Digital Course Construction:
Learn to Produce - Produce to Learn

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Abstract: Educational developers find themselves in an unstable balance between the inertia of tradition and an increased demand for innovative approaches. They must choose between tools, themes and traditions that address the local context and an emerging global convergence of such considerations. This paper presents a model with which to design digitally supported and both locally and internationally oriented courses based on practical experiences with WEB 2.0-oriented teaching and learning since 2003.

Introduction

Traditional education takes place in a closed physical and social space and with limited and well known technical resources [Tyack and Tobin 1994]. More often than not there is only one person in charge.

Digital technology is now transforming these ways in which we learn and teach. We might describe the new developments from sociological, technological, institutional and economic perspectives. But perhaps we can pinpoint the current development by reference to a change in reading and writing modes. As measured on an ordinary day in 2000 and 2009 the average number of minutes spent on reading has markedly increased in Norway (Figure 1.).

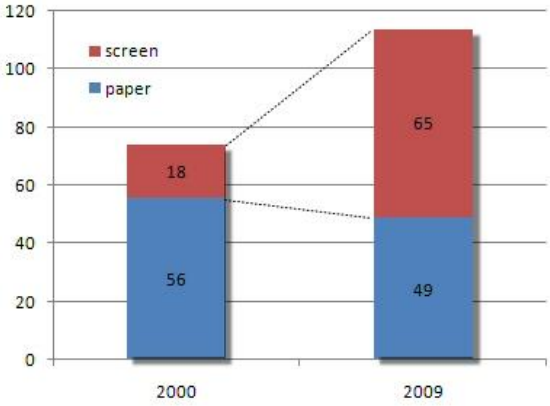

Figure 1 Minutes of daily reading from screen and paper, Norway 2000 and 2009 (Statistics Norway 2008)

But this reflects two opposing tendencies. While paper-based reading is somewhat reduced; which partly explains the financial difficulties of the printed press in this country and elsewhere; there is a manifold increase in the time spent on screen reading.

We take this change in the reading mode as a surface phenomen that covers deeper structural changes in our mediated communication patterns. The printed medium tends to support a communicative structure. A few authors and editors produce texts for the consumption of manifold readers. This is the one-to-many mode of traditional publishing.This also defined the social function and framework for linear intermediares like libraries and bookshops. The digital space, on the other hand, is materially, - and therefore also socially - , structured for both reading and writing. The inherently dialogical character of the digital medium is slowly absorbed by the educational communities and integrated into educational designs.

But during the first phase of networked digitalization the dualistic and reciprocal character of the World Wide Web was somewhat masked by the fact that it was *initially* easier to browse than to produce content. But now, - with the very rapid advance of Web 2.0 techniques and infrastructures -, content production has been radically simplified. Writing and other forms of self expression is on a par with reading and watching in terms of technical challenges. The new Read &Write space extends to virtually every screen surface that is digitally interconnected. For these reasons we assume that one defining parameter of current educational life is that the social enclosures of schooling; and with that the teacher notion of *my classroom as my castle*; is under duress.

But there is of course more to social interactions than reading and writing on a digital canvas. Physical proximity and a containing physical space is required for important transactions like group synchronization, development of trust, instantiation of governance and power structures etc. Early predictions of the surmise of brick-

and-mortar style educational institusions have failed. But the *solidity* of these frameworks is withering. They become translucent. More important, though, than opening up of physical space, is the corresponding reformation of social relationships. This coincides with access to an abundance of technical and textual resources that draws large numbers of people into direct and indirect relationships to each other on a global scale.

Local and Global Contexts

The societal *opening up of learning* is one of the main findings in an the Learnativity investigation that a group of researchers conducted on behalf of the E-Learning Initiative of the European Union (Learnovation 2008). The paper presents a two-dimensional analytical schema. The values on each axis in this schemata are continous, but for brevity we treat them as dichotomous and thus forming a 2x2 grid as shown in Table 1.

	LOCALIZED, CONTEXT BOUND	GLOBAL CONVERGENCE, META CONTEXT
INERTIA	**I**	**II**
INNOVATION	**III**	**IV**

Table 1: Two analytical dimensions for e-learning

In this classification, we may position an educational institution or an educational practice along one dimension leading from inertia to innovation and by their contextual scope with values spanning from "locally bound" to "global convergence". Typical instances may be described as

I. **Local and tradition-bound**.
This is typical of schools and universities that cater for the needs of local or regional constituencies in traditional fashion, i.e. the dominating feature of contemporary education.

