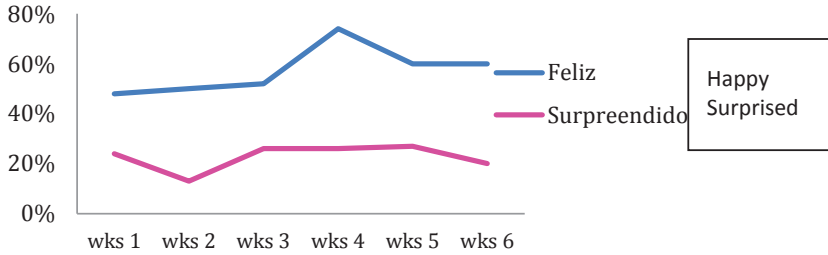


Figure 4. Emotional states evaluations. Source: UCIP Report- phase 1&2; Mateus et al., 2012.

### Evolution of emotional intensity

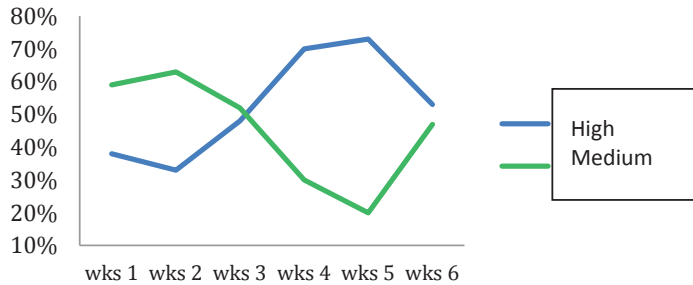


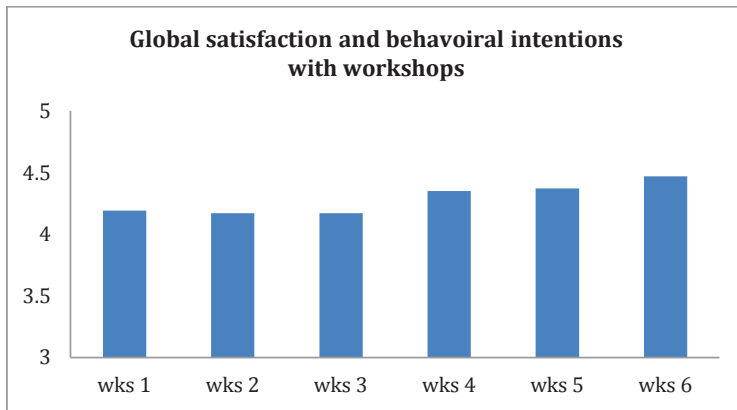
Figure 5. Emotional intensity evaluations. Source: UCIP Report- phase 1&2; Mateus et al., 2012.

## The perceptions and attitudes evaluation

The evaluation instrument aimed at measuring the participants perceptions and attitudes about: (a) the methodological tools employed in each workshop; (b) the discriminated quality performance and self-expressive capacity (attractiveness) of the workshops (c) the global satisfaction with the sessions' functioning and the behavioral intention of recommending and continuing the collaborative participation.

### SATISFACTION WITH THE WORKSHOPS

The participants average global satisfaction with the workshops contents and work method is very positive ( $M=4,26$ ;  $sd= 0,73$ ), and increases along the process, as in figure 6. This high satisfaction (motivation) is also revealed by the declared will of contributing further to the project (98,5%).



**Note:** Average summed scores of the scale: 1 (Totally disagree) to 5 (Totally agree).  
questions: *In general, I am very satisfied with this experiment + I would recommend this session and work method to other people.*

Figure 6. Global satisfaction and behavioral intentions with workshops. Source: UCIP Report-phase 1&2; Mateus et al., 2012.

### *Modelization of the evaluation of workshops*

The evaluation of the workshops was measured by a 5-point balanced agreement scale constructed with two dimensions: (a) Technical Quality and (b) Self-expression. This two-dimensional construct was inspired from a solid theoretic referential for the evaluation of creative processes (Christiaans, 2002). An exploratory principal components factor analysis, with varimax rotation, was executed confirming the significance of this two dimensional construct (KMO=0,896; tot.var explained= 62,645%; F1(Technical quality)=52,345%; F2(Self-expression)=10,292%)

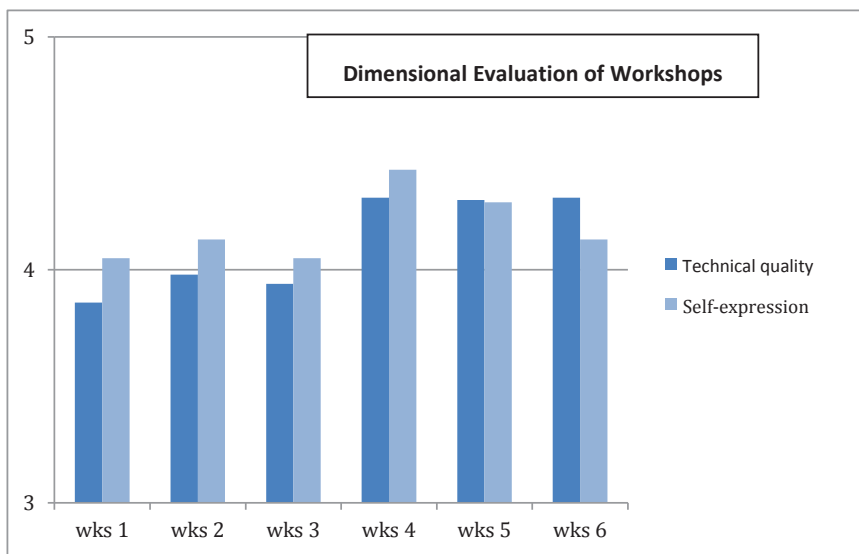
Furthermore, the reliability of the 12-item scale (9-item weighted agreement x importance scores + 3 un-weighted items) calculated for all workshops results is of high order (Cronbach's alpha= 0,871).

Overall, the participants evaluated the attractiveness of the workshops in a very positive manner and declare that the collaborative work there produced contributed for their self-enjoyment (*self-expression*). The evaluation of the two perceptual dimensions of the construct, weighted by the attributed importance for each item is constant all along the workshops, as in table 5 and figure 7. Besides, the "technical quality" of the workshops sessions is also very positively and incrementally appraised along the process. The two dimensions independence is significant ( $F(5,124) = 2,56, p < .05$ ).

**Table 4. Evaluation of quality and self-expression**

	wks 1		wks 2		wks 3		wks 4		wks 5		wks 6	
	M	sd	M	sd	M	sd	M	sd	M	sd	M	sd
Technical quality	3,86	0,42	3,98	0,61	3,94	0,78	<b>4,31</b>	0,61	<b>4,30</b>	0,70	<b>4,31</b>	0,61
Self-expression	<b>4,05</b>	0,51	<b>4,13</b>	0,59	<b>4,05</b>	0,58	<b>4,43</b>	0,60	<b>4,29</b>	1,05	<b>4,13</b>	0,91

**Note:** Weighted scales: 1. Totally disagree to 5. Totally agree



**Figure 7. Dimensional evaluation of workshops.** Source: UCIP Report- phase 1&2; Mateus et al., 2012.

One of the questions of the “technical quality” dimension (“we obtained positive results for improving energy consumption efficiency”) is highly correlated with the energy efficiency attitudinal expression. Overall this perception evolved positively along the workshops revealing that the participants’ view that the work produced in a cooperative manner can very importantly contribute for a more efficient energy consumption behavior, as shown in figure 8. The sequence measured is significant ( $F(5,124) = 5,03, p < .001$ ).

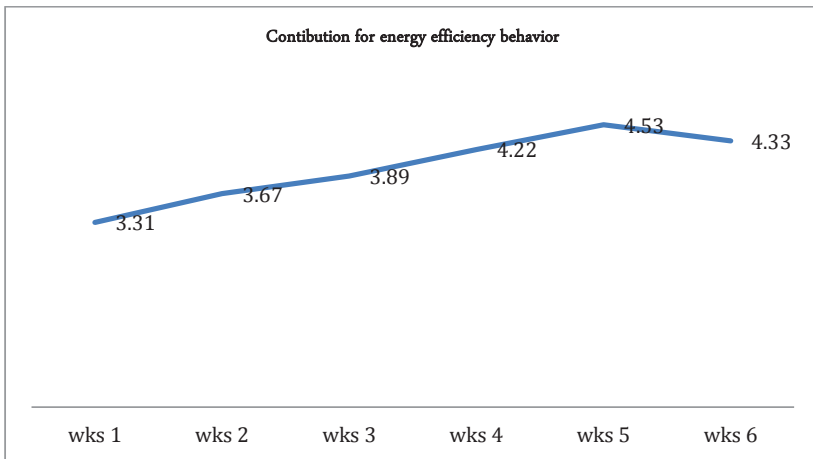


Figure 8. Average scores for the evaluation of “contribution to energy efficiency understanding”. Source: UCIP Report- phase 1&2; Mateus et al., 2012.

A linear regression analysis revealed that the two-dimensional construct (Technical quality and Self-expression) contribute to significantly explain the variation of Global satisfaction with the workshops . The results show that its contribution is very significant ( $Adj R^2 = .55, F(2,127) = 79,32, p < .001$ ). The Technical Quality perception is the more determinant factor for the Global Satisfaction of the participants with the workshops sessions ( $\beta = .62, p < .001$ ), followed by Self-expression (attractiveness + self-expression) ( $\beta = .18, p < .05$ ), as in figure 9.

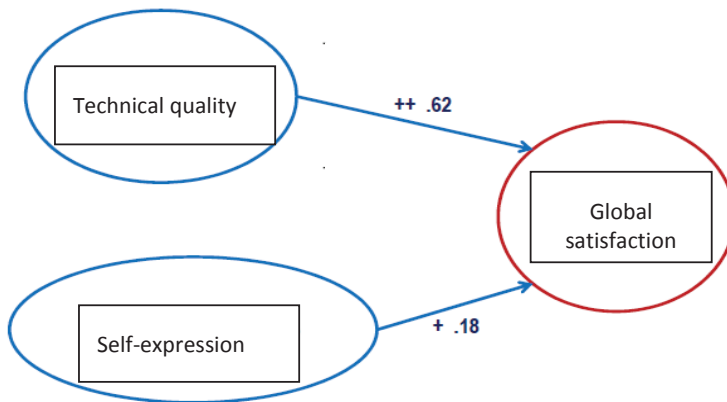


Figure 9 . Global satisfaction explanatory factors. Source: UCIP Report- phase 1&2; Mateus et al., 2012.

The equation for the prediction of Global Satisfaction with workshops (e.g. methodology) is resolved according to the following model:

$$GS = 4,252 + 0,62 \times TechQuality + 0,18 \times Self-expression$$



## Discussion

It can be concluded that the quali-quantitative methodology tested to validate the design thinking - Ideas(R)Evolution - procedures for the development of an energy supplier's UCIP (User Centered Innovation Programme) in Évora, Portugal, demonstrates the adequacy of the repeated measures mixed quali-quantitative method for an holistic dynamic evaluation of the workshops participants perceptions of the results efficacy and subsequent attitudes (e.g. satisfaction and behavioral intentions) towards the experiments. It reveals the program's evolution in two levels: (1) through a valid set of comparative standardized measures (quantitative structured metric data) related to the participants' emotional feelings and cognitive attitudes towards the workshops experiments; (2) through a rich set of exploratory qualitative data (qualitative semi-structured data) justifying the participants' opinions, attitudes, aspirations, behavioral intentions and perceived outcomes.

As often argued in the literature (Christiaans, 2002; Cronin *et al.*, 1992; Kelly, 2006, Kotler, 2010, Lusch, 2011. Mateus *et al.* 2011) the design thinking and marketing research inputs for the co-creation of value, innovation and creative intelligence within the microeconomic processes, is in need of a more accurate and operational set of measurements (proofing) and procedural validation that can bring to light and increment its full interventional potential, for a more credible and tangible evaluation of its action power in the development of the "economy of happiness"(Pralhad, 2004; Tofler, 2006).

This methodological validation of an user-centered open innovation program based on quali-quantitative methods, and applied through a longitudinal design by a set of self-administered instruments that diachronically collect the emotional and cognitive quantitative and qualitative measurements of the workshops, proves to be a robust and valid method.

The battery of the repeated measures plan applied demonstrates that the sequence of measures and instruments as a whole configures a parsimonious evaluative model, of which the method essayed is reliable, valid and most likely generalizable for future research.

The results also demonstrate that the methodological approach essayed adds accuracy to Ideas(R) Evolution methodology. In this light it is highly recommended that other replications and critical evaluations of this methodological approach are reproduced in diverse research contexts.

