Combining Craft and Digital Tools in Design Education for the General Public

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The use of information and communication technology (ICT) in the Art and crafts subject in general education in Norway is examined through a survey and qualitative interviews with teachers. Both the survey and the interviews reveal that teachers prioritise traditional crafts over ICT. Several teachers view youngsters as *digital natives* who will master the digital tools anyway, while they fear that material knowledge, motor skills and craftsmanship will be lost. The writings of Vetlesen (2015) and Sennett (2008) on the relationship between craft and technology are used to shed light on the teachers' priorities. The term *digital natives* is discussed against Nordkvelle and Fritze's term *medialized*, which suggests that mastery of ICT does not apply to a whole generation. This leads to the conclusion that the Art and crafts subject should include both ICT and craft. In this article, we introduce practical studio work that combines crafts and digital tools, and we discuss if such a combination can meet future challenges in the education of youngsters.

ICT, craft, art and crafts education, design

1   Introduction

Digital tools and crafts are often viewed as contradictions in general design education in primary and lower secondary schools. A growing number of schools and municipalities in Norway have a priority focus on information and communication technology (ICT), where digital tools shall be implemented in all subjects at all levels. In some of these schools the pupils get their own iPad already as six-year olds. Due to the traditional crafts' prominent position in the Art and crafts subject, a priority focus on ICT may not affect this subject.

In this paper, we present three assignments for use in the Art and crafts subject, aiming at building a bridge between these contradictions. A study of how digital tools are used in Norwegian primary and lower secondary schools, with pupils in the age range 6 to 16 – both schools with and without a digital focus – and what the teachers report about their priorities between ICT and craft is also

presented. We discuss how the presented assignments may accommodate some of the challenges identified in the study.

2 Building a bridge between digital tools and crafts: Assignments for use in the Art and crafts subject

Artistic research has been used in developing assignments to be used in the Art and crafts subject. We build upon artistic research as a method for research through artistic work. This method may include both theory and practice (Berg, 2014, pp. 22–23). Similar terms used are *research by design* (Sevaldson, 2010) and *research through art and design* (Frayling, 1994, p. 5).

In this study, different ideas and solutions for assignments were tried and evaluated in a reflective, artistic practice. The projects most suitable for educational purposes, which allow the youngsters to develop their knowledge of traditional crafts and physical materials, as well as their digital skills, were chosen for discussion in this paper.

2.1 Making a digital collage from drawings and paintings

This project started out with an exploration of artistic mediums, in this case, aquarelle, acrylic paint and crushed charcoal mixed with water. It is therefore suitable as an introduction to these artistic mediums. The work was then digitalised and put together in photo editing software, such as GNU Image Manipulation Program (GIMP) or Adobe Photoshop.

The artistic mediums were applied to different surfaces, such as canvas and smooth and rough paper, to make different-sized paint samples, as shown in Figure 1. The youngsters learn how the paint behaves with different amounts of added water, observe how the different pigments in aquarelle paint blend into each other and how the different surfaces affect the overall appearance. It is also possible to sprinkle salt over the wet aquarelle paint to observe its effect.

To create figurative images, it is possible to combine these paint samples with drawings or sketches. A scanner was used to digitalise the paint samples and drawings. Scanned with a high resolution, even quite small paint samples, such as 5 x 7 cm, can be used in larger digital images. If a scanner is not available, it is possible to photograph the samples and drawings.

In the photo editing software, the youngsters are introduced to basic tools and features, such as marquee tools, layers and masks. The scanned paint samples were inserted into separate layers over a neutral background. If working with circles or squares, the software usually has marquee tools in those shapes. The students simply choose an interesting area of the paint sample, select it with the marquee tool and either use masks or the eraser tool to remove the rest from that layer. For different shapes, they draw each shape on a separate layer and use it to make a selection. This is shown in Figure 1.

Figure 1 Left: Paint samples. Right: Screenshot of using a triangular shape to make a marquee.

Drawings can be used in a similar manner to cut out pieces from the paint samples. The students use a marquee tool suitable for selecting an irregular shape or area, such as the magic wand tool or quick selection tool, and select a particular area of the drawing. They use that selection to mask out or erase the parts of the paint sample layer outside this area. They can keep only the lines from the drawing layer by marking and erasing the paper parts or use blending modes that subtract the light parts of the layer. They should feel free to experiment with blending modes on the other layers as well, to create new and exciting effects. Figure 2 show two finished products from such a process.

Figure 2 Left: Digital collage assembled from paint samples cut in triangular shapes. Right: Digital collage assembled from a drawing and a paint sample.

2.2 From photo to cross-stitch embroidery

This project emphasises the craft part, but the digital work is essential to get started, as this is where the pattern for the cross-stitch is made.