II. **Globalizing, but inert.**
In this quadrant we find traditional and massified distance education as well as efforts to commercialize degree programs. One may well use digital technology, but this fact has little or no consequence for the pedagogical modes and models. A typical example would be talking-head video lectures delivered over the Internet and on-line standardized multiple choice tests.

III. **Innovation-for-context**.
The third quadrant caters for strongly contextualized and innovative approaches to education using digital technology. In our view, this is the domain of educational programs that transcends the distinction and division between formal education and workplace activities, crash courses and educational updates during a career etc.

IV. **Innovative transcendence.**
The last and fourth quadrant is both globalizing and innovative. Here we find educational processes that develop new and transcendent modes for people who work and study or just take some time off on the global scene, - the *digital nomads*. Examples are cross-regional and global joint courses and degrees, children learning with and from each other in global school programs, the loafing life-long learner and the training programs of global companies that consider the whole world as so many, but still unified, places of learning.

We leave the two first types behind in order to focus on the innovative dimension and pose the question: What kind of educational designs may support the development of innovative educational designs? They should support local contextualization or transcendent globalization.

Is it possible to devise means that simultaneously support both these scopes?

Our answer to these two questions is affirmative, but tentative. It rests on factual experimentation with digitally supported designs over three decades. In particular the results from the last few years are promising. But they are also obviously developmental and exploratory. We thus base the remaining part of this paper on abductive reasoning. We develop our design model on the experiences from just a few empirical cases. We will look at the

model in general terms and then fill in the blanks with factual designs. Then we discuss this in relationship to the more general opening remarks.

A Production-oriented Model

A model underlines certain important aspects of phenomena to the detriment of others that are of lesser consequence. The model we present here has therefore only two basic unit types called *learning events* and *learning objects.* Both are taken as relatively coherent and delimited entities. The former is an *acitivity type*, i.e. a lecture or demonstration, a Q&A session or group discussion, a reading etc., while the latter is some type of *textual material* that is useful in relationship to these activites. *Textual material* is understood in the wider sense as collations (usually digital *datagrams*) of one or more symbolic types like alphanumeric characters, numerals, still images and image sequences, aural rendition etc.

Courses: Sets of Learning Events.

A *course* is a collective activity that is orchestrated so as to contain a set of such learning events supported by a set of relevant learning objects. For organizational, operational and conceptual reasons it is common to further divide a course into modules and sessions using this or some other nomenclature (Figure 2). The relationship between sessions and events is libral so that a session may have one or more learning events and a learning event may have one or more sessions.

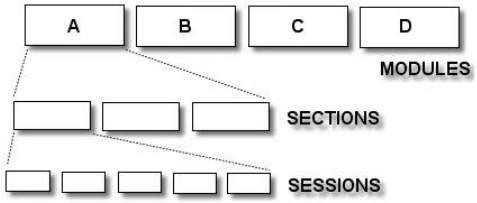

Figure 2 Modules - Sections - Sessions

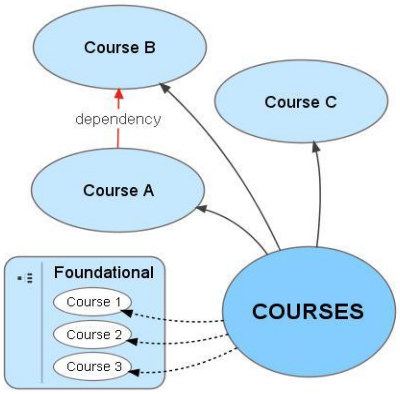

Figure 3 Courses and dependencies

Among the many qualities that make courses different from each other, we single out the two aspects of *depencendy* and *group dynamics*. The first is an important requirement in order to create cohesive study programs. Far too often courses are defined on a self-contained or *silo* logic that is derived from academic (and library) classification schemes of knowledge domains and the individualization of faculty work. This makes it easy on teachers and administrators and boring or rather meaningless for students. The other is the essential requirement to foster student activity.