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# Annex 1












## Questionnaire - stakeholders

(original version)

UCIP\_Univ Évora\_Workshop nr. \_\_\_\_

Página A

Estados emocionais

Como é que se sente depois desta experiência?  Assinale com X somente uma opção	Aborrecido		
	Surpreendido		
	Irritado		
	Enojado		
	Ansioso		
	Feliz		
	Triste		
	Neutral		
Porquê? Descreva numa frase por que é que se sente assim:			
Qual é a intensidade do seu estado de espírito neste momento?	  	Baixa      Média      Alta	
Assinale com X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Vire a página sff

Avaliação final	<u>Assinale e sua opção com um X</u>	
Quanto aos exercícios em que participou, em que grau considera ter atingido os objetivos de trabalho propostos?	objetivos (não atingidos) 1 - 2 - 3 - 4 - 5 (totalmente atingidos)	
<b>Exercício 1</b> (desenvolvimento e confronto de ideias - Mind mapping)	1	2 3 4 5
	<b>1</b> Assinale a sua opinião relativamente a cada um dos aspectos	<b>2</b> Atribua uma classificação sobre a importância que tem para si cada um dos aspectos
Quanto à avaliação desta sessão de trabalho, por favor indique a sua opinião sobre as seguintes afirmações (aspectos):	Discordo totalmente 1 Discordo em parte 2 Não sei / sem opinião 3 Concordo em parte 4 Concordo totalmente 5	Pouco importante 1 Importante 2 Muito importante 3
Este trabalho teve uma boa qualidade técnica	1 2 3 4 5	1 2 3
As técnicas utilizadas permitiram-me trabalhar melhor as temáticas	1 2 3 4 5	1 2 3
Teve uma dinâmica adequada	1 2 3 4 5	1 2 3
Permitiu exprimir os meus pontos de vista	1 2 3 4 5	1 2 3
As soluções encontradas utilizam algumas das minhas ideias	1 2 3 4 5	1 2 3
Obtivemos resultados positivos para o objetivo de melhorar a eficiência energética	1 2 3 4 5	1 2 3
Estas técnicas de trabalho são muito atractivas	1 2 3 4 5	1 2 3
O trabalho de equipa permitiu encontrar melhores soluções	1 2 3 4 5	1 2 3
Obrigou-me a pensar muito mais sobre o consumo de energia	1 2 3 4 5	1 2 3
<b>Para terminar</b>		
Em geral estou muito satisfeito com esta experiência	1 2 3 4 5	
Recomendaria esta sessão e método de trabalho a familiares e amigos	1 2 3 4 5	
Sinto que quero contribuir mais para este trabalho	Sim _____ Não _____	
<b>Indique o seu perfil</b>		
Género	Masc _____	Femín _____
Ano nascimento	_____	
Profissão /Actividade profissional	_____	
Residência(código postal completo)	_____	

Obrigado

## Observers formulary

(original version)

### Observadores

Enquanto decorre a aplicação de cada ferramenta: observa junto dos grupos de trabalho, toma notas e com vídeo à mão tira apontamentos (provas)

Descreve sinteticamente por palavras próprias (por bullets/tópicos)	Exercício 1 Ferramenta_ Confronto ideias / MIND MAPPING
<p><u>1. Aprecia a intensidade /nível da dinâmica:</u></p> <ul style="list-style-type: none"><li>- interação: Forte - fraca (F - f)</li><li>- organização tarefas: Boa-Má (B - M)</li><li>- liderança/papéis desempenhados: Activa-Passiva (A-P)</li></ul> <p><u>2. Toma medidas correctivas:</u> Fala com o Facilitador e /ou focaliza o grupo na tarefa. Regista apontamentos</p>	
<p><u>3. Regista ideais-força</u> que vão ser importantes para utilizar nos outros workshops mais tarde. (com apontamento/prova em vídeo se possível)</p>	
Dia:	
Grupo nº:	

## “Learning by doing” revisited: an interactive experience in teaching design methods

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**Abstract:** *This study represents an interactive experience towards conducting an undergraduate theory-based design course, ‘Design Theories and Methods’ in a product design department. These types of theoretical courses are usually conducted with a classical form of teaching where the lecturer is in a dominant position and bestows knowledge upon the learner (Wood and Rust, 2003). However, according to constructivist learning theory, knowledge cannot exist independently of the knower, but must be constructed through his own understanding of the situation (Hein, 1991). Therefore while a ‘revisit’ to Bauhaus education model is suggested, the main hypothesis is that “learning by doing” would provide a better learning process for the students and considering that the success of the students depend on their engagement in what they are learning, (Bayer, 1976). With this approach, students are made responsible for the ‘teaching’ within teamwork where the students are positioned to be active and creative where the lecturer is providing guidance (Yazici et al, 2001). The outcomes of the study show that students endeavor significantly more to learn and reformulate the topics in order to teach, and the interaction between students allows a more effective process for learning.*

**Keywords:** *Learning by doing, constructivist learning theory, teaching design methods.*

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We believe in learning by experience, which naturally lasts longer than anything learned by reading or hearing only.

Josef Albers

## **Introduction**

Design education requiring students’ active involvement and interaction with the lecturer and with other students is based on studio lectures where development of ideas meets practicing with materials. Although studio lectures cover the wide range of the undergraduate education programme there are still theoretical lessons, which are supposed to support the studio lectures conceptually and provide the students with a deeper understanding of what they are actually doing in studios. Unlike studio lectures, which are developed and specified for design education, theoretical courses do not have any specific formulation for design education. They are given as in many other undergraduate programmes where the lecturer tells and students listen to him/her corresponding to the traditional learning theory. The problematic thing observed here is that the theoretical knowledge cannot be efficiently transferred to the area of design practice. This actually requires moving away from traditional theory teaching and causes a search for more interactive methods specified for teaching design theories.

Based on constructivist learning theory and with a revisit to Bauhaus education model, this study represents a teaching experience, which focuses on the principle of ‘learning by doing’. Thus it is an attempt to involve the concepts of interaction and experience with a theoretical design course where design methods are taught to first year undergraduate design students. The paper gives a detailed explanation of the methodology used during the course, which basically consists of three main processes, such as, preparing the course content, practicing in the class and evaluating the outcomes.

## **Towards constructivist learning theory and Bauhaus education model**

The theory of constructivism suggests that we create our own reality and the knowledge to support it. We make sense of the world through building upon prior knowledge (Goodman 2008). Thus, constructivism has an interdisciplinary perspective covering psychological, sociological, philosophical, and critical educational theories. Considering the educational perspective, it focuses on the learner rather than the teacher. It is the learner who interacts with his or her environment and thus gains an understanding of its features and characteristics. It is the learner who constructs his own conceptualizations and defines, evaluates and solves problems throughout the learning process. Constructivist learning theory lets students make their own interpretation and thus build their own knowledge upon their individual understanding. The approach of constructivist learning theory is to keep students actively involved in the learning process so that they become the controllers of this process according to their own evaluation.

As Dewey (1997) states, the trouble with traditional education was that the educators did not consider the other factor in creating an experience; namely, the powers and purposes of those taught. It was assumed that a certain set of conditions was intrinsically desirable, apart from its ability to evoke a certain quality of response in individuals. This lack of mutual adaptation made the process of teaching and learning



accidental. For Dewey (1916), knowledge emerges only from situations in which learners have to draw them out of meaningful experiences. These situations have to be embedded in a social context, such as a classroom, where students can take part in manipulating materials and, thus, forming a community of learners who construct their knowledge together. Students cannot learn by means of rote memorization; they can only learn by “directed living,” whereby concrete activities are combined with theory. The obvious implication of Dewey’s theory is that students must be engaged in meaningful activities that induce them to apply the concepts they are trying to learn.

Considering the practice of the constructivist learning theory in the field of design education, the corresponding approach is the Bauhaus education model where design students were supposed to ‘learn by doing’. Bauhaus education model is a guide for lecturers how to engage students to interact and collaborate for a more effective learning process.

While the concept of a Basic Course is one of the greatest legacies of the Bauhaus, it was a notion that had many precedents in progressive educational reforms of the nineteenth-century, particularly in the *kindergarten*, as developed by its founder, Friedrich Froebel. Froebel’s greatest influence was the Swiss educator Heinrich Pestalozzi, whose concept of sensory education was an application of the Enlightenment ideals set forth by Jean-Jacques Rousseau (Lupton and Miller 1993). It was Johannes Itten who was giving the Basic Course and stated that “a teacher who communicates to his students nothing but the syllabus laid down by the authorities, using methods he learned at the teachers’ training college, can be compared to a dispenser of pills made up according to prescription, who can never be a true physician” (Itten 1975).

Accordingly, Josef Albers’s pedagogic emphasis lay in practical, concrete exercises; in “learning through conscious practice”. Albers included a discussion of “methode” among his course outline, lectured on the topic of “creative education”, and published “Werklicher Formunterricht”, an essay in which he laid out his views on education as a balance of discipline and freedom, experimentation, and the encouragement of controlled mistakes. The dialectics of education – the process of drawing out rather than imposing information and knowledge – became even more pronounced in the radically new context of Black Mountain College, where the importance of facilitating exchange among students was essential to the collaborative nature of the institution and its educational program. His courses are laboratory classes that aim “first at observation and articulation, that is, conscious seeing”, and emphasize the “control of means, hand, [and] tools, as well as the collaborative, comparative nature of peer review and critique as fostering “self-criticism and judgement” (Saletnik and Schuldenfrei 2009).

To summarize, constructivism in educational terms emphasizes learning and not teaching, encourages learner autonomy and personal involvement in learning. This means that the learning experience is both subjective and objective and requires that the lecturer’s culture, values and background become an essential part of the interplay between learners and tasks (Kukla 2000). The task or problem is thus the interface between the lecturer and the learner (McMahon 1997). This creates a dynamic interaction between task, lecturer and learner. The constructivist learning theory thus emphasizes the importance of the relationship between the student and the lecturer in the learning process (Savery 1994).

In addition, it requires certain collaboration among learners. Learners with different skills and backgrounds should collaborate in tasks and discussions to arrive at a shared

understanding of the truth in a specific field (Duffy and Jonassen 1992). Many successful implications of this approach can be observed at Bauhaus. To have an effective collaboration between the learners, they should constantly be challenged with tasks that refer to skills and knowledge just beyond their current level of mastery. This captures their motivation and builds on previous successes to enhance learner confidence (Brownstein 2001). Another important aspect for an effective interaction and collaboration is to engage the learners not only to participate in the problem-solving process, but also in the definition of the problem itself (Derry 1999).

Within the scope of this study, the attempt is to find a way to apply the constructivist learning theory premises, such as, creating a dynamic interaction between learner, lecturer and task; providing collaboration among learners and engaging and challenging the learner for a theoretical design methods course. Thereby, it is an experimental approach, which borrows from Bauhaus principles and adapts them on a theoretical field.

## **The course ‘Design Theories and Methods’**

The course Design Theories and Methods aims to give an insight to the first year students to have an understanding of design processes and methods. It is the target of the course to involve student participation and application of different creativity techniques in idea or concept generation. The course is positioned in the second semester of the undergraduate course programme in the Department of Industrial Product Design at the Technical University of Istanbul. The expected learning outcomes for students are listed as:

- Understand how design is made as a human activity.
- Understand on a broad level the phases of design process
- Understand the research bases of design as individual and group activity and understand gathering information not only from Internet and library but also from the designers and producers.
- Develop the basic skills on writing, visualizing, and reporting of the gathered information.
- Learn to find new ideas applying creativity techniques and how to collaborate with colleagues.
- Understand the importance of relations between industrial design, user, customer and producer.

The course has been conducted with classical teaching methods where the lecturer used to tell and students used to listen to her during the lectures. Generally, the lecturer was making presentations with textual and visual content, and students were expected to ask questions whenever they could not understand something.

In this section of the study, the course is examined to give information regarding how the lectures were conducted in the last semester. Thereby, the formulation of the content, the process in the classroom, and the evaluation of the students are examined.

### ***Content***

Delft Design Guide (Figure 1) is used as textbook of the course Design Theories and Methods. Edited by Annemiek van Boeijen and Jaap Daalhuizen, Delft Design Guide

presents an overview of product design approaches and methods used in the Bachelor and Master curriculum at the Faculty of Industrial Design Engineering in Delft. The design guide is largely based on existing books and articles and it gives brief information about the chosen methods and examples of practice (van Boeijen and Daalhuizen 2010).

It consists of three main chapters: Approaches to Product Design in Delft, Design Methods, and Competences in Design. Considering its relevance to the main content of the undergraduate course Design Theories and Methods, the second chapter 'Design Methods' is given to the students. The chapter 'Design Methods' has four main parts, which are Creating a Design Goal, Creating Product Ideas and Concepts, Decision and Selection, Evaluation of Product Features. Each part consists of summarized methods and techniques related to the relevant title.

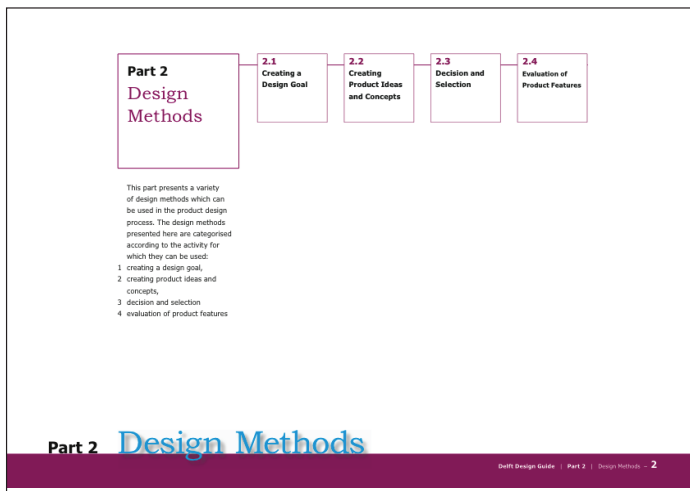


Figure 1. Delft Design Guide – Part 2

The textbook Delft Design Guide has been useful for the students since it was written in a simple way so that students could understand the described methods and techniques generally. Furthermore, what the students have found most attractive about the book is that it emphasizes key steps of each method and suggests possible exercises. However, some students claim that most of the methods are best understood after talking about them in the classroom.

The syllabus of the course is formulated around the second part of the guide and thereby, parts of this chapter are distributed to the 13-weeks schedule of the course programme. The idea while preparing the syllabus was to emphasize the part 'Creating product ideas and concepts' and locate other techniques parallel to them in accordance in each class.

### *In the class*

There are 50 students taking this course and they are divided into groups of 5 and each group is assigned a certain technique. Each group is to make a short presentation of the technique and guide the other groups. They are to inform the class about the necessary equipment needed during the exercise, for ex: post it notes, pens, papers, images, music, and etc.

Each lecture is divided in two main parts: In the first part, the instructor group explains the methods with a presentation from the theoretical perspective. The second part of the lecture is reserved for exercising: The whole class defines a design problem together with the lecturers and then works on it with the relevant techniques to create product ideas, concepts, solutions, and etc. The responsibility of the instructor group thereby is to manage other working groups and supervise them if they need to.

The lecturer’s role in the class has thus become a participant observer who clarifies topics for students and gives instructions at some necessary points during the exercises.

#### PRESENTATIONS

Presentations are prepared and carried out by students. Each week another student group is assigned to prepare a presentation about the relevant method and works as the ‘instructor group’ for the class.

Since the instructor group is required to explain the method to the class, the group should study the method well in order to get a good understanding of the subject so that it could be able to explain it to the class. It has thus been a collaborative experience both for the instructor group and the rest of the class where they could communicate with each other in a much comfortable way than they would communicate to a lecturer (Figure 2).