The students use a photo of their own choice, preferably one with a simple motif. They should ensure that the photo is not protected by copyright and that they can freely do their own work based on it. To make a clean and simple cross-stitch pattern, some of the details should be edited out, and the number of colours reduced in a photo editing software of their choice, such as GIMP or Photoshop. If the image size is very large, it should be reduced to less than 1 MB.

Once the picture is ready, it is simply uploaded on the free web application KnitPro by Microrevolt. This translates the image into patterns for knitting, crocheting or cross-stitch embroidery. A cross-stitch pattern, as well as a finished embroidery, is shown in Figure 3. While uploading, the students must select which kind of pattern they want (in this case, cross-stitch) and choose among three sizes. It is worth noting that all three sizes are quite large for beginners. It is possible to cut the pattern into smaller pieces and divide them among the youngsters, so that each of them makes one segment, all of which are later assembled into a larger picture.

KnitPro generates a cross-stitch pattern based on a photo. Even though the photo has a reduced number of colours, the pattern may contain more colours. It may therefore be necessary to tweak the pattern while embroidering in order to decrease the number of colours and not overcomplicate the work.
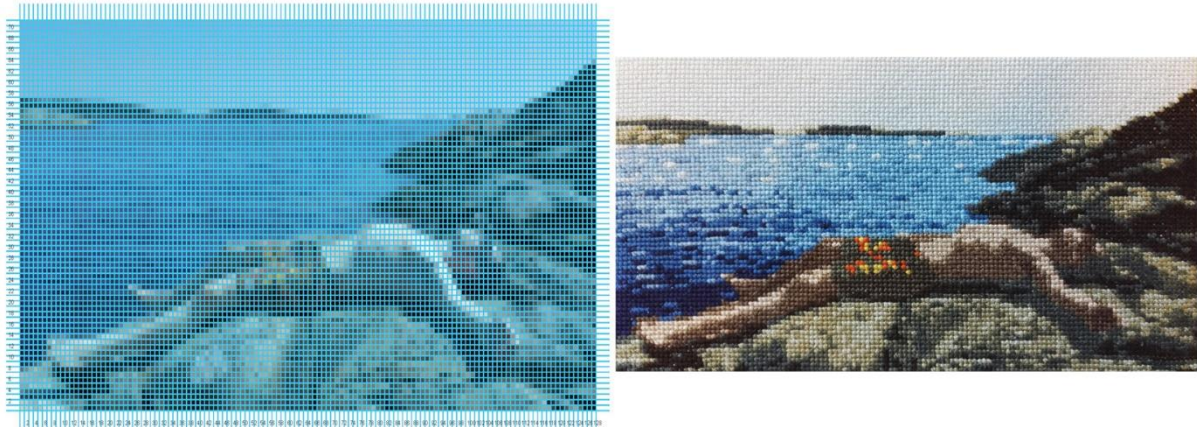
Figure 3 Left: Cross-stitch pattern generated, using KnitPro by Microrevolt. Right: Finished cross-stitch embroidery.

2.3   Using SketchUp to plan a gingerbread house and wooden chess pieces

SketchUp is a suitable tool for sketching and planning three-dimensional (3D) work, as it allows users to gain an understanding of proportions, rotate the model to look at it from different angles and work with real-world dimensions. In the planning of gingerbread houses, they are first modelled in three dimensions and then cut into individual pieces to make the stencils used in cutting the dough. This turns the sketches into useful tools in the process. Outside of the holiday season, the houses can be built of cardboard or similar materials. When designing chess pieces, the software helps the students see how each piece looks and evaluate how all pieces work together.