A dependency is shown in Figure 3 between courses A and B, but none for course C. This translates to the the requirement in many course catalogues that two courses must be taken in a given sequence since the one is cognitively or operationally dependent on the other. But as we will return to later, such relationships may be more subtle as when we consider courses from a production point of view. This happens in particular when courses are continuously improved and developed. We then have a case of run-time rather than design-time dependency. The subject content or formal design of Course B may for instance be dependent on the previous preparation and run-through of course A.

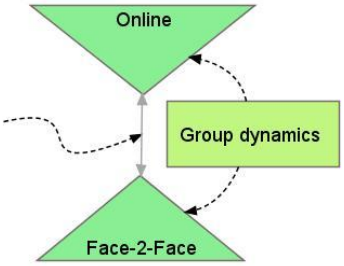

Figure 4 Group dynamics in blended courses.

As an example let Course A contain an assignment to develop a specific repository that is subsequently used as a resource in Course B. If the courses are stable, this resource will be created during the first run of A and may be reused repeatedly in later runs of B. But if a new and different repository is created for each run of A (and this is important for learning to occur there) and then used in B, there is a run-time dependency. Dependencies may also be reciprocal as when it is beneficial to produce or study two courses in parallel. One-way dependencies may here exist on the module or session level.

Another type of dependency exists between courses that are generally useful for operational training or conceptual framing. Common examples are methodology, study technique and academic writing courses. They are often of shorter duration or may be found as integrated module or session components inside other courses. We refer to this type of course as *foundational*. In some cases several courses of this type are organized as unified preparatory units for a given study program.

The second characteristic is the balance between same time & same place (*face-2-face*) activities and distributed modes. In Norway a run-of-the-mill design for commen 15 ECTS university courses (with 60 ECTS corresponding to a full academic year) requires 9-10 hours of weekly student engagement. This time is divided into face-2-face activities with a teacher present for 2-4 hours and the remaining for individual work. In some cases the latter is organized as non-supervised study groups. Such patterns are challenged by digitalization, the growing importance on collaborative modes of learning, the individualization of work schedules and the increased cost of teacher hours.

We approach this aspect of course design mainly as an effort to find the optimum balance between in-situ activities with a teacher in charge and the virtual (or "distance") organization of student work. The latter may or may not be organized collaboratively and this may or may not happen with students working in the same physical setting. From a design point of view we nevertheless uphold this specific distinction. It is mandated by the cost and group dynamics that follow from having a teacher present. Each solution leads to different takes on group dynamics.

Taking these two aspects together, we arrive at the simple model in Figure 5 for the initial steps in course design.

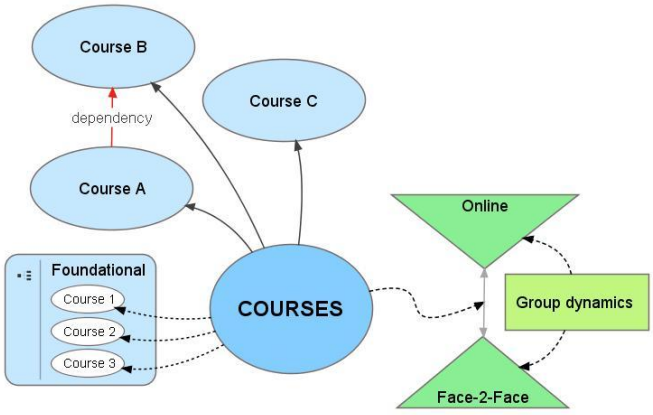

Figure 5 Simple Course Design Model

We therefore need to identify dependencies between aggregates of learning events, i.e. between sessions, modules and courses. Dependencies should be stronger between compontents inside than across courses. But one may also find examples of the latter type. At closer inspection these often prove to be derived from intra-module or intra-session dependencies. One approach is to define this as a course dependency that mandates a specific sequence of before/after or in-parallel course traversals. Another is to refactor the offending courses or to spin off dependency-generating modules or sessions into shorter foundational courses.

One characteristic of good group dynamics is to get into *flow* (Mihaly 1990). This may happen when tasks are not too simple as to bore and not too difficult as to demoralize. In order to achieve a state of flow we need to sequence tasks so as to resolves internal dependencies between them. We thus assume that the potential optima for group dynamics are to be found when the conceptual, operational and organizational dependencies between the learning units are well structured. This might be premediated. But the collaborative discovery of a good resolution may in itself be a strong lever to create flow-like states among participants.