*Figure 2. Instructor group’s presentation in the class*

Topics of presentation are taken from the textbook Delft Design Guide and listed under main titles as below in the Table 1:

**Table 1: Topics of presentation**

Creating a design goal	Creating product ideas and concepts	Decision and selection	Evaluation of product features
Strategy wheel Trend analysis Cradle to cradle EcoDesign checklist EcoDesign strategy Collage techniques Process tree WWWWWH Problem definition Checklist for generating requirements Design specification (Criteria) Design vision	Brainstorming How To's Mind Map Synectics Function Analysis Morphological Chart Roleplaying Storyboard Written Scenario Context Mapping	C-Box Itemised response and PMI vALUE Harris profile Datum method Weighted objectives method	Product simulation and testing Product concept evaluation Product usability evaluation

The instructor group is also required to define a design problem on which the explained method can be used. The lecturers are needed at this stage to formulate a clear design problem. Also, whenever the class cannot understand something about the topic, the lecturers help to clarify the issue with further explanations and examples.

An example for this situation is the 'analogy chart' that the instructor group has prepared before the class for the exercise (Figure 3) and these charts were filled during the class by other students:

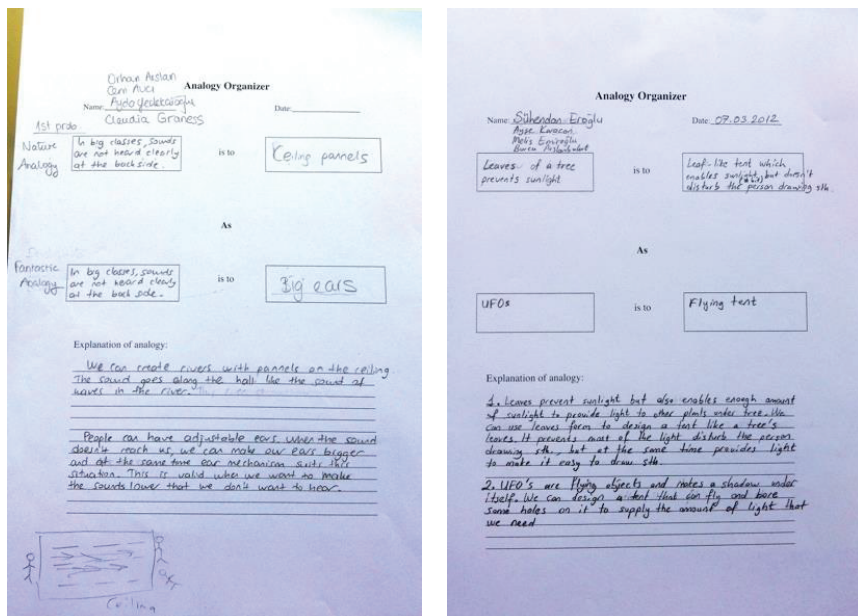


Figure 3. Analogy charts from exercises in the class

It should be kept in mind that the instructor group consisted of students who did not have any primary experience on teaching something, and therefore, the transfer of knowledge was problematic at some points. However, considering the constructive learning theory, which this study relies on it has been another attempt to keep the active position of the learner. Furthermore, in this triadic structure of the class, the constantly changing roles of teacher and learner make the boundaries between learning and teaching invisible, which result in a dynamic and interactive relationship based on instant feedbacks.

#### EXERCISES

Exercises are conducted after the presentation sessions where students work in teams and the instructor group helps them during this process. During the exercises, a high participation of students is observed. A collaborative platform has occurred where each group / student in the group is free to create his / her own experience and share it with others. So, it is an experimental and interactive atmosphere both for the students and the lecturers. Apart from the learning experience, the social interaction dimension in the class is also worth to consider. The sharing of the information provides a more effective learning process (Figure 4). Exercises lasted about 40 minutes in each lecture.

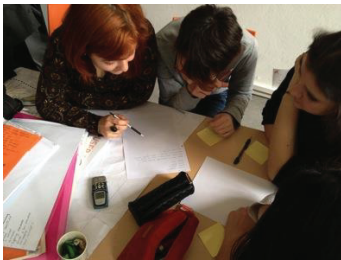






Figure 4. Exercises in the class

Some examples of mind mapping exercises' outcomes are given in the Figure 5 below.

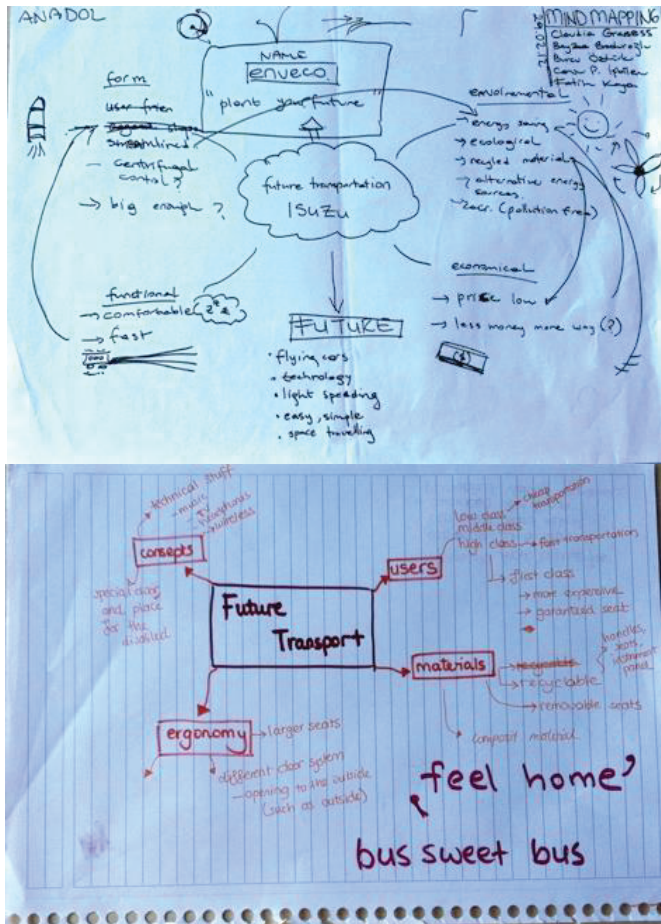


Figure 5. Mind map exercises

Other interesting results came out of the storyboard exercises (Figure 6):

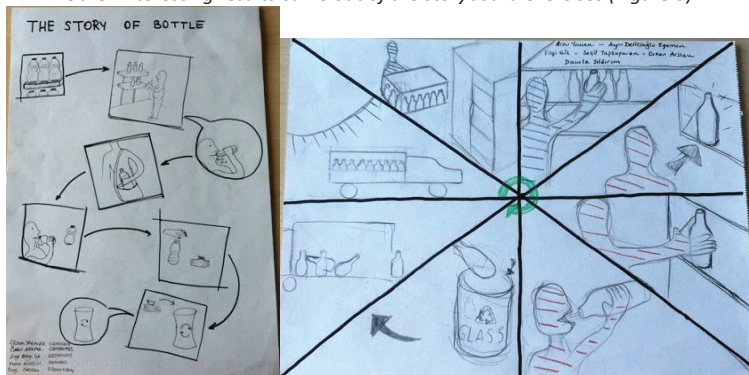


Figure 6. Storyboard exercises

It is remarkable that students show an effort to specify their work and try to differentiate from others. In this storyboard exercise, for instance, each group tried to design its own ‘storyboard form’ although it was not expected from them. Thus, it was an opportunity for students to express their individual approaches not only to the content but also to the form of the storyboard.

### Evaluation

The evaluation process of the students consists of two main components: the midterm exam and the final assignment.

#### MIDTERM EXAM

The midterm exam consists of two main parts:

In the first part, students are asked to explain the techniques (synectics, function analysis and morphological chart) in terms of when and how they are used with the stages of applying the technique. This part is to evaluate whether students have the ability to explain what they have understood so far in detail. In the first part of the midterm exam, it is observed that students had difficulties in describing the methods textually.

In the second part, the image of a product is given (the soap dispenser), and the students are asked to analyze this product using two different techniques (process tree and WWWWWH). This part is to evaluate whether students have really understand the techniques and can apply them to different products. Considering the second part, where students are asked to use certain methods to analyze the given product, it is possible to say that all have been successful in doing this.

#### FINAL ASSIGNMENT

In the final assignment of the course, students are required to design a ‘super hero’ or a ‘super tool’, which should be associated with at least one primary function (as a superior ability), such as cutting, drilling, hammering, freezing, deleting, etc., or one that they can define on their own. The final assignment consists of four main parts:

First of all, in order to create their own design goal, students are required to start their project by making a “trend analysis” of super heroes and related function/s and then to present the results by using “collage techniques”.



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Secondly, they are asked to create product ideas and concepts, to use the “mind map” technique to demonstrate and decide on the basic characteristics and the name of the hero and continue developing the hero/tool using the “synectics” technique and the results from the mind map exercise.

In the third part, students are expected to give a simple representation (drawing, model, picture of a model, and etc.) of their super-hero/tool.

Finally, they are required to show how their super-hero/tool fulfills his/her/its function in a “storyboard”.

Here are some examples of the final assignments in Figure 7 and Figure 8:

<p style="text-align: center;"><b>Example 1</b></p> <p style="text-align: center;">design theories &amp; methods    super hero/ tool    ayda mazyayim yadkicagau</p>	<p style="text-align: center;"><b>Example 2</b></p> <p style="text-align: center;">design theories &amp; methods    super hero/ tool    ayda mazyayim yadkicagau</p>
<p style="text-align: center;"><b>creation product ideas synectics; nature analogy</b></p> <p style="text-align: center;">design theories &amp; methods    super hero/ tool    ayda mazyayim yadkicagau</p>	<p style="text-align: center;">design theories &amp; methods    super hero/ tool    ayda mazyayim yadkicagau</p>
<p style="text-align: center;"><b>SUPERVISION</b> telescopic vision tool</p> <p style="text-align: center;">Design Theories &amp; Methods / Super Hero/ Tool / Ayda Yadkicagau</p>	<p style="text-align: center;">design theories &amp; methods    super hero/ tool    ayda mazyayim yadkicagau</p>

Figure 7. Examples of final assignments



Figure 8. Examples of final assignments

The final assignment is formulated to assess whether students understood the techniques and can exercise them on their own. In addition, the aim of the final assignment is to show the students the techniques and methods in their appropriate position during the design process and emphasize how these techniques support the whole process if they are used properly. Finally, for a general evaluation of the class, it is possible to claim that the majority of the class has understood and used the techniques and methods in a proper way.

## Conclusion

Revisiting Bauhaus education principles, which are specified for studio lectures in design field and applying them on a theoretical design course with the approach of

constructivist learning theory created the experimental approach of this study. The effort to create a better learning process for students and a much productive teaching process for lecturers mainly focuses on three key stages: Creating a dynamic interaction between learner, lecturer and task; providing collaboration among learners, and engaging and challenging the learner. Thereby, it was also a challenge for the lecturers how to make a theoretical course as interactive as possible.

The presentations that instructor groups should make every week is the biggest challenge for students and but it is also one of the biggest motivations to learn the subject. As mentioned before, this responsibility of explaining something to the class helps each instructor group to try and find the most appropriate way to understand that something. This is followed by the dynamic interaction in the class where each week’s design problem is formulated and revised together by the students and the lecturers through a short discussion. The interaction continues to the collaboration during the exercises in the class. Students learn by doing and they learn from each other so that they can also discover *how they learn* in their individual way.

In terms of self-criticism, it should be given that it is a challenge to manage the presentations where the instructor group of students explains the methods to the class. There was no standard among the presentations and this caused a difficulty for the rest of the class to follow at certain points. However, there were also surprising outcomes of this process as listed below:

- The visual and textual presentation quality improved each week although the lecturers intentionally made no comments about the presentation quality.
- Students have searched for other references and used them in their presentations in addition to Delft Design Guide on their own although they were not asked to. It was an effort to get a deeper understanding of the topic.
- The effort was not only to get a better understanding but also to give better explanations. So, students started to think about ways through which they can ‘teach’ the class more effectively. And the prepared ‘analogy chart’ was an example of that.

Considering the changing focus from the lecturer to the learner, this study is an attempt to improve the teaching and learning quality of the course ‘Design Theories and Methods’, however, it proposes, in a much general way, the change in the approach of theory teaching in undergraduate level and can be improved for further studies.

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# Simon Says Syndrome in Art and Design Education

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**Abstract:** *Learning is an important ‘task-conscious process’ that help changes in behaviour (or potential for change). In other words, learning is seen as an outcome - the ‘end product’ of some process. The ‘Simon Says Syndrome’ term was coined based on observation where teachers provide little learning for students other than the experience of doing. This resulted in students being apt at following instructions rather than exploring the process of learning. This paper also argues that ‘Simon Says Syndrome’ may be defined or reflected from the set of conventional practices and systems for teaching (or learning) especially within the art and design context; which ways and methods of teaching for the acquisition of necessary knowledge and skills are through the application of sequencing and memorising of instruction as a skill. The art and design field need students to acquire problem solving skills, which tends to require a much higher level of perfection to represent and solve problems. The danger of “Simon says Syndrome” also lies in the learnability and acquisition of principles in development of ideas. This is evidence in Malaysian classroom, where it is common for the art and design teachers to offer students suggestions or solutions by memorising and imitating techniques and examples of artwork from the books. This paper discusses on issues concerning teaching and learning experiences in art and design in Malaysia.*

**Keywords:** *Art and Design, Teaching and learning experiences, learning activities, behaviour.*

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## Introduction: The learning process

‘Reflection: the foundation of purposeful learning’

Learning is an important ‘task-conscious process’ that help changes in behaviour (or potential for change). Many theorists have, been less concerned with changes in obvious behaviour but are more concerned with changes in the ways in which people ‘understand, or experience, or conceptualise the world around them’ (Ramsden 1992). In other words, learning is seen as an outcome - the ‘end product’ of some process. According to Carl Rogers (1993):

I want to talk about learning. But not the lifeless, sterile, futile, quickly forgotten stuff that is crammed in to the mind of the poor helpless individual tied into his seat by ironclad bonds of conformity! I am talking about LEARNING - the insatiable curiosity that drives the adolescent boy to absorb everything he can see or hear or read... I am talking about the student who says, "I am discovering, drawing in from the outside, and making that which is drawn in a real part of me."... Now I'm grasping and comprehending what I need and what I want to know!  
Carl Rogers (1993)

What Carl Rogers implies is that learning is no longer just about gaining knowledge but also focuses on the ability of comprehending what is learnt through experience and making informed decisions. This evidently will ensure the depth or nature of the changes hence ensured a successful learning process. Säljö (1979), Ramsden (1992) divided learning into five different categories:

1. Learning as a quantitative increase in knowledge. Learning is acquiring information or ‘knowing a lot’.
2. Learning as memorising. Learning is storing information that can be reproduced.
3. Learning as acquiring facts, skills, and methods that can be retained and used as necessary.
4. Learning as making sense or abstracting meaning. Learning involves relating parts of the subject matter to each other and to the real world.
5. Learning as interpreting and understanding reality in a different way. Learning involves comprehending the world by reinterpreting knowledge

Ramsden (1992)

Ramsden argues that learning as quantitative increase in knowledge, as memorising and acquiring facts, skills and methods as ‘a less complex view of learning’. In this fact, learning is something external to the learner. This is the conventional classroom learning and teaching commonly practiced in Southeast Asia generally. Acquiring knowledge has become a bit like shopping. People go out and ‘purchase’ knowledge - it becomes their possession. The last two learning processes look to the ‘internal’ aspect of learning. Learning on these two final levels is seen as something that one do in order to understand the real application. Hence the latter learning processes are important and should be a crucial element especially in art and design education.