The gingerbread houses can be designed in an intuitive manner. A simple house is first built in the shape of a rectangle, which is then pulled up to form a cuboid. A line drawn across the top of the cuboid forms the ridge of a gable roof when pulled farther up. In just four steps, a shape resembling a house is created. Such a house is shown in Figure 4. Using the line, rectangle and circle tools, it is possible to add or subtract parts of the model, for instance, adding a chimney or cutting window holes. If a rectangle is drawn on a wall, it is possible to use the push/pull tool to create a different shape. It is interesting to experiment with different architectural styles and building types, such as building a small village with small and large houses and a church. As the houses will later be made of gingerbread, the project does not call for a realistic representation or richness in detail. To make the stencils, each piece is selected, copied and rotated to face the same plane, as shown in Figure 4. This operation will challenge the youngsters' understanding of the software's three dimensions and will develop their navigating skills. By using the text tool, the pieces can be marked to keep track of them. Before printing the stencils, the students set the camera to show the pieces in parallel projection so that the measurements are not distorted by the perspective. The pieces are then exported as jpg files, printed and used as stencils to cut the gingerbread dough.
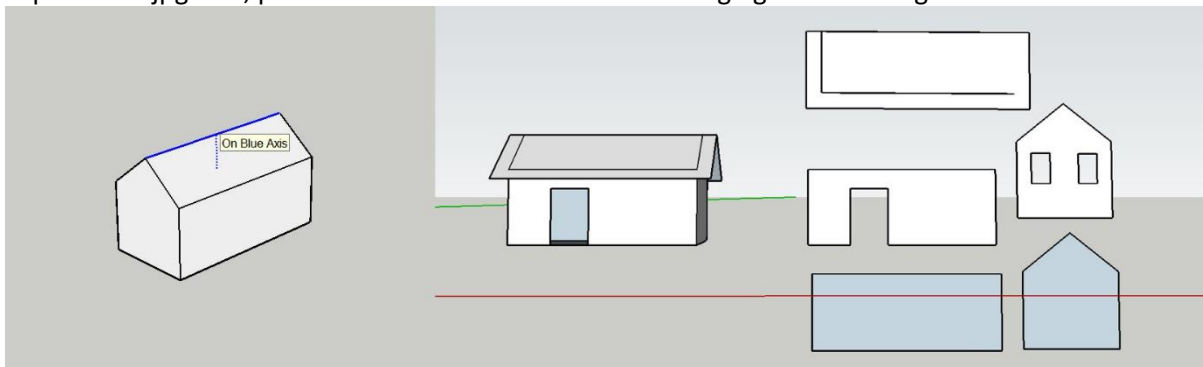

Figure 4 Left: Screenshot from SketchUp, constructing a simple house. Right: Screenshot from SketchUp, making stencils for cutting the gingerbread dough.

Designing chess pieces in SketchUp gives the students the advantage of seeing each piece's proportions and appearance, as well as how well the pieces work together when placed on the chess board. A full set, as shown in SketchUp, is shown in Figure 5, along with three pieces carved out in wood. One negative aspect of using SketchUp is that the students' knowledge of the software or the software's possibilities may restrict their creative outlet. Nonetheless, as the pieces will later be carved out in wood, a simpler design may be better. When the pieces are designed, the youngsters can make blueprints in SketchUp by exporting images of the parallel projected pieces, as seen from the top, bottom and sides.
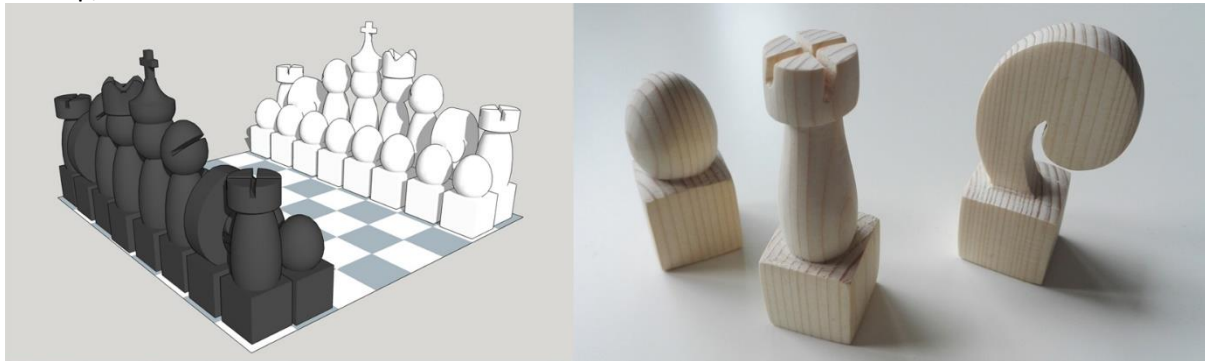

Figure 5 Left: 3D model of a chess board with a set of chess pieces, exported from SketchUp. Right: Chess pieces carved in wood.

3   Methodology

A mixed-methods approach was used in this study, including a survey and five qualitative interviews. The selection of participants and execution of the study are presented below.

3.1   *Survey*

Randomly selected Art and crafts teachers participated in the survey; the participants are called *respondents* in this paper. The respondents were chosen through a random draw in Norwegian public schools, both at the primary and the lower secondary levels, with pupils in the age range 6 to 16. The selected schools were contacted and asked to reply with the contact information of their Art and crafts teachers. The survey was sent by email to 168 teachers whose information was provided by the schools; 82 teachers responded, equivalent to a response rate of 48.8%.

The survey was a digital questionnaire consisting of 10 questions of different types. The respondents were asked to rate how much they agreed with different statements, answer multiple-choice questions and finally, write comments about their positive and negative views on the use of ICT in the subject in a text box.

