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From Gender-segregated Subjects to Multi-material Craft: Craft Student Teachers' Views on the Future of the Craft Subject

This paper describes the views of student teachers of craft about the future of craft as a school subject. The study was conducted at the University of Turku, Department of Teacher Education, in Rauma in 2014. The literature review revealed that the subject of craft in Finnish basic education is understood as a dialog between the maker and the materials. However, teaching and learning craft in schools and in teacher education has a strong gender-based tradition. The aim of this study is to investigate student teachers' understanding of craft as a school subject in the future and their solutions to teaching craft in basic education. The data were collected from essays (N = 20) written by student teachers of craft. The essays were analyzed qualitatively using content analysis. The results showed that the student teachers of craft viewed holistic craft, reflective action readiness, entrepreneurial behaviour, multiple skills, the use of versatile materials, and craft as sources of pleasure as the main solutions for the future of craft as a subject.

Keywords: craft education, multi-material craft, pedagogical innovation process, gender-segregated craft, teacher education, basic education

Introduction

In many countries, craft as a school subject has disappeared from curricula because of societal change. In many cases, the subject is now included in technology studies, art education, or home economics. However, in Finland, craft has retained its status as an independent school subject and an academic discipline in universities. In the Finnish Basic Education Act (628/1998) and the Finnish National Core Curriculum for Basic Education (2004 and 2014), the subject is called crafts. Crafts is a compulsory subject in Finnish primary schools from the first to sixth grades (ages 7 to 12), and in the seventh grade (age 13) in secondary schools. In the eighth and the ninth grades (ages 14 to 16), students can select crafts as an optional subject. The basic elements of the craft in Finnish basic education (grades 1–9, from ages 7 to 16) are material and processing techniques, design, and technology (FNBE, 2004, 2014).

In this study, we use the concept of *craft* as the school subject and *craft education* as the academic discipline in the teacher education program at the University of Turku. Equivalent school subjects with objectives similar to Finnish craft are found, for instance, in “Design and technology” in the UK, “Sloyd” in Sweden, and “Design, wood, metalwork, and home economics” in Denmark. In some countries, such as Austria, Estonia, France, Germany, Latvia, and Japan, craft are included in home economics (textile work) and technology (technical work) (Autio & Soobik, 2013; Rasinen et al., 2009; Syrjäläinen & Seitamaa-Hakkarainen, 2014). At present, the main content of the craft subject included in the Finnish National Core Curriculum for Basic Education (FNBE, 2004) is in the areas of technical and textile substance. This content is based on materials, techniques, tools, machines, and devices; in other words, the technology includes a wide range of material areas. In teacher education for the subject of craft, the students' major discipline is craft education. Furthermore, some craft studies are compulsory in every primary teacher education program at Finnish universities. To obtain a permanent teaching

position, a master's degree-level examination is compulsory for all teachers, including craft teachers (Lindfors, 2010).

In Finland, craft have been regarded as a diverse and versatile subject in curricula since 2004. However, both the teaching and learning of craft has been based on traditional gender segregation. This is primarily because of the curriculum: the subject of craft is divided into technical work and textile work (FNBE, 2004). Male teachers teach most of the technical work while female teachers are involved in the textile work. This division of the content (see Figure 2) and teaching methods support gender-segregated craft education (Kokko, 2012; Marjanen, 2012; Lepistö, Rönkkö, & Tuikkanen, 2013; Lindfors, 2012). The learning objectives are defined by the level of the students' knowledge and skills in craft, design, and technology. Moreover, if the students are allowed to choose the content of the craft, almost all boys choose technical work and almost all girls choose textile work (Lindfors, 2012; Sigurdson, 2014; Dakers, Doe & McNamee, 2009). This societal phenomenon invites us to consider which teaching models would best support a holistic learning process instead of enabling gender-based choices in relation to future-oriented solutions in diverse material environments.

The new National Core Curriculum for Basic Education (2014) defines educational craft as an expanding and modernizing multi-material school subject that includes a variety of technologies (FNBE, 2014). The focus is on developing students' exploratory, creative, active, and entrepreneurial future-oriented work. Hands-on learning in a wide range of materials and technological areas will be the main didactical guideline in promoting students' open-minded application of knowledge and problem-solving skills.