Based upon researchers’ personal experience in teaching and observing teachers in Malaysia, many problems assigned by art and design teachers provide little learning for



students other than the experience of doing. Students were often 'spoon-fed' with instructions, notes and often rely on those instructions rather than take full responsibility of their own learning. Rather than take chances with their art and design work, students tend to be wary of what they have to offer, and are less explorative with their ideas. Therefore, it is a common scenario to see students waiting for further instructions before moving to the next stage of their design. As a result, 'spoon feeding' becomes an unhealthy practice and alarming phenomenon. Hence students are apt at doing rather than learning.

The 'Simon says Syndrome' is the extension of the 'spoon-feeding' learning. As teachers, what was observed countless times, students are afraid to take initiatives with their own ideas or explore limitless possibilities at the chance of being 'punished' for thinking outside the box. 'Follow whatever the teacher says' is the heart of the 'Simon says Syndrome'. Limiting the inquisitive minds to explore myriads of learning outcomes, would further guarantee more timid and less resourceful learners in the near future.

It is never easy to find the 'perfect' method in teaching especially in the field of art and design. Some academics argue that the field of art and design itself has become much more complex as theories of knowledge have changed. This paper attempts to give a concise yet clear clarification of the term art and design in relation to education. Within this framework, the notion of 'Simon says syndrome', its contributing factors and consequences are discussed.

According to Smith (2001) 'the term art (and design) education is generically describes any form (often institutional) educational activity that involves art (and design), and it is used to describe the specific study of that activity'. Hence in this instance, the definition of art and design education is generally accepted as a field of study rather than a discipline, and because art and design is so varied, no clear or consistent single method or approach to its inherent methodology. As a result many different and external disciplines have been applied to this field and these have influenced in turn both general and specialised art and design education pedagogy.

Secondly as political, social, economic and technology progresses so does the way design evolved. The history of art and design education reflects not only a relationship to general education but also influences from the social sciences, advances in technologies and the conceptual and visual changes which occur within the field of art and design practice. Its boundaries and complexities have been and still are infinitely variable even elusive, and changes and shifts whether to do with politics and social issues, fashion and trends or connected to highly specific cultures and sub-cultures are an essential part of the content of art and design education. Indeed change itself is an intrinsic and unavoidable component.

Finally the quest to understand self and to examine the nature of experience, representation, identity and subjectivity has always formed the basis of cultural exploration. The need to justify explain and relate to these issues has taken place through philosophy, sociology and historical study, disciplines which have provided discrete methodologies which have brought new emphases and understanding. The more complex society and art and design forms become, the more relevance of these disciplines shifts and it is continual shifting, sometimes of necessity and at other times the dictate of fashionable trends that form the impetus for teaching and learning.

In this sense, the old school style of teaching using chalk and board, textbook and the conventional classroom learning is also no longer viable. What is needed is the reflection of how art and design is highly inter-related with fashion and trends, social



and political issues are developing hence demolishing the anxiety of focus on the relationship of theory to reflective practice. It is crucial as academician and teachers we look at these developments. It gives clues and possible directions when approaching the best possible method in parting knowledge, specific study activity and encouraging critical creative thinking in art and design education.

It is time to stop for a moment and think about the past learning and teaching experiences. Most educators are already well established in this reflective process. Educators in the field of art and design have been trained to analyse what they do in the course of their everyday work so that they can find the best ways to make a difference for the learners they teach. Qualified teacher should be well established in this reflective culture, should understand that in order to continue to improve and learn more about effective teaching, they need to make time and space to think carefully about what they are doing in their sessions and for the organisation as a whole. By reflecting and constructively analysing in this way educators will find new and better ways of teaching and develop professional competence across an increasingly broader range of knowledge, skills and expertise. The focus must be on factors that influence learning rather than on what is presumed to be an interesting problem. Effective teaching entails identifying what students gain by doing problems, and using content, process and criteria directed towards learning.

## **‘Simon Says Syndrome’: Understanding the Symptoms**

### *Historical Contribution*

Before the advent of British colonial period (1786-1956), the education system in Malaya was principally about the teaching of Islamic studies (*Fardhu Ain*) since the era of Malacca sultanate and with the spread of Islam in the 15<sup>th</sup> century. It was centred within teachers' private home where students learn to recite the Quran in the houses of their teachers commonly known as *Ulama*. Due to increasing number of students, the teaching was conducted at mosques and *madrasah* and finally placed within religious institutions called '*Pondok*'<sup>1</sup>. From the '*Pondok*', a style of disseminating knowledge was transformed to a formal school based learning system under the British which is still applicable today which was based on Barnes Report 1951<sup>2</sup>. According to Stedman (1986), Malaysian education system is patterned after the British education system.

At the end of the British colonialism era, several group of educated Malays including Abdul Razak then the Education Minister, headed a special committee to revamp the pro-colonial education system which represent the new national interests. This report known as the Razak's Report (1956) act as a catalyst in establishing the Education Ordinance 1957. This ordinance recommends the promotion of cultural (inclusive of art), social, economic and political development accepted by the nation as a whole. Stedman (1986) reported:

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<sup>1</sup> At the religious institutions, there was no standard syllabus and the content and delivery were based on curriculum used in Al Haram Mosque in Mecca.

<sup>2</sup> L.J. Barnes (Director of Social Training from Oxford University) was appointed to investigate and study the type of education system suitable to be implemented in Malaya. The report is to highlight the establishment of primary education which is not racist and using Malay and English language as a medium of instruction.

'After independence in 1957, Malaysia began building a nation with which all the ethnic groups could identify. Parliament's enactment (1957) of the Education Ordinance, which made Bahasa Malaysia a common national language to be used in a unified system that would preserve the language and the culture of the different ethnic group in the country, was seen as a key in building national unity' Stedman (1986: 4-5)

Since Razak's report, the educational curriculum has undergone several changes to suit the aspiration of the Malaysians. This speeds up the process of national integration and unity. The Rahman Talib's report was set up to review the education policy in 1960 which became a basis to establish the Education Act 1961. The act provides the legal basis for enabling national language to be a compulsory subject in primary and secondary school and all training institutions. However, the Act provides little framework on art education. The main objective of the education is to promote the cultural, social, economic and political development of the nation.

According to Shukor Hashim (1989), the art papers were not a compulsory subject to pass in order to be elevated to the next level. Art was merely an optional subject. Little effort has been made to change this direction or concept of art teaching (Zain, 1978, Hassan, 1978). In addition, parents and children viewed art subject as least important as compared to other compulsory subjects such as Bahasa Malaysia, English, Science and Mathematics. In this sense, the art education in the Malaysian context is believed not to contribute towards the development of cognitive skills and decision making skills. Art education during this time was not seen as a valuable asset in a newly independent country which looks into the development of science, technology and economy. When review of the curriculum was made later, art teaching was affected. Art education in secondary school has not changed much since 1978 which focuses on studio based activity. Students are basically taught the technical "know-how" of studio production, imitating of great works while eliminating the creative expressions of art. Consequently from 1985 until the present day, the curriculum of art in secondary school has not had a major review. The implementation of this policy has been one of central issue affecting in teaching and learning especially in the area of art and design in Malaysia.

The Malaysian art curriculum emphasises on 'techniques' rather than the expressive and creative aspects of learning which inevitably leads the schools producing skilled artistes rather than creative and innovative artists. There is no proper or specific pedagogy of art syllabus in Malaysia. Even the materials such as the art book available in the market does not give room for creative development or exploration as most of the drawing activities just encourage imitating other people's work. The art activities do not allow students to think and draw by themselves. As a matter of fact, none of the books discuss Malaysian art history, the work of the masters as well as indigenous works. This is a common conventional teaching and learning practices in acquisition of knowledge.

This paper argues that 'Simon says Syndrome' may be defined or reflected from the set of conventional practices and systems for teaching (or learning); which ways and methods of teaching for the acquisition of necessary knowledge and skills are through the application of sequencing and memorising of instruction as a skill. This is based on the order and organisation of learning activities which affects the way information is processed and retained (Glynn & DiVesta, 1977; Lorch & Lorch, 1985; Van Patten, Chao,

& Reigeluth, 1986). This is evidence in Malaysian classroom, where it is common for the art teacher to offer students suggestions or solutions by memorising and imitating techniques and examples of artwork from the books.

The 'Simon Says' teaching and learning is a suitable teaching or learning method for lower level of education, where the educational methods, strategies and techniques of teaching processes is designed for the purpose of imparting basic understanding and developing basic competencies through instructions. This does not mean instructional based learning do not hold any weight in the learning process. Instructional learning is still an important part of design pedagogy; used to elaborate the meaning and importance of design and instructional strategy but it should not be used as the main template for learning especially in art and design field. This is because instructional learning can be too restrictive and somewhat rigid to allow for exploration of unconventional idea generation. It is seen to be more suited for vocational education where the need for skills and fluency to follow instructional planning and objectives with practice; specific based knowledge and generic instructional skills is required.

The Art and Design field need students to acquire problem solving skills, which tends to require a much higher level of perfection to represent and solve problems. This will ensure that art and design students actively create their knowledge rather than passively listening to the teachers. It is about structuring learning situations cooperatively so that students work together to achieve shared goals. It is important for art and design to be taught to understand increasingly rich and varied design concepts and literature. These encourage and illustrate a growing effort to engage students more deeply and thoughtfully in subject-matter learning, between principles and practice, between the past and the present. Where students are asked to think through concepts and situations, rather than memorise and follow existing templates.

The danger of 'Simon says Syndrome' also lies in the learnability and acquisition of principles in development of ideas. It frequently argued that art teachers themselves are not qualified to teach the creative arts because there is no such policy to guarantee the teachers to have a prior intensive knowledge in the arts themselves. As aptly put by Hafshan A Razak (2010), most art teachers were creativity killers as they were not even familiar with art curriculum.

Learning and teaching is an on-going acquisition and transference of knowledge. Learning could also be thought of as 'a process by which behaviour changes as a result of experience' (Maples and Webster 1980 quoted in Merriam and Caffarella (1991). It is 'concrete, immediate and confined to a specific activity (Rogers 2003). How learning is being 'administered' is the key to a successful knowledge acquiring. The current design curriculum calls for emphasis on an active learning and teaching approach, and therefore demands educators to employ this teaching-learning style. However, it is acknowledged that little attempt is made to elaborate and to indicate how it can be translated into the teaching learning process at the classroom level. Thus, learner-centered pedagogy is most commonly understood for what it is not.

### *'Simon Says Syndrome': Parental Influence*

This paper also argues that parenting styles and the upbringing of their children has great influence on the latter's success in school and their social life. Researchers and experts on parenting believe that learning starts from home. The early development of the child at home in five basic areas physically, emotionally, socially, intellectually and language competency is crucial and has great influence on his/her continuance from school to tertiary level. Parents play a very important role in the development,

exposure and creativity of their childrens' lives. Baumrind (1971) proposed three types of parenting styles; the authoritative parent, the authoritarian parent and the permissive parent, and each vary in its own characteristics.

The authoritative parent exerts high parental control along with warmth. The child's activities are directed into a rational and issue-oriented manner which encourages verbal 'give and take' between both parties. The child is allowed freedom of expression, to question and given reasons behind the parent's policies. The parent values both autonomous self-will, the rights of the child but at the same time maintains his/her status as the key advisor in any decision making.

The authoritarian parent on the other hand values obedience as a virtue, believes in inculcating such instrumental values as respect for authority, respect for work and the preservation of order and traditions. Unlike the authoritative parent, she/he does not encourage verbal 'give and take' but rather believes that the child should accept her word for what is right. Any questions being asked by the child will result in doubting the parent's capability in raising the child and showing disrespect. The decision making is absolutely the parents authority and never democratic. The authoritarian parent believe that love and support should not be shown openly as the authoritative parent as this can spoil the child and lead to disrespectful behaviour towards the parents, elders and the community. Love and support comes in the manner of respect, obedience and preservation.

The permissive parent allows the child to make decisions by himself, does not hold much or exert control over his child. He allows behaviour that is mostly disapproved by the other two parental groups. There are no house rules and the child is free to do as he/she likes. In this situation, both parent and child do not interfere in each other's business.

Asian parents mostly fall under the authoritarian group whereby traditions, cultural norms and religious values are instilled and passed down from one generation to the other. Asian parents and children have always been taught from the very beginning to respect their elders especially parents, teachers, care-givers and leaders. Questioning their intentions or decisions is considered the same as being disrespectful. Assumptions like the parents and teachers are always right are taken seriously by the community. As a result, children are not encouraged to discuss, question or express their thoughts freely. Studies undertaken by Baumrind (1991), Henderson & Reiss (1999) suggest that these children can be maladaptive as they are constantly under pressure to perform by demanding parents with very high expectations. On the contrary, results show that Asian children in America who are raised by authoritarian parent do well in school (Steinberg, Dornbusch & Brown: 1992).

There is no doubt that children in Malaysia are doing well in schools especially with students scoring straight A's in their government examinations. But the question is do these children continue to do well in tertiary level? For example, Universiti Sains Malaysia under the APEX (Accelerated Programme For Excellence) programme was given the mandate to pick and choose the crème of the crop to undertake the degree programmes. These crème of the crop do not question, do not argue, lack in curiosity and critical thinking. They wait for instructions, take the instructions as mandates and do very little thinking. Questions or situations that require spontaneous response are not handled or accepted well by these students but any questions that require facts from books or notes are well delivered. This clearly shows that these students from young have been taught to follow instructions, memorise facts but given little space for critical thoughts, unfortunately becoming the killers of creativity!