3.2   *Qualitative interviews*

The interviewed teachers are called *informants*. The informants were strategically selected and divided into two groups. The first group consisted of three teachers working in schools or municipalities with priority focus on ICT, and they were assigned the code Gr1Teacher(X). The second group comprised teachers working in schools or municipalities without such a focus, who received the code Gr2Teacher(X). The informants in group 1 were chosen through a search for schools with a publicly known priority focus on ICT. The schools were contacted and asked to provide a list of Art and crafts teachers who were willing to be interviewed. The second group was recruited through the survey. A question about whether the respondents' school leaders required the use of ICT was used to identify the relevant informants. Less than 10% gave a negative answer to this question, so the respondents who also answered "partly", combined with little to average use of ICT, were considered relevant. Two of the contacted respondents agreed to be interviewed. All five informants were well educated and highly qualified to teach the subject. They had between five and thirty years of experience as Art and crafts teachers and worked at primary or lower secondary levels in public schools.

The interviews were semi-structured and lasted between 30 and 60 minutes. The contents of the interviews somewhat varied. However, the main topic was how the teachers used digital tools in their classes, as well as which factors, such as access to equipment and their own digital competence, and which parts of the subject they wished to prioritise, might explain their use.

4 What does teachers express about digital tools in Art and crafts?

4.1 How are digital tools used in Art and crafts?

In the survey, the respondents were asked to rate how often their pupils used different digital tools or software and how often they worked on different tasks in class. None of the respondents answered that they used any of the given tools or software in all or almost all classes. The most widely used tools were software for text treatment and presentations, such as Microsoft Word and PowerPoint, and internet search engines. Additionally, the most common tasks were internet searches and working with text documents. These are common tasks that can be used in most projects, so it would only be natural that they were the most prevalent. As much as 30% of the respondents answered that their students never used subject-specific software, such as Adobe Photoshop, GIMP, VideoPad and SketchUp, for digital drawing, photo or video editing or 3D modelling, as shown in Figure 6.
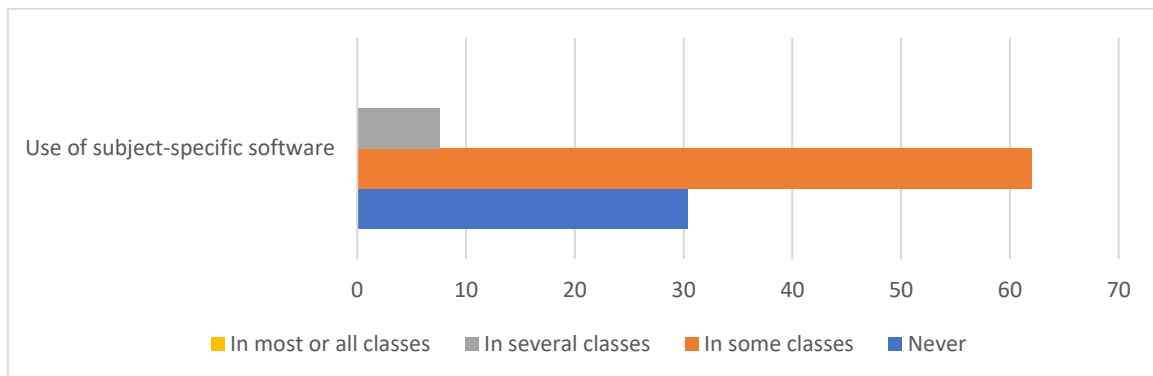

Figure 6 Diagram showing the respondents' rating of how often subject-specific tools were used in class. Approximately 30% answered that their pupils had never used subject-specific software, while 62% had used it in some classes. None answered "in most or all classes".

In the last survey question in the open field, many respondents praised the easy access to inspiration and information provided by internet search engines. Almost as many wrote about great experiences working with photo editing, animation and so on.

The interviews told the same story. Two of the informants, Gr1TeacherA and Gr2TeacherA, only let their pupils use digital tools for making presentations, writing texts and searching for inspiration or information. The other three, although some were limited by the lack of software, also taught subject-specific use of ICT. Their pupils worked on tasks, such as animation, 3D modelling, mobile photography and photo editing, often combined with traditional techniques, such as drawing or woodwork.

4.2 Teachers prioritise traditional crafts and experience with materials over ICT

The main aim of this study was to find explanations for teachers' use of digital tools. Limited access to relevant equipment and insufficient digital competence were both cited as explanations for the lack of ICT use, but the most important factor might be the teachers' prioritisation of traditional crafts and opportunities for the youngsters to gain experience with materials. Many of the informants reported that the Art and crafts subject was not allotted enough time to fulfil the demands of the curriculum; thus, they needed to prioritise some parts of the subject over others. There seemed to be the perception that crafts constituted the subject's core element. As Gr1TeacherA expressed in the interview, "[…] I think, in a way, that the main task as an Art and crafts

teacher is to teach them [the youngsters] some craft, whether it's sewing or drawing or …". A similar view is illustrated in the following response from the survey:

> *Art and crafts is first and foremost a practical subject. ICT is used a lot in all subjects. In the Art and crafts subject, I want to focus on the practical, to teach techniques and practical designs. I use the digital format a lot for the presentation of finished products and in the process of sketching. Otherwise I do not wish to spend time on a computer; rather I want to create and make physical products. (Respondent #50)*

Gr1TeacherA worked in a school where all pupils received their own iPads upon starting school at age six. The iPads were used in all subjects, and Gr1TeacherA reported that if a teacher did not want to use this tool, he or she ought to find another place to work. Although everyone was required to use the iPad, Gr1TeacherA clearly stated that she used it as little as possible in Art and crafts; instead, she put a lot of emphasis on crafts. In the interview, she admitted that this could be a reaction to the school's digital focus.

> *They [the youngsters] get a lot of knowledge about digital tools.. all sorts of digital tools really, but what they have less knowledge of, is how to use their hands. It's a lot of touch system and using your index finger to navigate, but somehow.. fine motor skills are very under-stimulated. (Gr1TeacherA)*

Gr2TeacherA showed a similar attitude towards ICT and crafts. With about 30 years of teaching experience, she claimed to have observed a decline in the youngsters' practical skills. She no longer expected them to have basic skills, such as cutting with scissors and threading needles, and felt the need to prioritise the training of practical skills through crafts. She also expressed the opinion that ICT should not be the focus in Art and crafts: "(…) it is supposed to be a practical subject, and I think that it isn't the use of computers that should be the most important".

Many of the respondents and the informants had a positive attitude towards ICT and made use of digital tools in a wide range of ways. However, it appeared that many of them valued the craft part of the subject most highly, as shown in the following comment from the survey: "(…) But it [ICT] can never replace the value and importance of using tools and materials". Another respondent emphasised the importance of the tactile dimension of working with materials. "What can be negative [about using ICT] is the eventual lack of direct tactile experience of materials in different processes. An understanding of the material and physical world in Art and crafts is still significant and important".

A more positive attitude towards ICT was apparent in the interview with Gr1TeacherC. Her pupils had worked with photography, photo and video editing, digital drawing and 3D-modeling, but she also had reservations concerning too much ICT in Art and crafts:

> *I have to tell you that I put extra weight on the use of practical materials and tools, so really, we are a bit sceptical about using it [ICT] too much. Now, we see that if we use digital tools more, we are afraid of being assigned larger groups of pupils. But we have really good teacher competence, studios and tools here, both for woodwork, sewing, ceramics and everything like that, so it is important for us to work most with that. (…) But it is a supplement to do it [work on ICT] a little, but definitely not too much, I think. It can be too easy to just take out the iPad and do something fun there. It is really important to maintain the quality of materials, knowledge about tools and using pencil and paint and all that. It is really important. (Gr1TeacherC)*

Again, traditional craft and working with materials were valued the most, while working on an iPad was mentioned as something easy and fun. It is also noteworthy that Gr1TeacherC was reluctant to use digital tools more for fear of being assigned larger groups of pupils or losing her well-equipped studio, due to economic cuts. Although she also regarded ICT as an important part of Art and crafts, her prioritising of crafts was also apparent. Based on this, the potential changes mentioned above would be detrimental to the subject.

In the survey, the respondents were asked to rate how much they agreed with the following statements: "In my classes, I put weight on ICT", and "I prioritize traditional craft and materials over

ICT in my classes". The responses clearly showed that many of the respondents prioritised traditional crafts and materials, while quite few put weight on ICT. For both statements, about a quarter of the respondents placed their responses in the middle of the scale, but most of them seemed to have clear opinions on these matters. Figure 7 shows the respondents' answers.

In the open field at the end of the survey, many of the respondents chose to express their views on the relationship between crafts and ICT. Some of these comments are quoted in the preceding paragraphs, while others are cited in the following ones.

The curriculum implemented in 2006 included a prominent position for ICT. Digital skills are regarded as one of the five basic skills that should be incorporated into all subjects to develop youngsters' abilities. This might be the reason why some of the respondents reported that ICT was taking over their teaching curriculum at the expense of more traditional techniques, as shown in the following comments from the survey:

> *"Find it unfortunate that the focus on practical craft disappears; everything drowns in the digital."*
>
> *"[ICT] may* "steal" *too much of the time and the craft part will be compromised."*
>
> *"I don't see a lot of negative sides if it [ICT] is used with sense. It must not take over for the craft where you work with your hands."*

In these quotations, it is possible to recognise the fear of ICT dominating Art and crafts, pushing out the crafts. In the interviews, Gr1TeacherA and Gr2TeacherA expressed worries about the neglect of youngsters' practical and motor skills. Craft still **occupies** a prominent place in the curriculum, but many youngsters spend a large part of their spare time on computers and other digital tools. Gr1TeacherA did not consider it necessary to spend time in school on teaching the youngsters about this.