In the promotion of non-segregated and multi-material craft, it is necessary to develop teacher education. Recent research has shown that stereotyping shapes gender-related attitudes in teaching, which can undermine students' performances and interests in some school subjects (Shapiro & Williams, 2011; Stout et al., 2010; Buschor et al., 2014). There are also requirements for assessing the perceptions of the benefits of same-gender teachers as role models for students (Stout et. al, 2010; Carrington & McPhee, 2008; Thorne, 1993). Instead of focusing on textile or technical work, the objective of the teacher education program in craft at the University of Turku has been to develop student teachers' capability to operate in a multimaterial world as creators of innovative solutions. The hypothesis is that by studying both areas—soft and hard materials—future teachers of craft will have a wider view of craft education. It will also promote gender-neutral attitudes and improve their potential to cooperate with other teachers. This wide-ranging expertise in the materials will also promote the potential of future teachers of craft to share their knowledge and skills with other teachers of this subject. Moreover, versatile material expertise will help to develop the understanding of how to tutor pupils using pedagogical innovation processes (Lepistö, 2010; Lindfors, 2010; Lindfors & Hilmola, 2015).

The aim of this study is to clarify the concept of multi-material craft and to present research data about student teachers' views of craft as a future school subject. Hence, we pose the following research question: What kinds of views do student teachers have of the future of the subject of craft? In the following sections, we will describe the development of future craft education by emphasizing the following: first, craft and innovative design processes; second, the craft subject as a dialog with the material; and third, the development of gender-segregated craft. Based on the results, we will discuss the future of craft as a subject and propose new research topics to support the redesign of gender-segregated craft to promote multi-material craft.

Literature Review

Innovative Design Process in Craft

Innovation as a learning process is a many-sided, holistic design process. In the pedagogical context, we see the innovation process as an inventive problem-solving process, which produces a new, practice-oriented solution with high usability at the student level. The innovation process

(see Figure 1) includes several cycles of planning, studying, optimizing alternatives, solution testing, critical evaluation, repetition, and implementation (Lepistö et al., 2013; Lindfors, 2010; Lindfors & Hilmola, 2015).

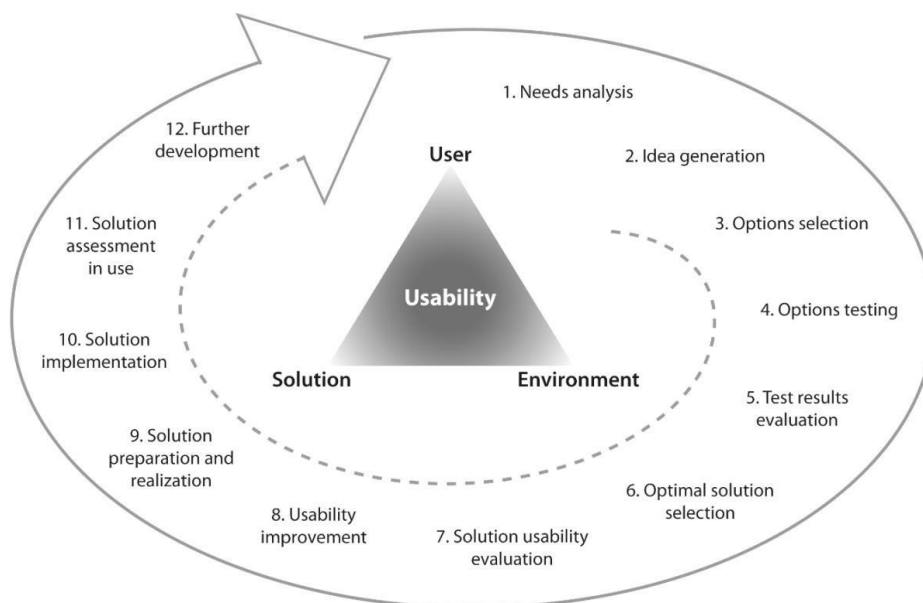


Figure 1. Innovative design process (Lindfors, 2010; Lindfors & Hilmola, 2015).