The arts just like the sciences need individuals who are curious, able to question, reason, hypothesise and synthesize. Both fields require creative and innovative individuals who are big risk takers and not afraid of failures. Children raised by authoritarian parents are small risk takers compared to children raised by authoritative and permissive parents. This could be explained due to the absence or lack of democratic environment in decision making. This also leads to these students being less open, afraid that they would be branded as disrespectful if voiced their thoughts and some are not so comfortable having discussions with teachers, lecturers as these were never much practised in schools or the home.

The one way traffic is much preferred by students as it makes their lives easier but found to be monotonous by lecturers. In order to have a well rounded, balanced and creative child, it is suggested that parents should adopt a more 'reflective-enhancing communication' parenting technique that encourages two way traffic in communication, helping children to understand their behaviour and make necessary changes, believing in the child as to develop child's self confidence. Studies show that 'reflective-enhancing communication' (Applegate et al., 1992) promotes the development of advanced behaviour and thought processes while encouraging reasoning, logic and problem-solving. This ultimately can help the child to develop his creativity and critical faculties. This type of home environment does provide a smooth transition from home to school and tertiary level.

### *'Simon Says Syndrome': Learning Spaces*

Humans are creatures of habit and sometimes changing the habitat may lead to distraction. At the same time, it is important to also understand that learning spaces is a form of habitat which lends a healthy learning habit which needs constant improvement. This is because learning spaces have always had a profound impact on the learning capability. Learning spaces are defined locations, physical or virtual, where learning happens and should capture the purpose of learning. Andrew McDonald (2006) suggested that, ideally, learning space should be functional, adaptable, accessible, varied, interactive, conducive, environmentally suitable, safe and secure, efficient and suitable. According to Commission for Architecture and the Built Environment United Kingdom (CABE 2011), learning spaces relates to the curriculum and pedagogy plans where particular tasks in learning should be allocated to ensure that it will have a positive influence over the learning process. By providing dedicated yet fluid learning spaces, it could encourage a positive learning environment which allows for exploration, experimentation and reflection in learning. These positive learning spaces are characterised by:

1. **Personal spaces** - places students are allowed to work independently or quietly; good environments to aid concentration.
2. **Transition spaces** - these spaces for moving from one activity to another at different times; for easy movement, perhaps for meeting while walking or for moving past displays and other quick-stop locations.
3. **Play/relaxing spaces** - spaces to spend time between learning activities, where student might relax or socialise.
4. **Large group spaces** - spaces that can hold lots of people for an discussion or daily activity
5. **Small group spaces** - places to work with a small group aiming for the same goal, allowing access to resources and shared working.

6. **Specialist areas** - spaces which house specialist equipment useful for exploring different areas or interest or subjects.
7. **Display spaces** - places to find out what others are doing and see examples of other people's work.

Scheduled learning times in specific learning spaces with firm expectations of achievement within each period would improve results but this could also lead to a regimented routine. It is important to build flexibility into the learning programme and spaces or it can impede the learning process. In this study it is important to highlight that one of the contributing factors in 'Simon says Syndrome' is the lack of conducive classroom – a space for learning which allows for diverse pedagogy possibilities with different expectations and goals in learning.

The learning process is changing. Learners too are changing; there are many more learners who are aware of different learning possibilities, and students are more diverse –in terms of age, ability, perceptions and background. They have different expectations of learning and of learning spaces: some prefer the conventional learning spaces such as auditorium and classroom while others want to learn using network and mobile devices within a personal space. In these instances the learning spaces play a major role in shaping the learning experience and in-directly affecting learning attitude. According to Fraser (1994,1998a)

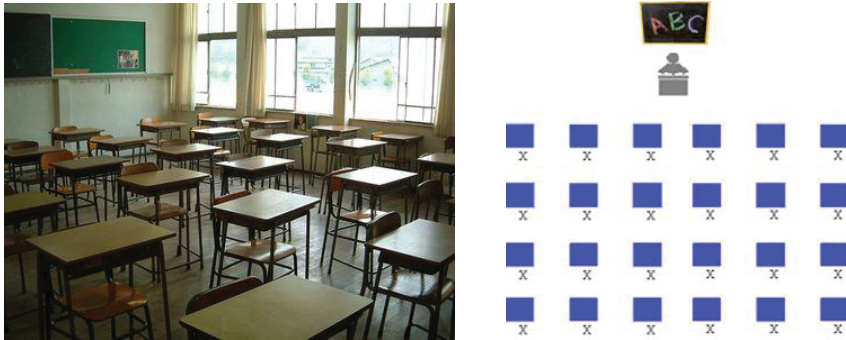
'a conducive classroom or learning spaces is a pivotal linchpin in promoting a favourable mood or atmosphere in a classroom to ensure an effective teaching and learning process to take place'.

Fraser (1994,1998a)

While Dorman (2002) supports the fact that 'student learn better in a positive classroom environment...one integral feature in creating conducive classroom environment is a good classroom organization and management'.

For this study, examples of physical arrangement of a classroom were taken from the learning spaces in Malaysian schools and universities which often arranged to be regimented (see **Figure 1**). This is typical of most public schools and universities where majority of the courses offered are not from the arts. Instructional learning and memorising sequence was the core of the learning style. Taking the template of these learning spaces and learning styles, either from the engineering or sciences faculty, some universities running the art and design based classroom adopted generic template for a learning space. Hence the idea of conformity come into place, setting the scene for 'Simon says Syndrome' learning and teaching activity.

The traditional physical arrangement of learning spaces can either promote or hinder the teacher's efforts and the quality of learning that takes place. Different seating arrangements are appropriate for different pedagogical styles and learning activities. A classroom that is not arranged to be functional could encourage student off-task behaviour. But on the other hand, a classroom that is arranged with rigid attributes would only encourage self timid and restrictive learning behaviour. In the art and design studies, it is crucial for the students to be able to probe, analyse, question and follow a 'fluid' learning and teaching style. This will encourage critical and creative learning. The art and design curricular exploration and reflective learning is encouraged, but the conditions of existing learning spaces dictate otherwise.



**Figure 1.** Malaysian typical traditional classroom layout

This study believes, the learning environment managed in such a regimented and restrictive manner shapes the values of the learning experiences. This in return becomes the catalyst towards a 'one way' learning attitude- which makes ways for the 'Simon says Syndrome' learning and teaching to take flight. When these students find themselves in the different learning environment, they fail to cope with the style of learning in higher learning institution which is more fluid and less regimented; allowing room for reflection and the need to re-adjust becomes a daunting task. As a result, these students revert back to their previous learning values - going back to the 'follow what the teacher says' experience.

This process then became a vicious circle -when the same student graduates, becomes a teacher and administers the same teaching and learning styles. At the end, it results in the 'Simon says Syndrome' to permeate deeper into the educational psyche. Hence it is important that educators understand this and look into the possibilities of breaking the cycle thus creating appropriate learning spaces which encourages positive learning style.

### *Impact and consequences of 'Simon Says Syndrome'*

The impact of this syndrome is huge. The list is long. 'Simon says Syndrome' long term affect many corners of the education, economy and behaviour. This paper identifies some of the many impacts and consequences which are:

1. Student apt at following instructions
2. Control 'C', Control 'V' symptoms (Copy and Paste)
3. Memorising and imitation becomes a skill
4. Unable to think out of the box
5. Restrictive initiative
6. Lack of confidence
7. Docile and timid
8. Skilled but not innovative

The list above exemplifies some the common issues whereby if not tackled and dealt with, would jeopardise the learning behaviour. Ramsden (1992), '...learning should concerned with changes in the ways in which people 'understand, or



experience, or conceptualise the world around them'. Ramsden identifies that learning is not about following set instructions neither the ability to produce by imitating and memorising certain task without any consideration of the consequences. As a matter of fact, learning should allow for task-conscious processes that help changes in behaviour (or potential for change).

Although today's more conventional learning and teaching style works (to a certain extend) in producing skilled workers, it is important to see that within the creative industries, skills alone does not carry enough weight in ensuring a sustainable result. Even more alarming, with the advent of global changes in economy, environment and politics, learning through memorisation and following the dotted line will no longer be viable. This is because with the rapid changes in trends of living and expectations, a person must be able to be spontaneous, improvise and produce quick solutions based on reflection and critical understanding of certain concepts. It is quite clear that the 'Simon says Syndrome' will not allow for this!

## **Conclusion: Breaking the Cycle- Reflective Learning; A Possibility**

From our preliminary observation of the art and design students in our university, it can be said that the 'simon says syndrome' is an issue plaguing the tertiary education process in Malaysia. It is not a myth but a serious reality which could result in lack lustre and timid learners. Worst still, in the era where Malaysia sees itself as a global challenger in the creative industries, the learning and teaching systems in art and design education is seen to take two steps back. What is important now is the ability to admit that the syndrome is real and it is a hindrance towards a better learning experience and goal. The symptoms are clear and by understanding the underlying issues which contributes towards the 'Simon says Syndrome', the next step is to look at potential learning styles that could help build better learners, cohesive learning and teaching pedagogies, and encourage critical learning within the art and design education in Malaysia.

Hence this study proposes further research to be undertaken in order to identify the factors that leads towards the recurrence of the syndrome in the Malaysian tertiary education process. The main research areas identified to be looked at are:

- a) the provisional factors from the provider's part such as the programme which includes syllabus, curriculum, lecturers, facilities and the vision and mission of the universities which directly or indirectly causes the simon says syndrome in Arts programmes in Malaysian public unversities.
- b) The pedagogy or methods used to teach the students
- c) The attributes of the students themselves such as their upbringing and background
- d) The weaknesses and the strengths of the existing learning model.

The research would then propose for a new learning model for arts and design based on the findings of the research. The new learning model will closely looks at the reflective learning as a remedy to break the 'Simon says Syndrome' effect and at the same time encourages learners to be both brave and critical in their thinking. Reflection



is an active process of witnessing one's own experience in order to take a closer look at it, sometimes to direct attention to it briefly, but often to explore it in greater depth. This can be done in the midst of an activity or as an activity in itself. The key to reflection is learning how to take perspective of one's own actions and experience - in other words, to examine that experience rather than just living it. By developing the ability to explore and be curious about our own experience and actions, we suddenly open up the possibilities of purposeful learning—derived not from books or experts, but from our work and our lives. This is the purpose of reflection: to allow the possibility of learning through experience, whether that is the experience of a meeting, a project, a disaster, a success, a relationship, or any other internal or external event, before, during or after it has occurred.

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# Relating creativity, fantasy, invention and imagination: studying collective models of creative collaboration from Kindergarten to University Degrees

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**Abstract:** *In recent years, cognitive psychology has supplied interesting analytical frameworks for the processes involved in the construction of knowledge at all levels of education, from kindergarten to college.*

*In design teaching and for many decades theories have been proposed about design projects "methods" and "methodologies". However, only in recent years theoretical approaches to "creativity" and the creative process have been proposed and have started to be implemented in academic curricula, or as working methods (co-creation).*

*Creativity, thus, has become an area of "focus" of research, with important implications on the design discipline. However, creativity, invention, imagination and fantasy simultaneously interact within the mind, and it seems difficult to distinguish specific procedures for each and every one of them. How to encourage and nourish these mental processes in design students? Is it possible to discriminate "phases" of these processes on the different contexts of learning? It seems that when we reach adulthood our mind no longer has room for fantasy. Is it possible for a professional designer to operate using fantasy and imagination? The aim of this paper is to contribute to an understanding of how fantasy can stimulate creativity.*

**Keywords:** *creativity, invention, imagination, fantasy.*

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## Introduction

The proposed topic of this symposium, *Design Learning for Tomorrow - Design Education from Kindergarten to PhD*, partly dovetails with my work in the past three years in the Project Department at ELISAVA Escola Superior de Disseny i Enginyeria de Barcelona. This positions me to share some of the methodological questions that the teaching team and I are examining with regard to how to “stimulate”, “nurture” and “train” our students in individual and collective creativity.

In recent decades, creativity has been the topic of prominent studies in cognitive psychology (Cropley 1968) with major implications in the worlds of design, innovation and the new information and communication technologies (Rowe 1987, Boden 2004, Hemlin and Allwood and Martin 2004, Sawyer 2006). Creative processes have even become an academic subject and working methodology - brainstorming, design thinking, co-creation, etc. - (*Design & thinking* 2011).

However, creativity, invention, fantasy and imagination interact simultaneously in our minds, and it seems hard to distinguish between the procedures that are related to each of them.

Technical schools and universities train not only future professionals but also individuals and citizens. Therefore, design schools in particular must become more deeply committed to the education of the future designers who will shape our everyday environment. The educational system must constantly undergo change and must continuously rationalise the educational models in order to match them to the times (Findeli 2001).

It is a fact that students – using the term very loosely, starting from when they enter school as young children – no longer need to go to school to “know”. Today knowledge is global; there are thousands of channels to access it that are much more dynamic and interesting than the traditional “encyclopaedic culture”. So schools must focus on the “ways” people learn and on developing competences related to “training” the mind to process and synthesise information and generate innovative ideas. At a design school, the emphasis should be on “lateral thinking” (De Bono 1991) and/or “divergent thinking” (Robinson 2010), which constantly strives to break the moulds of experience.

The purpose of this paper is to spotlight the factors that play a role in defining our students’ creativity, with a special emphasis on the relationship between creativity and fantasy. Back in 1973, Gianni Rodari wrote his *Grammatica della Fantasia*, an attempt to classify the “ways” in which stories can be invented and created for children. So today, why should we not imagine that we can begin to compile educational experiences to explore and classify possible “ways” of stimulating fantasy and creativity?

I would like to stress the need to reflect on this topic within the context of the Spanish educational system, because at the university level we suffer from the results of an academic curriculum grounded upon rote, behavioural learning. Consequently, at project-based universities we must focus on a more collaborative, dynamic and experiential kind of learning.

In Spain, design programmes have only been recognised as Bachelor’s degrees in the past five years. ELISAVA was the first Spanish design school, founded in 1961, and one of the first schools to adapt its educational system to the European Higher Education Area.