Dynadocs: Sets of Learning Objects

The size and number of pages of a printed textbook might vary, but it is still easy to find the first and the last page. Printed matters may also be changing, but this happens with the issue of new editions (that may force students to buy them anew). Content-wise they remain basically the same. As such a document used to have both stability and closure as part of its defining characteristics.

With digital documents this static character is replaced with various forms of changeability or dynamism. We will refer to them as dynamic - as opposed to static - documents, or *dynadocs* for short. This is of tremendous importance for the development of textbooks and their relationship to course design.

Figure 6 shows a number of dynadoc "textbooks" (to the right) and three digital repository types (to the left). The textbooks are collations based on the learning objects that are hosted by these respositories.

Three such repository types are highlighet, namely cloud-based suites with support of several basic textual formats; and locally hosted resourses by way of Content Management Systems (CMS) and multimedia servers. From a logical point of view the dividing lines here are quite arbitrary. Video clips and slideshows may be hosted on a CMS platform and all such materials may well reside *in the clouds*.

For several reasons we maintain a modeling principle of local hosting, though. Many educational institutions want to maintain control of their CMS for configuration, fraud prevention and privacy reasons. Locally produced multimedia content may be too sensitive to be stored outside the institution. In important areas, particularly in the developing world, the Internet infrastructure is still too fallible with fall-out and unstable access. Local storage and hosting is of importance.

In the model in **Feil! Fant ikke referansekilden.** the resources of the Content Management System are *themed* with which we (from Wordpress fame) imply the ability to personalize and refactore content for varying visual and navigational requirements.

For structuration and retrieval purposes one may also want to impose pedagogical classifications, for instance the E-lesson Markup Language (eLML) schemata for learning objects (eLML 2010), but this is not yet tested or implemented in our designs.

Only two examples for the PC and the mobile phone are mentioned here. This extends to the whole range of potential screen estates like handheld, lap- and table-top, board- and wall-sized display as well as surround/immersive technologies and the corresponding means and measures for interactive manipulation. Multiple-touch technologies are for instance rather different on a mobile phone and an interactive whiteboard.The multimedia respository is described by the two formats video and slideshow. Other alternatives are also common.

The cloud-based respositories are described in more generic terms with options for alphanumeric text, numerals (calculation, descriptive and representative statistics) and imagery. Other formats for audio etc.could also be included. They represent overlapping categories and there are strong internal relationships and dependencies as when some pictures for a locally hosted slideshow may reside in the clouds.

Combining all elements above, we arrive at the general model in Figure 6. Is is based on a one-to-one and internal relationship between a given dynamic textbook and a given course. In different wording this can be described as *one course – one textbook* or one-to-one (1:1) since one of the dynamic characters of the "book" is that it is, to some extent, tailormade for each particular course. But there may of course exist many-to-many (N:M) relationship between parts of a given dynamic text and subunits of a given course, reflecting their internal dependencies.

Along the lower edge we have indicated potential divisions of work between teachers, students and teacher assistans (to the right), authors and instructional designers (in the middle) and producers of digital content and structure like documentlists/librarians, photo- and videographers and web designers (to the left). One may also read this as a growing potential for restructuration of educational work.

One main point of this model is to visually factor the (re)production environment in which dynamic textbooks are created, maintained and used. Another is to highlight the potential span and overlap of teachers', students' and instructional designers' contributions on the one hand and the potential new role for digital documentalists and librarians.