> *Well, I think that everyone now has so many digital things at home, at least I see my children spending time with this, taking pictures, manipulating them and doing so much with these pictures, adding filters and.. it's not necessary to teach them because they know how to do it. (Gr1TeacherA)*

Gr1TeacherA expressed her view on the youngsters as "digital natives" who would master ICT anyway; as a result, she was comfortable with her priority of crafts.
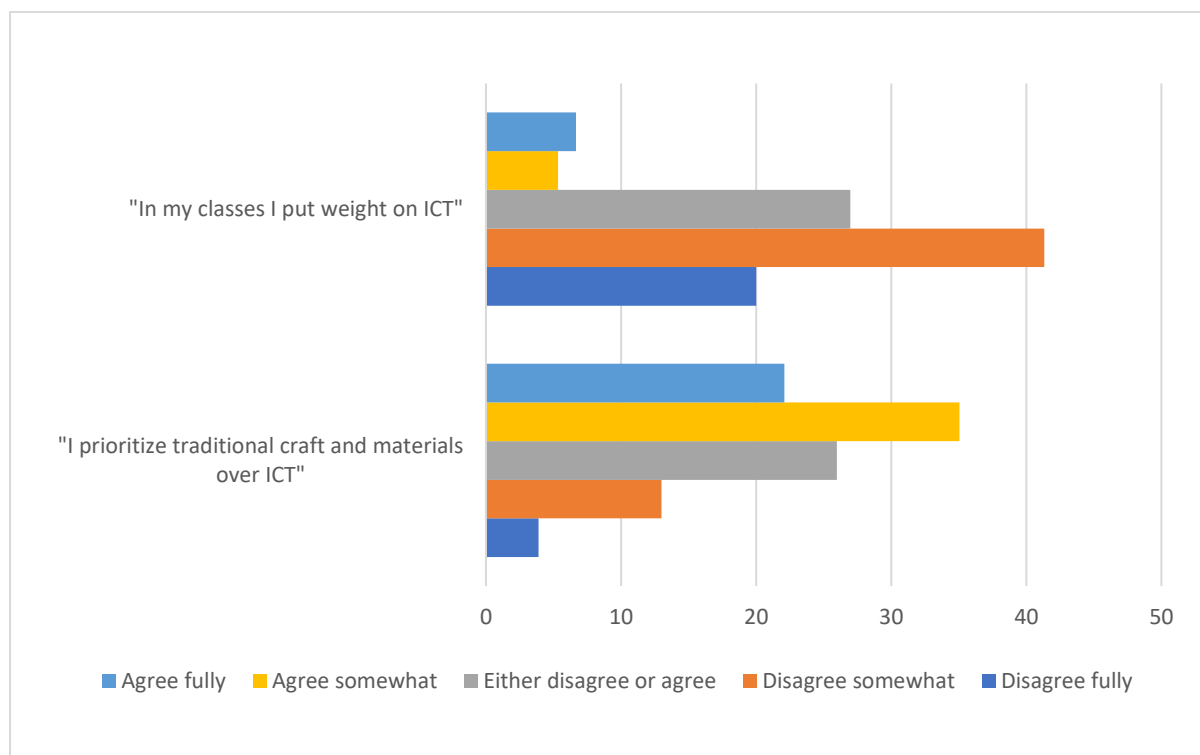

Figure 7 Diagram showing the distribution of the respondents' answers, rating how much they prioritised ICT and crafts in

their Art and crafts classes. Around 12% reported that they agreed fully or agreed somewhat with the first statement, "In my classes, I put weight on ICT", while 61% disagreed somewhat or fully. The second statement, "I prioritize traditional craft and materials over ICT", received opposite responses; 57% agreed fully or somewhat, and nearly 17% disagreed fully or somewhat.

5   Combining ICT and craft in perspective

The study showed that many teachers prioritised craft and teaching youngsters to work with their hands and materials over ICT. This preference was justified through their observation that youngsters lacked motor and practical skills, while they might be able to acquire digital skills on their own. The teachers also seemed to place the highest value on the craft aspect, perceiving that teaching such skills is the Art and crafts teacher's most important task. To understand these findings, they are discussed in relation to Arne Johan Vetlesen's (2015) and Richard Sennett's (2008) writings on the relationship between technology and craft. Marc Prensky's (2001) and Yngve Troye Nordkvelle and Yvonne Fritze's (2015) articles about digital natives are also discussed.

According to Vetlesen, technology allows for less physical and sensuous experiences with the surrounding world, as sight is favoured over hearing, smelling and touch (Vetlesen, 2015, p. 167). Much content in the Art and crafts classes stimulate all four of these senses. Youngsters hear the difference when knocking on wet and dry ceramics, smell various types of wood and touch different types of yarn, while sight is prioritised in all parts of the subject. The lack of physical and sensuous experiences from ICT may explain the teachers' fear of losing the crafts part of the subject.