'Inspired by the reference of the Ulm School, ELISAVA was associated with a yearning for openness and freedom of thought during the dictatorship, and it thus became a platform for reflection and debate, based on which it built an innovative educational plan. The design of subsequent curricula prioritised a commitment to society and the desire to provide students with a well-rounded education based on the active development of the student as a basic premise for sound training.' (Elisava TdD 26, p.7)

Since 1997, the school has been a mixture of different yet complementary programmes and professions, including design programmes with specialisations in graphic design, industrial design and interior design, and design engineering programmes. They both benefit by sharing faculty, classrooms and students.

ELISAVA has an international faculty with divergent backgrounds, including designers, architects, engineers, artists, anthropologists, sociologists, art critics, economists and entrepreneurs.

I have been teaching at ELISAVA for 14 years, especially in the first and second years. At first I taught the history of design in the Design programmes, but later, when I joined the Engineering faculty to teach courses on design methodology, aesthetics and culture, I had the chance to expand my interactions with students from different backgrounds. The first year I shifted my knowledge from one field to the other. The engineering students were fascinated by the contents I sought to teach, but I soon realised that the degree of interest in certain subjects was quite different, the mental procedures with which the students generated information was also different, and the results in terms of their proposed projects were highly diverse (Perrone 2004).

Likewise, my experience of becoming a mother in the past seven years has given me the chance to witness children's learning processes firsthand and has aroused in me a great deal of curiosity regarding the genesis of expressive and creative thinking. Are children more creative than adults? Do they have more fantasy? There are different answers to this question (Munari 1977, p. 30, Sawyer 2006, p. 19), but I felt that the best way to clarify it was to work with children's schools by holding artistic creation workshops and observing specific situations firsthand.

The convergence of these circumstances led me to wonder whether it is possible to forge connections between the evolution of children's creativity and the evolution of my university students' creativity.

The aim of this paper is to contribute to an understanding of how fantasy can stimulate creativity. This study is preliminary and speculative in nature and still lacks a solid theoretical corpus that could scientifically argue for the observations made and case studies examined to date. It stems from teaching experiences that I myself have conducted and/or that have been conducted in conjunction with other instructors under my supervision. However, I believe that despite this we can reach some interesting preliminary conclusions and thus I feel justified in sharing the educational experience at this conference.

### *Defining fantasy, creativity, invention and imagination*

In recent decades, cognitive psychology has supplied interesting analytical frameworks for the processes that play a role in building knowledge at all levels of education, from kindergarten to the university.

There is a large theoretical corpus explaining the mechanisms of perception, memory and learning in schoolchildren (Pozo 1989). There are also many studies focusing on how creativity is developed in children (Vygotskij 1972) and particularly on

the relationships between art and childhood (Parini 2001, Matthews 1999). Likewise, there are different suggestions on how to approach education in order to stimulate creativity (Restelli 2002, 2008). However, there is significantly less literature when the scope of study is restricted to adolescence and adulthood.

In order to delimit the theoretical framework of this study, I will define the concepts of creativity, invention, fantasy and imagination viewed from the discipline of design. If we had to trace back to the origin of these words, the sequence in which they appear would be the opposite (imagination – fantasy – creativity – invention). It would also become clear how for many years they belonged exclusively to the realm of the history of philosophy, as psychology only started to take an interest in them in the modern age.

Early on, philosophical speculation on these terms was aimed at justifying and understanding artistic creation. We owe the first distinction between imagination, as the “faculty of producing the perception of what is sensibly absent”, and fantasy, as a *facultas fingendi* which consists of “producing the image of something that has never been perceived by the senses by dividing and composing images” to Christian Wolff - *Psychologia empirica*, 1730- (Abbagnano 2004, p. 580).

Later, Georg W. F. Hegel made a radical distinction between imagination and fantasy as determinants of intelligence, yet with different activities; the former simply reproduces while the latter creates.

By the time cognitive psychology began to take an interest in the imagination and fantasy, the two terms were no longer separated by a conceptual distance. In 1901, Théodule Ribot spoke about “creative imagination”, and in 1930 L. S. Vygotskij finally recognised in all humans a shared “creative aptitude” whose differences are particularly evidenced as a product of social and cultural factors.

In 1968, with Arthur J. Cropley creativity became synonymous with “divergent thinking” that is capable of constantly breaking down schemas and stereotypes based on experience.

‘A mind that always works, that is always willing to question, to discover problems where others find satisfactory answers (...), that rejects the codified, that manipulates objects and concepts without letting itself be inhibited by conformity, that is a creative mind’. (Rodari 1973, p. 165)

Given these premises, Bruno Munari upholds that ‘a product of fantasy, like that of creativity and invention, is born from the connections that thought establishes with what is known’. (Munari 1977, p. 29). I shall take the classification that Bruno Munari set forth in his book *Fantasia* as the foundation of this study. Below is a definition of terms, summarised in Figure 1.

#### FANTASY

Everything that did not exist before, even if it is impossible to realise and unreal. This is the faculty that enables us to think about something that does not exist, and it implies no practical materialisation. It is the freest faculty of all.

#### CREATIVITY

Everything that did not exist before but can be realised globally. In the field of design, creativity serves an aesthetic purpose and meets social, economic, human and psychological needs.

#### INVENTION

Everything that did not exist before but that can be realised by solving a problem from an eminently practical standpoint. Invention enables us to envision something new yet with no aesthetic considerations. When a new instrument or artefact is designed, no thought is given to its having to be “beautiful”; rather, it must merely work.

#### IMAGINATION

This is the ability to visualise ideas. Imagination makes visible what fantasy, creativity and invention dream up. Imagination can visualise things that already exist and is not necessarily creative.

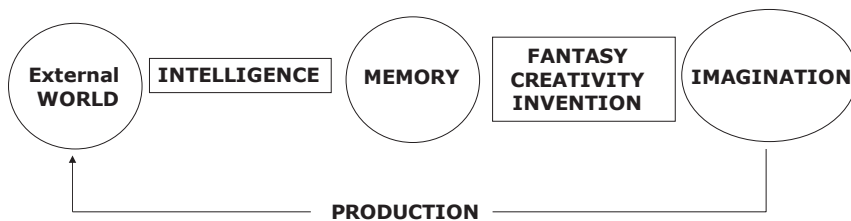


Figure 1. Diagram explaining the relationship between fantasy, creativity, invention and imagination by Bruno Munari.

Bearing these definitions in mind, I believe that it is important to include Margaret A. Boden’s definition of the concept of creativity:

‘Creativity is the ability to come up with ideas or artefacts that are new, surprising and valuable... As these very diverse examples suggest, creativity enters into virtually every aspect of life. It’s not a special ‘faculty’ but an aspect of human intelligence in general: in other words, it’s grounded in everyday abilities such as conceptual thinking, perception, memory, and reflective self-criticism. So it isn’t confined to a tiny elite: every one of us is creative, to a degree’. (Boden, 2004, p.1)

Boden’s definition further clarifies, “never mind who thought of the idea first”; what matters is “how did that person manage to come up with it, given that they had never thought of it before?” Boden thus distinguishes between ‘psychological’ creativity (P-creativity) and ‘historical’ creativity (H-creativity).

## Hypothesis

It is common knowledge that children are filled with fantasy. Still, Bruno Munari refutes this statement by explaining that children actually project everything they know onto their nearest environs. They have limited knowledge of the world, and anything around them has the same qualities, so a large ball might be a “mother” and a small ball would be the “daughter” (Munari 1977, p. 10). Therefore, as Munari argues, the more we know the more we should be able to establish new relations. So he wonders: where does the system fail? Why do eighteen-year-olds reach the university “anesthetised” to knowledge? It seems that when we reach adulthood our minds no longer have any room for creativity and fantasy.

Generally speaking, with the exception of a handful of innovative educational institutions, the Western European education system is organised into a linear, convergent thought system in which we are taught to give single answers and solutions to problems. From childhood, the mind is exercised in a structuralist way, separating knowledge into academic disciplines (Gardner, 2007) precisely in the age of globalisation.

There are “phases” in the thought processes which include fantasy, creativity, invention and imagination at the different stages of schooling and in a variety of learning contexts; therefore, our first hypothesis is that the more we stimulate the fantasy the more we nurture creativity.

Another hypothesis upon which this paper is grounded is that age influences models of collective creativity: the younger the students, the more creative and collaborative they are because they are not yet conditioned by the mental stereotypes that prevent them from going counter to the customs and convictions already instilled in them.

We do not yet have many projects that can demonstrate our hypothesis – in fact, I believe that in order to remain coherent with our premises, we can never reach simplistic conclusions – but we do have a series of interesting cases worth sharing.

## **Methodology**

The curriculum implemented in the Design Programme in 2001, which was replaced in 2011, lasted four years, the first two of which were core subjects taken by all students. The design courses in these two years offered an interdisciplinary approach to global projects which students were able to resolve thanks to a teaching team that was usually made up of at least one professor/professional from the field of graphic design and one professor/professional from the field of industrial design or spatial design. The projects proposed usually had somewhat open prompts which allowed students to define their own project and make a design proposal. One example of such an exercise is “Pic-nic urbano” (Urban Picnic), in which students were asked to choose a location, propose “what and how” to eat, develop the utensils needed and generate the media campaign.

However, the new curriculum in the official Bachelor’s in Design, which was implemented in 2009 in compliance with the European Higher Education Area, has just one year of core subjects, while in the second year students are able to choose their design courses more focused on the disciplines of visual communication or on product and environmental design.

One of the first-year courses is particularly interesting with regard to the topic being discussed in this paper, namely the “Design Methodology” course, which is also in the curriculum for the Design Engineering Programme.

The general competences in this course are:

- The capacity to analyse and synthesise.
- Working in interdisciplinary teams.
- The ability to organise, plan and manage time and resources.

Developing their own methodologies and procedures during the process of the design project.

This course particularly stresses the methodological aspects of the design process. However, in recent years we have steered the syllabus and exercises with the following goals in mind:



1. To exercise the students' individual imaginations in order to identify their predisposition to visualize what creativity, fantasy and invention can produce separately.
2. To encourage the mind to work using fantasy by forging "fantastical" relationships between known elements and objects.
3. To propose creative collaboration situations, especially between students from different backgrounds.
4. To verify the relationship between memory and imagination when remembering and narrating a visual structure.

Upon this groundwork we have developed a variety of instructional experiences focused on achieving these objectives. The methodology we use particularly takes into account aspects related to attitudinal competences (being) and procedural or instrumental competences (knowing how), according to their official names in the Bologna methodology.

In order to explain and understand the exercises – or case studies – I shall first define all the parameters that make up the boundaries of the method used.

The variables of the study shall include the age of the students and the kind of instructor. The boundaries of the case studies are already defined by the spatial context where the exercises are performed: kindergarten and ELISAVA Design and Engineering School in Barcelona. The stakeholders are the students with their different backgrounds and how they resolve the exercises.

## *Case studies*

BELOW IS A DETAILED EXPLANATION OF THE CASE STUDIES.  
CASE STUDY 1: DRAW ELASTIC GLASS

Due to the students' educational background (baccalaureate in art, technology, social studies and humanities) and their intrinsic predispositions, we decided to work in parallel with them in their first year of ELISAVA's Bachelor's in Design and Industrial Design Engineering in order to compare results with the same exercise prompts.

**Prompt:** draw "elastic glass" (individual development)

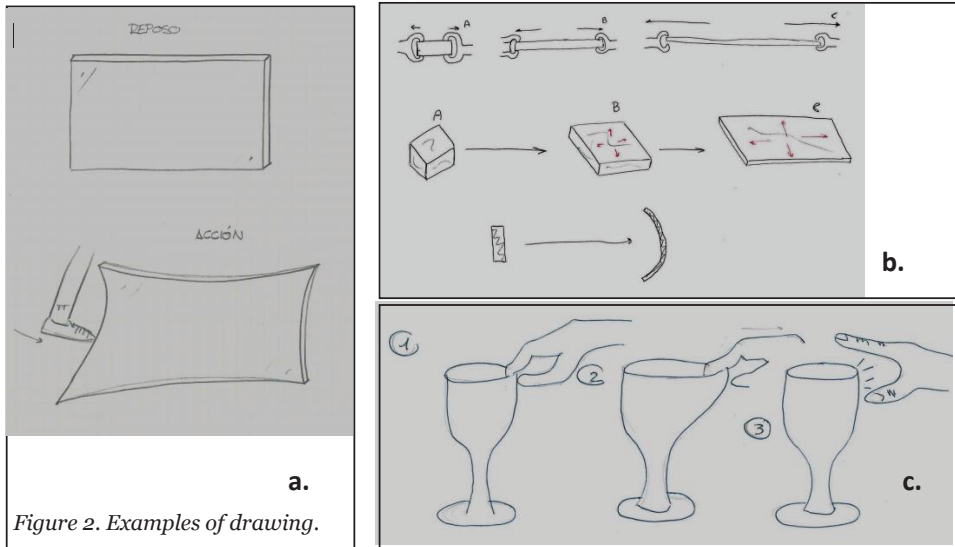
**Time limit:** 10 minutes

**Objectives:** To exercise the individual imagination of students when visualising something that does not exist.

**Rationale:** At design universities we tend to use drawing as an expressive tool to render analytical drawings based on observation or to envision the design of a "future" object/space/message. But we seldom ask students to draw something that they cannot see or that cannot exist, such as "elastic glass".

Conclusions: We detected three patterns in students' responses (Figure2):

- a. the student depicted only part of the information and did not explain the concept (i.e., there is a disjoint between logical thinking and imagination)
- b. the student tried to depict what elastic glass would be like and how it would behave scientifically according to its physical and chemical properties (i.e., invention was activated)
- c. the student sought an application of the proposed material (i.e., creativity was activated)



#### CASE STUDY 2: FANTASY

Once again the students were in their first year of the Bachelor's in Design and Industrial Design Engineering. We gave them an open-ended prompt to solve which strove to achieve neither a specific formalisation nor real functionality.

**Prompt:** Forge relations based on an assigned object in order to imagine a new object or a "fantastical" story (development in pairs).

**Time limit:** two weeks

**Objectives:** To encourage the mind to work using fantasy.

**Rationale:** Proposing an exercise without defining project functions, characteristics, requirements or the formats in which it should be turned in gives students complete freedom to take decisions and lets their thinking be utterly free.