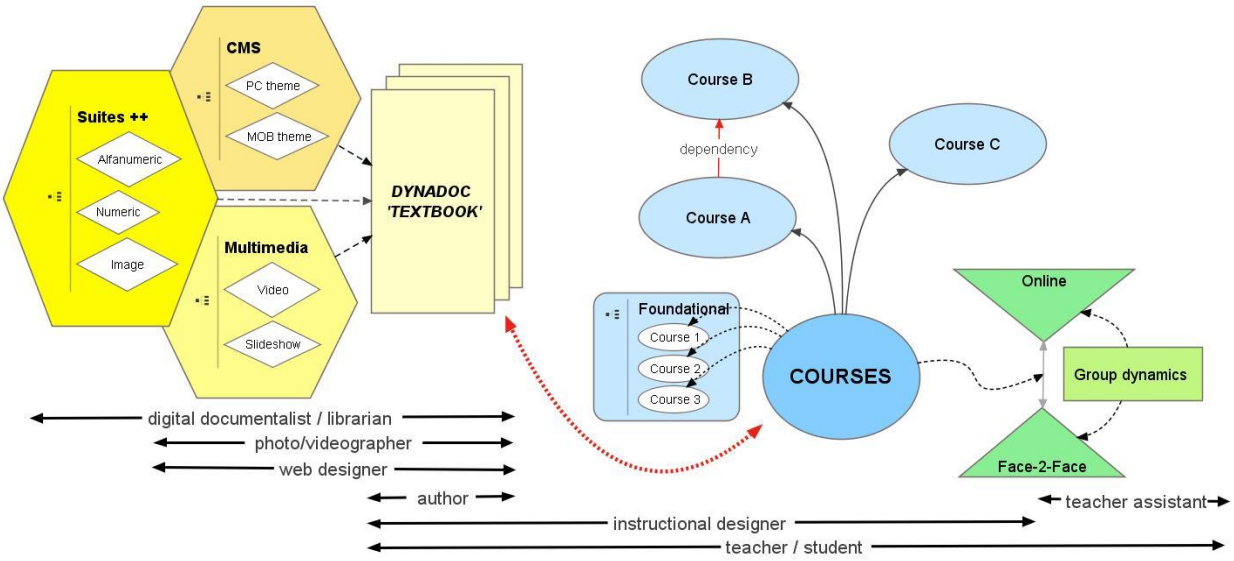

Figure 6 Generalized course design model

Experiental background

The previous model tries to generalize from three overlapping approaches to course design that we have used over the last years. We refer to these designs as the "ABCD", "Little Prince" and "Umbrella" principles.

The "ABCD" design was developed for two 15 ECTS courses of 400 student hours each that were launched in 2004 and 2009 respectively with repeat runs in 2009-2010 and 2010-2012. The first was called "Fragments". It deals with principles and practices for creating stand-alone e-learning solutions. This course is directed at current and future teachers, instructonal designers and other end users. The second is called "ACHRON" for "Art and Cultural Heritage Resources ON-line". It is targeted at curators, librarians, teachers, journalists, artists and others that work with cultural communication and dissemination. The letters stands for inAuguration, Basics, Case study and Documentation. These letters represent the four consequitive modules that are blended with face-to-face venues between each of them.

The "Little Prince" design got its name from a passage in that famed book by Saint Exupery. In the first chapter there is a drawing that most people (in the book and among the readers) take to be a hat. But it is in fact, says the little prince, a picture of a boa constrictor that has eaten an elephant. For course designs this image illustrates an approach where course participants do some preparatory work (the snake's head) before a period of intense and heavy engagement (the elephant in the belly) that is subsequently rounded off with an afterglow and tying up of loose ends (the tail). This design principle has been applied to 6 runs in 2008-2010 of a 180 hours (7 ECTS) introductory course called "LATINA" which stands for *learning and teaching in a digital world*.

The third design has been used for a number of courses at the Masters and Ph.D. level over the last 10 years. An "umbrella" is here a containing function for several smaller and student-driven projects. Each of them is organized on a master-apprentice relationship between faculty and students. To support part time study, the design caters for initial as well as follow-up negotiation periods between the students' workplace and academic institution. This is a prerequisite to obtain a good blend between local and centralized communities of practice and across institutional borders in national internationally oriented projects. Participants direct their own work as individuals or in smaller groups. Their projects must reflect core concerns and developmental challenges in relevant professional practices at the workplace. The "umbrella" function is useful to relate projects and work groups to each other for synergy and shared access to technical, organizational, financial and theoretical resources.

See Figure 7 for a brief overview of the ABCD design for a blended course of 15 ECTS or 400 hours of student work. The course contains four modules that are derived from pedagocial principles rather than subdivisions of subject content.