Sennett's (2008) broad definition of crafts includes musicians, glass blowers, scientists in a laboratory, architects, Linux programmers and weavers. His definition therefore exceeds the limits of the Art and crafts subject and does not distinguish between work with materials and digital work. For Sennett, *craftsmanship* is about the wish to do good work for its own sake (Sennett, 2008, p. 20). However, Sennett still warns against replacing experience with the physical world with digital simulation when he writes about architects using 3D modelling or computer-aided design (CAD). By using only digital tools in planning instead of spending time on the location, making sketches and drawings by hand, the architect loses an understanding of materials, proportions and other physical properties. Without such understanding, critical design problems may emerge (Sennett, 2008, pp. 39–45). Some of the dangers here relate to the quick calculations of digital simulations, while drawing each brick in a building takes a long time. Several times in the book, Sennett emphasises the slowness of craft, both in gaining skills and working with single products, as important. Time allows for reflection and creativity. Quick solutions, such as digital simulation, do not provide the craftsman enough time to reflect on his or her choices (Sennett, 2008, p. 295), and the final product may exhibit flaws that should have been discovered earlier in the process.

In Sennett's warnings against digital simulation, there is also a valuation of physical, sensuous experiences with materials and places. Vetlesen has written more on technology replacing these experiences with the surrounding world, comparing the traditional felling of trees with the use of a modern forestry vehicle, a discussion inspired by encountering such a vehicle. The forestry vehicle is operated by pushing the right keys while looking at a screen, in a similar manner to writing text, although the task is completely different. The operator's main attention is oriented towards the screen, with occasional glimpses at the tree to ensure that the process is going well. This process is in huge contrast to the traditional felling of trees, where the carpenter physically engages with the trees, using his or her senses and handling the different obstacles at hand. In the forestry vehicle, every tree feels the same, making a single tree an almost abstract entity that is not experienced in a physical or sensuous way. The machine stands between the man and the tree – subject and object – making the direct contact between them superfluous (Vetlesen, 2015, pp. 147–149).

> *The change that interests me is not primarily a matter of man's relating to the tree being mediated by a machine (computer) that literally is an in-between between subject and object. Rather, and more profoundly, it is a matter of the subject-outer reality relationship – a two-way affair, as we saw – being replaced by a man-machine (technology) one. (Vetlesen, 2015, pp. 148–149)*

Vetlesen explains a phenomenon that may be difficult to express in words. Based on this study, it is apparent that experience with materials is highly valued among Art and crafts teachers. However, none of the participants in this study justified *why* this was the case; rather, they simply stated that it was extremely important. Accepting Vetlesen's assertion about the use of technology leading to abstraction makes it easier to understand the fear of ICT taking over art and crafts, thereby compromising the crafts component.

Sennett traces the line of crafts backwards, including the 19th century's emerging machine culture. Against the machine's perfection, the craftsman became a symbol of human individuality, directing attention towards variations and small mistakes in the products (Sennett, 2008, p. 84). In the Victorian age, there was a growing concern that the large number of identical objects could dull the senses. The identical, perfect, mass-produced products did not invite a personal relationship (Sennett, 2008, p. 109). Over a century later, after the digital revolution, these thoughts are still relevant. In this study, we encountered the perception that digital artworks were less personal. Gr2TeacherA called this a negative aspect of the use of ICT in Art and crafts.

> It can be very impersonal, I think. A bit artificial. Lifeless. If you are making stuff on the computer. And it is very, like.. things can look very alike. I'm thinking about a personal expression, that is something I find very important. (Gr2TeacherA)

Personal expression is highly regarded, along with craft skills, by Art and crafts teachers in their evaluation of the youngsters' work (Lutnæs, 2011, p. iii). One may consider whether Gr2TeacherA's statement about digital drawings being impersonal is indeed true, but it justifies her lower priority of the digital aspect of Art and crafts.

Gr1TeacherA expressed the opinion that it was not necessary to teach youngsters about ICT because they could learn it on their own. This can be linked to the term "digital natives" coined by Prensky (2001). According to Prensky, children born after the digital revolution think and process information differently from the older generation – called "digital immigrants" – because they have spent their lives surrounded by digital tools and media. The digital natives are accustomed to rapid information processing and multitasking; they prefer pictures and graphics over text and favour games over "serious" work. In contrast, the "immigrants" may adapt to the digital community, but they will always be revealed by their "accent", an outdated, pre-digital language (Prensky, 2001, pp. 1–2).