**Conclusions:** We detected several different patterns in students' responses (Figure 3):

- a. the group that literally analysed the assigned object and from there came up with functional or dimensional variations (i.e., fantasy and creativity was activated)
- b. the group that related by opposites (i.e., fantasy was activated)
- c. the group thinks of a functional application (i.e., invention was activated)



as the workshop they had taken examples and hung them on the walls of the room where the workshop was held.

**Objectives:** To propose situations involving creative collaboration, especially among students from different backgrounds; to verify the relationship between memory and imagination when recalling and narrating a visual structure.

**Time limit:** an hour and a half

**Rationale:** this exercise in collective memory involves an effort at synthesis and enables us to verify the validity of teamwork.

**Conclusions:** We detected three patterns of responses (Figure 4).

- a. the group that literally resolved the exercise (i.e., there is a direct relationship between logical thinking and imagination)
- b. the group that took the exercise as a minor experiment (i.e., creativity was activated)
- c. the group that never managed to satisfactorily resolve the prompt as a result of collective creation.



a.



b.

*Figure 4. Examples of maps of Barcelona.*



c.

It is noted that the group work of elementary school students are more creative and quickly get consensus individual intervention to achieve results visually interesting (Figure 5).



Figure 5. Examples of African masks.

#### CASE STUDY 4: COLLECTIVE MURAL

This last case is not parallel to the three previous cases from the methodological standpoint, but it is based on a similar premise and was conducted with the same objectives.

In March 2009, I contacted the Escuela CEIP Jujol elementary school in Barcelona with a request to work with its three-year-olds to create a collective collage that would depict the sky and the moon. This drawing was rendered on large surfaces of blue paper on which the rooftops of an imaginary city were drawn, and the children were allowed to add any element that would complete the depiction, distinguishing between buildings, roofs and sky.

We set out many materials – large and small pieces of paper that were white, coloured, smooth, rough, opaque and transparent, along with cotton, string, etc., all of which were transformed into parts of the urban landscape.

**Time limit:** an hour and a half for each group of 8 children.

**Conclusions:** the children worked together to create the mural, each agreeing on their individual contributions to achieve visually intriguing results as a group (Figure 6).



In March 2011 we were contacted by an agency to recruit a group of students as "illustrators" for the Mobile World Congress Fair at the Ericsson booth.



This was an interesting project because six students in their third year created a "Living wall" in real time about the network society of the future. This mural was built during the 4-day exhibition, and the students interacted with the participants of the exhibition in a co-creation process which gave us input and opinions which we later tried to depict on the canvas.

We suggested that the students were not mere executors but could work according to a common strategic approach that, due to the size of the backdrop (2 x 6m), would ensure a consistent result. In this case, the goal was to exercise the imagination to illustrate other people's ideas. Despite the multiplicity of proposals offered and the heterogeneity of the team, the results were truly amazing.

**Time limit:** 4 days

**Conclusions:** The students collaborated to create the mural, which achieved aesthetic uniformity despite its different parts (Figure 7).



*Figure 7. "Living wall" by Gaston Lisak, Javier Jabalera, Sergio Castillo, Francesc Moretó, Arnau Tasies, Sheila Bermudez, for Ericsson at the Mobile World Congress Fair (<http://vimeo.com/23982076>).*

## **Conclusion**

In this article, I believe we have illustrated the importance of working on many levels. The first case study proves that the minds of our students are different, and that imagination is directly linked to each mind. Engineers and designers have to speak the same language, understand each other and complement each other's training, so the goal is to better stimulate the "disciplined, synthetic mind" of future designers as well as the "creative mind" of future engineers.

The second case study demonstrates that stimulating "fantasy" is important in terms of creativity and that it helps students to become familiar with divergent thinking. Design universities must stimulate our students' divergent thinking using the different parameters set forth and encourage situations of "boundless" creativity in order to achieve tangible results.

The third case study shows that in situations of collective creativity, age affects the results and that children are more "collaborative" than students in their first year of a university design programme. However, this case also shows that when students are in their third or fourth year at the university, their academic maturity enables them to resolve collective creativity projects more readily and with better group dynamics.

I would like to conclude this paper by encouraging everyone interested in partnering with us on organising a possible “fantasy grammar applied to design”. The idea is to generate an educational tool that would be useful for universities specialising in design in order to encourage FANTASY in future design professionals.

To this end, we are currently working with institutions in different disciplines (Centre Santa Monica- Barcelona, Fabrica/Benetton, Istituto Italiano Statale Comprensivo di Barcellona) to expand the case studies, and we are planning to create a web platform where we can compile the educational experiences of institutions, professors, students, PhDs and researchers.

Since last year, the ELISAVA’s Design Department has been coordinating the partnership with the Fabrica Live Window project ([www.livewindow.it/](http://www.livewindow.it/)), the creative core of Benetton Group. Fabrica invites prestigious universities and design schools from all over the world to join its network and get global visibility for the creativity of their students. Their works are posted on Benetton Live Windows. The project is very interesting because it allows the results of the same prompts as it was solved by students of the same age but from different cultural backgrounds to be compared. In many cases, we can detect connections, and so it is possible to figure out how to reach the same solution (see the proposals for the International Day of Peace).

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# Educating multidisciplinary postgraduate product design students: challenges for a new programme

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**Abstract:** *Design professionals are increasingly expected to work in interdisciplinary teams, often working together to solve more and more complex problems. This may contradict aspects of traditional design education where effort (and assessment) was focused on the skills of the creative individual. While expertise or skill in a specific discipline is still critical to perform as a designer, a greater awareness and understanding of other disciplines is required. These educational challenges are further compounded in a new Product Design programme at AUT University due to its relatively small number of students. However, developing a new programme presents an opportunity to support new approaches to teaching and learning, without the constraints of institutional history and tradition. An innovative pedagogical approach to product design was developed that expands the definition of a 'product' to become 'the product of' a creative design process rather than necessarily the tangible, physical 3D product outcomes. This paper outlines and discusses the key aspects of the learning and teaching approach that underpins the postgraduate Product Design Programme at AUT. Practical examples of learning and teaching interventions, in and outside the curriculum, are presented; along with examples to demonstrate how these have been incorporated into practice-based postgraduate research projects. In addition a holistic approach that has been taken to integrate the key learning and teaching elements to develop a framework that will be the foundation for further curriculum development in the postgraduate programme is discussed.*

**Keywords:** *Design Thinking, Curriculum Development, Learning and Teaching*

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## **Introduction**

The Product Design programme at AUT University was developed in 2007 and launched with the first intake of students in 2008 (Withell and Reay 2012). In 2012, the Product Design department had seventy-five students across three years at undergraduate level. The postgraduate programme is small but emerging, with 4 and 5 students in 2010 and 2011 respectively, and 10 (current) in 2012.

Developing a new programme presents an opportunity to support new approaches to teaching and learning, without the constraints of institutional history and tradition. A recent focus of the department was to expand the definition of a 'product' to encompass a broader range of 'designed' outcomes i.e. 'the product of' a creative design (thinking) process. This was in response to the global emergence in the broadening of the product designer's role. Consequently, a design solution presented, or explored, within the constraints of the programme may not necessarily be a tangible, physical 3D product outcome. This is emphasised by developing student capabilities in Design Thinking principles, methods and processes to support the broader role of design as a problem solving activity (Withell and Reay 2012).

Design professions are increasingly expected to work in interdisciplinary teams, often working toward solving more and more complex problems. Design practitioners are now held as promoters or agents capable of contributing to positive societal change (Shedroff 2009, Spangenburg et al. 2010). Designers are more often asked to play a deeper role in informing society through intelligent thought and action, and in doing so positively contribute to the global ecological balance (Whitely 1993). This may contradict aspects of traditional design education where effort (and assessment) was focused on the skills of the creative individual. While expertise or skill in a specific discipline is still critical to perform as a designer, a greater awareness and understanding of other disciplines is required.

Staff teaching into the Product Design programme at AUT University recognise that the three-year undergraduate degree makes it difficult for most students to develop their design education to a level that they can immediately contribute to the professional design community. Consequently, the programme encourages those students, driven to work in the design profession, or those who are wanting to make a more significant contribution to the design profession through more advanced academic research, to further their studies via the postgraduate programme (Withell and Reay 2012).

At AUT the first year of postgraduate study (called an honours year), while research focused, is considered a 'bedding in' year, where students from the undergraduate programme further develop their core design skills while being introduced to more advanced theoretical design research (Withell and Reay 2012). Following the honours year students may continue into the one year Master of Art and Design programme (thesis year), and often complete or further develop their research enquiry from the previous year.

New Zealand is a relatively small country, with a limited manufacturing infrastructure. This combined with a geographic location somewhat isolated from other countries means that many of our top students often seek employment internationally upon graduation. The design community, and design as a profession is consequently in a state of transformation. In order to best prepare our students for this continually evolving and newly emerging design future, we recognise that a cohesive, yet broad package of learning and teaching activities is required to educate well-

rounded graduates that may be employed as designers in a wide range of disciplines, or areas. Furthermore, we propose that these broad skills or characteristics will provide a strong foundation for those students who wish to study at the highest academic levels and make a more theoretical contribution to design knowledge.

Three key areas of learning and teaching identified as important for graduates are discussed below:

## **Transferable Skills**

Transferable skills are those that can be successfully applied and used in a wide range of disciplines and situations. While many methods and process used in design activities (e.g. brainstorming etc.) may be useful in situations outside of design, as stand alone methods they do not represent a cohesive package that may be viewed as being of 'high value' to future employers. Consequently, we have identified Design Thinking as such a package of methods and processes that may be taught in a systematic way, are highly valuable as an approach to underpin product design projects. More importantly, Design Thinking is viewed as a very valuable 'process package' that is being rapidly integrated into leading organizations and business outside of traditional design communities.

Design Thinking can be conceived as a 'human-centred methodology' (framework) that supports and drives effective innovation (Bauer and Eagen 2008). The usefulness of Design Thinking in tackling complex or 'wicked problems', as opposed to well defined problems is important (Cross 2001; Buchanan 1992). "Wicked problems are complex that they cannot be analysed and fully understood in order to be solved afterwards by rationalistic scientific processes, but should instead be reframed and addressed through an iterative processes by the designers involved" (Poulsen and Thogersen 2011). Design Thinking can also be described as the study of the cognitive processes that are subsequently manifested in design action (Cross 1992, Dunne 2006). Owen (2007) proposes Design Thinking as the transpose of scientific thinking. Where scientist's processes and analyses 'facts' to identify and discover patterns, "the design thinker invents new patterns and concepts to address facts and possibilities by using inductive, deductive and abductive reasoning" (Dunne and Martin 2006, p. 517).

The product design programme at AUT is currently embedding a Design Thinking methodology from enquiry, opportunity spotting and mechanism to drive creative responses, to the design-led solving of problems. While students regularly use the systematic Design Thinking processes model in their design projects, through ongoing discussion with a number of design-led organisations, an opportunity was identified for the AUT Product Design department to develop and deliver Design Thinking workshops to local businesses and organizations. The primary goal of the Design Thinking workshops are to provide business leaders who have committed to integrate design into all aspects their businesses, a further understanding of, and an improved capability in Design Thinking through a transformational, experiential encounter.

In addition, the opportunity to include postgraduate product design students in the workshops brought significantly enhanced value to the proposition for all parties participating. The postgraduate product design students at AUT University have a well-developed theoretical and practical understanding of the Design Thinking principles and processes. The students were partnered with business leaders in team situations, with the expectation that the students would benefit from the close contact with business leaders and would gain a deeper understanding and confidence of business

thinking and contexts with 'real world' participants. Correspondingly, the business leaders were expected to benefit from the close, collaborative practical interaction with a group of young and enthusiastic creative designers.

The initial workshop evaluation indicated that that with some refinement, the model developed offers an excellent opportunity for universities to assist in developing Design Thinking capability, and to assist students in understanding a professional environment, as well as further develop collaborative skills outside of the traditional studio situation (Withell and Reay 2011). Feedback from both students and business professionals indicates that all participants' enjoyed the workshop, and helped them develop a deeper understanding of Design Thinking. With continued development, evaluation and further implementation, it is hoped that the workshops will contribute to raising the international competitiveness of New Zealand businesses through design.

A second workshop was run at the end of 2011 and built on the feedback from the first (Withell and Reay 2011). Instead of a two-day workshop, the activity and content was delivered over a single day of focused activity involving external participants from the Human Potential Centre at AUT University. In contrast to the first workshop, a 'real' brief was the focus of the workshop at the request of the external group who were looking for new ways to approach a problem of enhancing physical activity in office environments. While their approach initially was to develop standing furniture, the approaches used in the workshop resulted in a greater understanding of problems associated with offices and potential design opportunities. Not only did this workshop 'open the eyes' of the health and physical activity researches to the value of design thinking as a way to approach complex problems, it led to subsequent ongoing collaboration between the two departments involving two post-graduate summer studentships and staff research where a new office furniture ecosystem was designed and manufactured to encourage and support an active, collaborative office environment in the recently developed Human Potential Centre at AUT University (Reay and Withell in press).

The feedback from both workshops was similar in that the external participants appeared genuinely 'blown away' by the ability of the students to quickly and effectively take ideas into drawings and 3D models. This was considered a critical aspect of the workshops. The participants from both business professionals and research staff from the Human Potential Centre were experientially drawn and transformed by the power of prototyping as a method and process to drive creativity and innovation. The 'non-designer' participants in the group were quickly inspired to draw and use hot glue guns and to actively and collaboratively engage in the groups' prototyping sessions. In the second workshop, they were more confident, and willing to contribute to and help facilitate sessions.

## **Values**

Sustainability has emerged as core issue that designers must engage with, and embrace. Sustainability is now taught as an integral part of many design (and other) tertiary education programmes, recognising the growing acceptance of the role sustainability has to play in the development of our futures. Design practitioners, through their roles in shaping the future, are viewed as being key agents to promote social change, especially around unsustainable behaviours (Sosa and Gero 2008). Designers are now viewed as having a moral and ethical obligation to be responsible for their designs, and the social and environmental impacts of their work Whitely (1993).

There has been an increased focus on identifying opportunities to support and enhance sustainability by those in the design community. This transition not only presents a huge challenge for product designers but also provides opportunity for designers to reframe their practices and processes.

Design has been challenged to contribute to the transition to sustainable societies, and Design for Sustainability (DfS) is the response (Spangenberg et al. 2010). DfS can be described as a strategic design activity, embeds design into sustainability, to conceive and develop sustainable products, services and solutions (Manzini and Jegou 2003, Spangenberg et al. 2010). DfS aims to address all dimensions of sustainability, operates at a systems level to challenge mainstream notions of consumption and production to identify and provide 'real' satisfiers for people, while maximising positive impacts on nature, people and society (Spangenberg et al. 2010).