The short 40 hours module A (for inauguration) is used to situate participants within the social, conceptual and operational space of the course. This is done entirely online with the participants residing on their home turf

(academic institusion, workplace or generally in their home country or on the move as the case might be). They meet face-to-face for a week's worth of work that is used to review their preparations in module A and prepare for the subsequent module B. The latter "basic" module of 80 work hours is used to present and work in more depth with basic concepts, operations and behaviors.

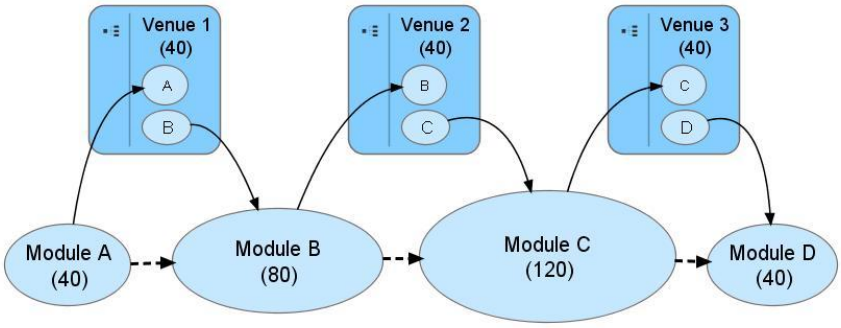

Figure 7 ABCD design for blended mode courses.

Module A and B prepare for the larger module C that is built on the students' engagement with one or more case studies. This work requires the construction, deployment and test of a particular design or solution to a factual problem. 1/3 of the entire course or approximately 120 hours is set aside for this exercise. The second venue is thus a review of the "basics" and an in.dept discussion and preparation for students' develolpmental work.The last module D is used to document and disseminate experiences both descriptively and analytically.

The subject content of a given course is distributed and orchestrated over this body of activity types. As an example, consider a model diagram for the first venue in the ACHRON course in Figure 8. The course was initially run entirely within the fall semester 2009 with Norwegian students and is now deployed internationally with Norwegian, Polish and Chinese participants 2010-2012. During the preparatory period (A) the participants will only meet online. They will work with a set of readings that provide background for writing an introductory essay. They will also conduct analytical work where they provide and analytically describe a photograph sequence that illustrate certain esthetical formalisms like "line", " texture", "contrast", "dept of vision" etc as well as creating a commented digital story from these pictures. All results are uploaded to the course site using a tailormade repository.

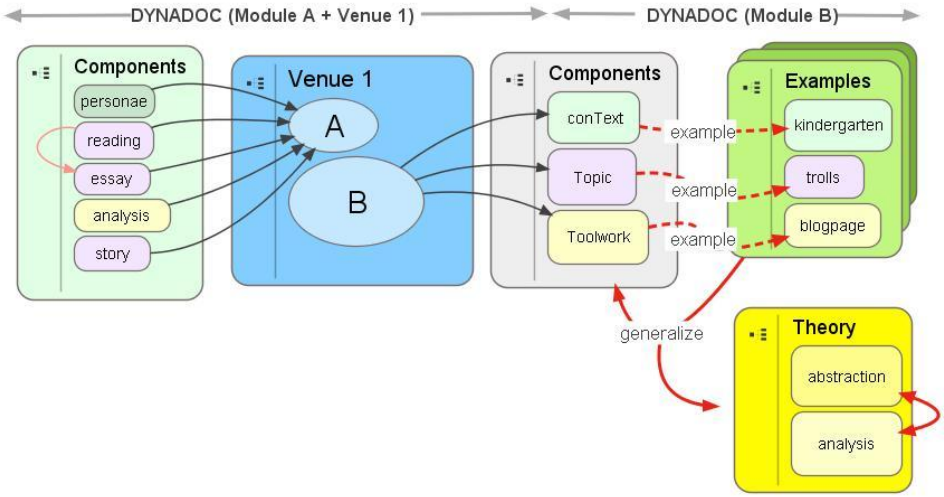

Figure 8 Factual design of first venue in an ABCD-derived course.