In their article "Digital immigrants or just medialized", Nordkvelle and Fritze (2015) present arguments against the term "digital natives"; instead, they propose the term "medialized". While "digital natives" refer to a certain generation, "medialization" describes how much a person's life is affected by technology and media (Nordkvelle & Fritze, 2015, p. 71), thus transcending generations. Although most Norwegian youngsters have access to some digital technologies, according to the studies discussed in Nordkvelle and Fritze's article, differences related to gender, social class and interests affect their digital skills (Nordkvelle & Fritze, 2015, p. 68). Based on these findings, claiming that youngsters will automatically master ICT seems too easy. Thus, schools need to train all youngsters in some basic digital skills to bridge a potential knowledge gap. If a school focuses on ICT, all subjects should be included and pull the load. Crafts occupy a special place in Art and crafts, but that does not mean that the former should be the only part of the subject. To ensure that youngsters develop the digital skills necessary for the 21st century, along with sufficient practical and motor skills, teachers should find a way to include both ICT and craft in the subject.

The three assignments for use in the Art and crafts subject presented in the start of this article can all be viewed as possible solutions for combining ICT with craft. Cross-stitch embroidery and woodwork develop the youngsters' motor skills and they learn basic skills such as threading needles and handling knives, as well as give them experience in working with soft and hard materials. Building a house made of gingerbread or cardboard trains their practical skills when assembling flat pieces to create a three-dimensional structure. Working with the paint samples for the digital collages provides experience and knowledge about different types of paint on various surfaces, which will offer a solid foundation for further work on paintings. These are all common tasks

mentioned in the Norwegian curriculum and used by many Art and crafts teachers. What are the advantages of combining them with ICT?

First, as many of the teachers expressed their fear of ICT taking over the subject, pushing out the crafts, we believe in the importance of showing that these contradictions can be combined. It is not necessary to choose either craft or ICT; instead, the digital tools can support craft projects, speeding up slow and repetitive parts of the process to leave more time to work on the craft aspect. This might be best shown in the example of the cross-stitch embroidery, where the pattern is generated in seconds rather than spending hours on drawing it manually. Moreover, giving the traditional craft a more modern appearance by using photographs may make the assignment more interesting for youngsters. By working on designs in SketchUp, it is possible to make blueprints and stencils in the same process, instead of drawing these separately. The option to cut and paste allows for rapid duplication to try out small design tweaks or use the same design elements in different pieces. It does not mean that ICT should always replace the hand in sketching, considering the positive aspects of the slow process of drawing manually, as pointed out by Sennett (2008, p. 295).

In the first assignment, working with paint samples allows for a freer exploration, as students are not restricted by the fear of ruining a nice painting. The notion that the samples will be used further on may motivate students to search for interesting and beautiful results. Otherwise, they may find the sample making useless and tedious despite the useful experiences such a process may provide. As opposed to the other assignments, its end product is a digital image. One informant expressed the view that digital images are often impersonal, artificial and lifeless, which seem to be negative characteristics in the Art and crafts. In this assignment, the digital images are based on handmade images that are later digitalised. This process provides a personal touch and richness in texture that may may counter the informant's association of digital images with negative attributes.

Working with software for 3D modelling can enhance the youngsters' understanding of perspective and the relationship between two-dimensional representations and three-dimensional objects. This skill is necessary for creating their own drawings or understanding images, such as architectural sketches.

An important aspect of digital skills is the knowledge of copyright and the laws that restrict sharing of images. When working with photographs in a project such as the cross-stitch embroidery, it is relevant to address this issue, as found images might be used, modified and built upon in making patterns.

6   Conclusion

This study showed no significant difference between schools with and without a priority digital focus, in the Art and crafts subject. In fact, the informant who stated most vehemently that she avoided ICT worked in the school with the highest implementation of digital tools.

Most participants in the study put weight on craft, developing practical and motor skills, working with the hands and gaining experience with materials. In their respective writings, Vetlesen (2015) and Sennett (2008) shed light on the value of craft and materiality. According to them, technology may lead to an abstraction of our surrounding world and offer less physical and sensuous experiences, meaning that we will have less understanding of our surroundings. Art and products made with digital tools may also become less personal, whereas the personal perspective is highly regarded in Art and crafts.

Some participants expressed the opinion that it would be unnecessary to teach youngsters how to use ICT, as they would master the tools on their own. This is not necessarily true for all, as differences in gender, social class and interests affect their digital skills. The schools must therefore take the responsibility to train all youngsters in the necessary skills for the future.

Craft and materiality are highly valued by Art and crafts teachers and should remain so, but there is also a need to include digital tools. Through three examples of assignments for use in the Art and crafts subject, we showed that a combination of ICT and crafts might be fruitful for both developing

digital skills and practising traditional crafts. Art and crafts teachers should not feel the need to choose between ICT and craft but include both in their teachings.

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