In order for graduating designers to more effectively contribute to the sustainability challenges facing us, requires higher education institutions to "increase the awareness, knowledge, skills, and values needed to create a just and sustainable future" (Cortese 2003, p.17). A change in mind-set is critical to achieve this vision. This will require a sustained, long-term effort to transform education at all levels (Cortese 2003). A new educational agenda has been established to present new ways of thinking and a reordering of intellectual priorities that more effectively contribute to social and ecological unbalances. Sustainability provides colleges and universities an opportunity to confront their core values, their practices and the way they program for student learning (Wals and Jickling 2002). Consequently it is anticipated that through a more focused emphasis current student's will be better prepared "to do what we, the present generation, have been unable or unwilling to do" (Ramirez 2006, p.191).

While design educators have responded to sustainable imperatives in various ways, it appears that approaches are mixed and often appear to be ad hoc. A recent survey of Australian industrial design programmes illustrated that while aspects of environmentally sensitive design are currently being incorporated in most Australian industrial design degree programs, it is only to a minor extent (Ramirez 2006). The teaching of sustainable design and the underpinning values need to be more deeply embedded into the curriculum of product design programmes. In responding to the need for a focus on sustainability in higher education, many programmes have developed projects centered on design for social responsibility. This may be in response to a perceived likelihood of a successful outcome. In contrast, despite the plethora of sustainable design frameworks attempting to provide solutions to the world's ecological crisis, many designers oversimplify such systems in order to attain suitable design outcomes. Superficial design responses are not uncommon when it comes to issues of sustainability (Reay, McCool and Withell 2011). In part, this is due to the complex nature of ecology and ecosystems. It is difficult to develop student projects that go beyond "eco-design" to help them better appreciate the complexity of the relationships between the environment, society and the economy (Reay, McCool and Withell 2011).

The role of design for sustainability is a core part of curriculum development in the Product Design programme. While we believe we cannot 'tell' students what their 'values' should be as designers or as individuals, we do believe that exposing them to the complexities of challenges the world faces, and providing them with methods and process to make a positive contribution to these challenges, will present them with the best opportunity to effectively assess how they want to contribute to the future. Furthermore, through personal reflection on these challenges in the relative safety of

an extended academic environment, helps ensure that when students leave University they are better positioned to identify those organisations with values that align with theirs. Furthermore, they will be more likely to increase their employment prospects by more effectively articulating their values to future employers.

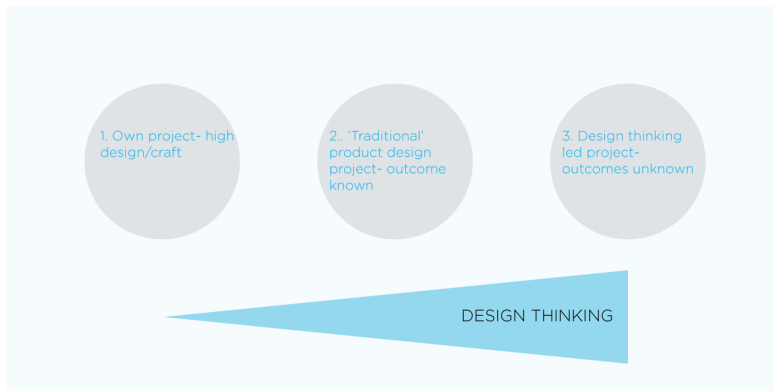
Through the diverse background of the teaching staff and exposure to a broad range of experts who engage in sustainability related issues in disciplines outside of design, we can challenge students to question their values. We believe that this personal will help them better position themselves, and more effectively understand their role in contributing to a design-led future.

## **Expertise**

Generally students are encouraged to take one of two approaches when developing their practice-based design research projects. The first is to start broadly with a context or topic area (often “wicked problems” based), and to use design thinking as a means to identify meaningful opportunities. In contrast, a student may start with a specific and well-defined problem, and use this to help explore and greater understand the broader context in which ‘the project’ is situated.

For most students, either approach can be aligned with one of three potential models for interdisciplinary interaction (Fig. 1):

1. Student has own project/concept/prototype and needs interdisciplinary support to fully explore and develop it to its full potential. For example, in order to develop a project to a commercial level, or develop a business or get it to a stage where a business may want a commercial interest, may require a level of external business engagement and support.
2. Student (may potentially be a recent graduate returning for further education) works on an industry project. It is important that both the student and the industry partner acknowledge the constraints of a postgraduate academic programme, student timeline, and ability etc. when developing a suitable project. Most likely such a project would have a clearly defined and identified business/commercial need.
3. Student collaborates on a project with an industry mentor on a shared interest project. This approach is potentially suited to smaller, research led projects where blue-sky thinking and concept development is a desired outcome rather than a ‘production’ ready product outcome.



**Figure 1** Three key areas of learning and teaching.

## Industry Mentoring

The product design programme receives considerable support from the product design community in Auckland. As well as fulfilling an advisory role, individual design professionals contribute to 'and participate in postgraduate 'crit' sessions and theory groups, bring a level of real world perspective to the students academic learning. A specific additional example of external industry engagement is where a local highly recognised and regarded product design firm annually 'sponsors' a contestable mentoring scholarship to support a final year undergraduate transitioning into the honours programme. While this does consist of a small financial award, the ongoing mentoring and support offered is considered by the department and the student to be the most significant benefit. During the period of study the student is able to visit the firm and utilise the expertise of the firm whenever they require, or just 'pop in and hang out' to gain greater awareness and experience of the professional environment. This programme has been highly successful from the programme's perspective, and has resulted in a wider reaching 'summer internship' programme being currently explored to identify greater real world learning opportunities before students transition from undergraduate to postgraduate study (Reay and Withell in press).

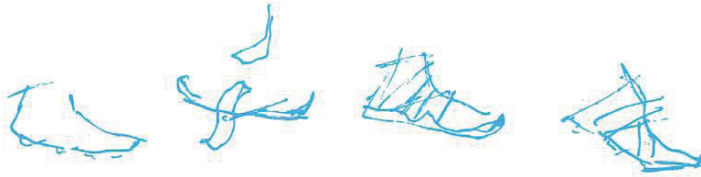
The following examples are presented of recent and current interdisciplinary postgraduate projects that align with the model presented in Figure 1 above.

### *Model 1. (Own Project)*

MINIMAL RUNNING FOOTWEAR: A CASE STUDY IN ENABLING DESIGN (REID DOUGLAS, MASTER OF ART + DESIGN CANDIDATE, 2012)

While working closely with a sport shoe manufacturer, this design research project represents a conceptual exploration of minimal running footwear, as a case study to develop a personal sustainable framework termed 'enabling design', which explores how product design can be used to foster skills and knowledge in a user, focusing on behavioral change for the cause of sustainability. While the project is both applied in nature and commercially focused through the involvement of an external New Zealand business, the student has used the opportunity of an in-depth personal framework to

drive a blue sky approach to shoe design that most likely would not have been possible outside of an academic environment, due to time and financial pressures.



**Figure 2** Early sketches- minimal running footwear. Source Reid Douglas.

### *Model 2. (Interdisciplinary product design project)*

NEXT TO SKIN: CPAP INTERFACE FOR SLEEP APNEA (SAM LEONG, HONOURS CANDIDATE, 2012)

This research design research project is undertaken in collaboration with the School of Engineering at AUT University, to develop novel technologies to treat obstructive sleep apnea, a sleep disorder characterized by pauses or abnormally low breathing during sleep. Through practice-based design research, this project explores how a lack of empathy towards patient's experience of equipment based treatment leads to medical solutions with a technological emphasis, that maximises functionality and safety. A human-centred design approach is being used to better understand the emotional and social factors that affect the relationship between people and this specific medical technology to redefine the patient experience of sleep apnea therapy, and improve treatment adherence.

SIMPLY HUMIDIFIED (MARK WU, HONOURS CANDIDATE 2011)

This research project was undertaken in partnership with Medicine Mondiale, a New Zealand based organization "focused on developing and commercializing innovative affordable products and technologies that make a significant and measurable impact on improving access to quality healthcare on a global scale" (Medicine Mondiale 2012). Specifically the project was to design and validate a humidification system for a low-cost, highly reliable infant incubator currently under development by the organisation. The challenge was to develop a humidification system suitable for continual long-term use in the challenging environments found in many developing nations. The design of the humidification system was a specific output, however it provided an opportunity for the student to explore the broader context of how design may enhance sustainable social development.





**Figure 3** Honours Student Mark Wu (with the Authors) holding his Infant Incubator Humidifier prototype.

### *Model 3. (Design thinking project - outcome unknown)*

ENGAGING ENCOUNTERS FOR PRESCHOOLERS IN THE DENTAL INDUSTRY  
(TAMARIN HOWSE, HONOURS CANDIDATE, 2012)

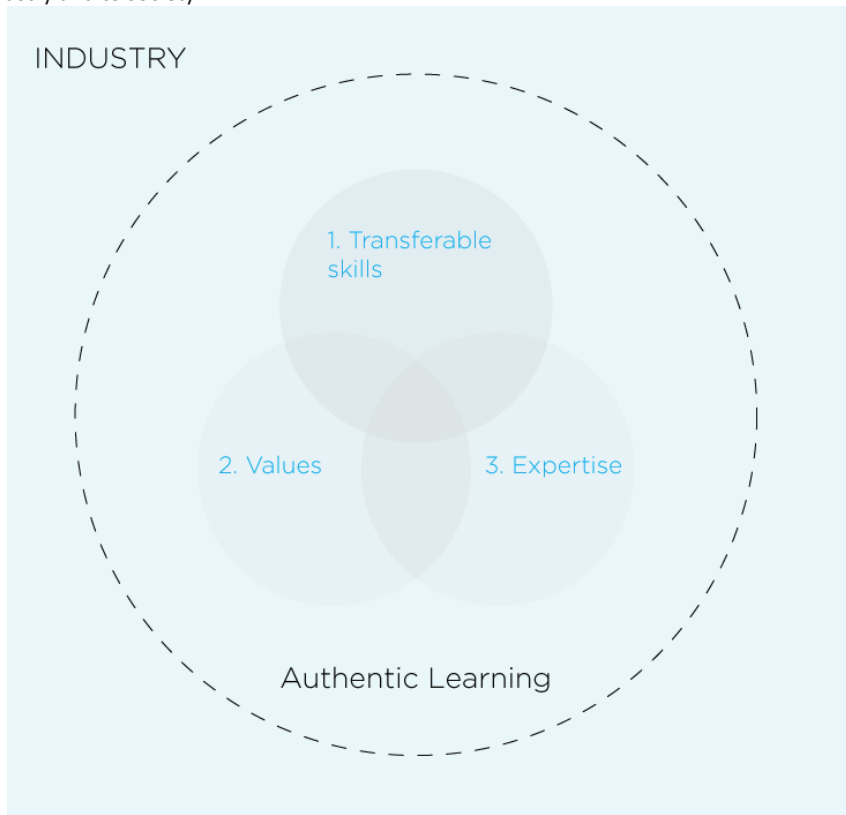
This current research project is undertaken in partnership with the Auckland District Health Board (ADHB) to rethink (redesign) the mobile dental clinics currently serving pre school children. The project aim is to improve the experience of preschool age children, caregivers and health professionals. It is hoped that by using design thinking to better understand the needs of users will help drive the transformation of the service toward a more engaging and positive mobile dental clinic experience for all user groups. For many children mobile clinics are their first encounter with professional oral health care services, and may also be the first encounter with the medical profession that they are aware of. In terms of shaping a child's attitude and beliefs towards the medical profession throughout their lives it is critical that their early experiences are positive. The objective of the project is to foster better preventative care from an early age.

### **Discussion**

The three broad areas of learning and teaching are delivered with a recognition of the benefits of an authentic learning environment (Fig. 2). To help facilitate a greater awareness (and understanding) expertise in disciplines outside of art + design, students are exposed to experts through a variety of authentic learning initiatives in their postgraduate (Reeves, Heerington and Oliver 2002, Callison and Lamb 2004). Authentic learning experiences that reflect real world knowing and doing may better support the translation of formal academic education into practice to help improve meaningful learning (Bennett, Harper and Hedberg 2002). Such a learning environment involves presenting activities that represent the complex tasks that might be performed by professionals, and where students have access to resources and engage in collaboration, articulation and reflections and they produce outcomes typical of quality performance (Reeves, Heerington and Oliver 2002).

The authentic learning activities resulting from the three modes of external interdisciplinary collaboration and engagement described above benefit students in many ways. Anecdotally, students engage more deeply with their projects when they have a level of authenticity resulting from interest and engagement by an external individual or organisation. Feedback from students (and external collaborators) indicates that the greater authentic interaction fosters empathy for and a better understanding of the benefits (and learning associated) with interdisciplinary collaboration and helps in preparing our students for the real world.

Building on the initiatives described in this paper the newly established Product Design department at AUT aims to create a collaborative interdisciplinary learning ecosystem for students, staff at AUT, and our wider community. We envision a space where diverse groups and individuals can come together to work together to create shared opportunities using Design Thinking Processes. By facilitating these types of collaborations between staff, students and external organisation we aim to drive high quality research that informs our teaching, and contributes to the design profession, industry and to society.



*Figure 4 Learning and Teaching Framework for Product Design Postgraduate curriculum development at AUT.*

We also see greater benefits to the department and the University by demonstrating leadership in research in the area of design thinking and broadly communicate the benefits of design led collaboration. We hope that this will result in the development of greater research connections and consultation with other staff throughout the University, as well as foster greater engagement with external organisation. Our ultimate aim is to grow and develop a quality interdisciplinary postgraduate research capability acting as a platform for positive interaction with University wide and external collaborators.

We believe that through the authentic learning opportunities described above we are providing a way for students to gain insight to the practical application of their learning, and to help develop confidence that will help facilitate a greater awareness (and understanding) of expertise in disciplines outside of art and design. In Product Design at AUT students are exposed to experts through a variety of authentic learning initiatives facilitated by the relatively broad range of backgrounds of the Product Design staff that are complimented by a growing number of external collaborative relationships (Reeves, Heerington and Oliver 2002, Callison and Lamb 2004).

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