The two first day of the week-long face-2-face venue are used to review this work. The remainder is used to present and work with with basic conceptual and operational compontents as well as a few excursions to relevant sites in the host country. In ACHRON the course topics for the basics period are context, topic and tools. Examples of social contexts are family visits to a museum exposition, secondary school projects on local history, historical

sites that are visited by cultural tourists etc. The topics span the entire field of art, art history and other aspects of cultural heritage. Tools are defined as digital resources that are useful in order to present and communicate about such items in such contexts. For each component the course provides introductions and more in-depth work with values assigned to each of these dimensions. Figure 8 provides one example with "kindergarten" as context, the Norwegian oral tradition of storytelling about trolls and their depiction in romantic art as the topic and with (some aspects) of blogging as the tool to build online resources to support interactions on these topics for this audience. 3-4 examples of this kind are presented. They serve as a foundation to generalize this three-component approach.

The examples are used to support generalization by access to and production of analytical and theoretical material.. To some extent these texts are prepared in advance for the A and B modules. This body constitutes initial content for the course textbook ("dynadoc"). But students and teachers are also required to augment the material with their own contributions as well as with freely available on-line during modules B and D. In this way the course textbook develops as a result of collaborative input. This is a core element of the model. In our experience, the main and serious challenge is here to establish an internal cohesion between description and analysis on (at least) two levels of abstractiton related to the examples given, namely

1. the operatonal and analytical dimensions of each factual and contextual example
2. some more general domain which the example is meant to exemplify

The inner relationship between these two aspects should establish a valid "channel of generalization" for analysis of each example so as to be of interest in other contexts. This abductive reasoning, where a tentative analytical framework is built on top of a very delimited set of factual examples, is a first step in the inductive-deductive mode of reasoning.

A similar structure was developed for the "Fragments" course. But here the components of module B consisted of preprogrammet fragments (hence the name) to build on-line discussion phorums, collaborative documents, online photo repositories etc. The students learn to build, combine and expand on these components. Their new contributions are then added to an expanding collection of such applets.

In both cases there is a mutual dependency – a *dialectic* – between course runs and the supporting dynamic textbooks. The texts support coursework, but coursework is also used to expand, revise and improve upon them. This does not only pertain to the written word, but to illustrations, multimedia content and exercises as well. The repository used for this course is a *mélange* of several locally hosted Wordpress installations as Content Management Systems (CMS), several locally developed databases, locally and YouTube hosted videos/digital stories and supporting materials (written text in PDF and wordprocessing formats, calendars, spreadsheets, slideshows etc) in Google Docs and other Google applets.

More important though, is the continuous reworking and expansion of case studies and other resources like new fragments for applet construction in the Fragments course and new solutions for presentations and interactions in the ACHRON course. Between these courses there is also a dependency in that new fragments may (and indeed have) been used to create new cultural dissemination solutions.

Summary

To summarize we return to the question posed at the outset of this paper: How can we create learning designs that support both a global reach and local contextualization?

This paper argues that a production perspective on education is essential. Rather than focus on students' ability to reproduce methodological receipes or theoretical models, they should be taught to produce for real-life deployment and reflect on this exercise. This kind of reflective practice may be obtained through flexible designs that rest on higher-order shcemate. An example was illustrated in Figure 6. The collective work of student, teachers and other supporting roles should result in two kinds of products:

(1) a continuously developed and course-specific dynamic text that reflects and links to the global repositories of similar materials
(2) a continuously improved procedural process to organize the work for everybody involved that is project and workplace (as well as pedagocially) driven rather than by the structuration principles of traditional academe. The workplace in question may or may not be, but often is, an institution of learning.

These two design principle also enable us to catch the differential between educational cultures as they are carried by participants from multiple countries. The course content and structuration are or are forced to become global in scope. Courses are designed to be run by partnerships between educational environments in several countries. Students may themselves be globally dispersed as long as they are able to meet each other in one specific location for a perod of intense interaction. In the ABCD design this happens three times of one week each over a year or so. In the "Little Prince" design there is only one venue that lasts two to four weeks with preparatory work and an aftermath. The "umbrella" design allows for even greater variety.

Additionally all students must be able to establish and maintain contact with their relevant field(s) of practice during the case study periods. Ample time is set aside by course organizers to negotiate the establishment of such relationships.

The coursework so far mentioned has been evaluated by participants. On a scale from 1 (poor) to 7 (excellent) the results lie safely in the 5-7 range. Such results are promising. Of greater importance than the feel-good of good feedback is a hunch that we may be edging away from a scholastic structuration of coursework that in some cases seem to suppress rather than liberate the creative energies in higher education.

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