At the student level, an innovative design process requires teachers to have the ability to understand the principles of inventive activity, the process of designing, making, and evaluating a solution, and the pedagogical knowledge of how to tutor a student. However, holistic craft (Kojonkoski-Rännäli, 1995) comprise the following phases of the innovative process: needs analysis, the generation of ideas, the designing of solutions, the making or manufacturing process, and finally, the assessment of the artefact and the entire process. To turn ideas into a viable craft product, the maker must obtain information about technologies, materials, and tools by asking, experimenting, and examining. In craft, the same person or people conduct all the phases, either individually or in a group (Pöllänen, 2009).

The subject of craft offers a natural context for innovative learning. The versatile process of making craft includes equal emphases on both technical and textile content. Instead of a gender-based dichotomy, multi-materiality has been considered a possible solution for promoting innovative learning in craft. Multi-material craft combine holistic design and making processes by using a wide range of materials, both soft and hard. In multi-material craft, the student designs creative and innovative solutions by using various materials meaningfully in order to create a functional solution to a particular problem. During the process, he/she learns by practical application the concepts, materials, techniques, and technology. The student does not have to learn all the materials and technologies that are available, but he/she has to become familiarized with the most versatile craft materials and approaches. The student must also acquire meaningful learning experiences to learn about and develop craft that are appropriate for the material world in which we live. The focus, therefore, is on understanding the process involved in learning holistic craft, the role of usability and appropriateness in designing a product or solution, pedagogical innovation, and the creation of future-oriented teaching methods. This focus requires the transition from the present techniques and materials used in craft teaching to those that emphasize planning and creativity. The focus should be on the holistic craft process and the joy and satisfaction derived from work and innovation (e.g. Dakers et al., 2009) such that it

challenges the development and regeneration of the subject of craft and its practice in teacher education. (Lepistö et al., 2013).

The Craft Subject as a Dialog with Material

The contents of the technical work and the textile work learned in the subject of craft are primarily based on materials and technology. This is contrary, for example, to the purely visual effects sought by art (Adamson, 2007). In a two-dimensional representation, a craft—for example, a design on a piece of wood—expresses the individual's experiences, kinesthetic memories, and corporeal concepts, particularly when the visual representation is experienced as momentous (Sigurdson, 2014). In craft, the focus is on creating a material solution by working with one's hands. The creative use of hands is a tool for the experiential and explorative acquisition of information and the formation of all kinds of materials. Although tools, machines, devices, and techniques—the technology of craft—are used as instruments, the immediate contact of human hands on the materials is the most essential (Kojonkoski-Rännäli, 1995, 2014; Risatti, 2007; Seitamaa-Hakkarainen, 2006, 2010; Sennett, 2008; Sigurdson, 2014). Teaching and learning crafts is often described with reference to the concept *learning by-doing*, but it could also be called *learning-in-doing* (Pöllänen, 2009). That is because making, doing, and functionality are involved during the craft-making process (KojonkoskiRännäli, 2014). In crafts, designing and making the artefact, particularly the dialog with the material, are related to the usability and functionality of the designed product. The maker must work with the material before he or she can understand, for example, how a piece of fabric, after undergoing different phases, will form a piece of clothing (Lepistö, 2010). Sigurdson (2014) described the self-referring transcendence that happens when the maker experiences sawing, carving, turning, or drilling as being one with the three-dimensional object.

When an individual works on a piece of material by hand, he/she experiences and understands the material world concretely and functions in connection with it. Because it is a physical activity, the hands-on process calls on the maker's mental and cognitive abilities, such as creativity, thinking, exploring, and consideration. A craft maker who works intently with his/her hands also nurtures his/her thinking (Huotilainen, 2013a; Kojonkoski-Rännäli, 2014). This activity is understood as a process in which the hands and the mind of the maker are simultaneously engaged in the material-making (Risatti, 2007). There is a dialog between the maker and the material when, on one hand, the maker conducts different technical experiments related to the structure of the product and the behaviour of the material and, on the other hand, tests and develops his/her own skills (Lepistö, 2010). All activity in the world is based on various materials; consequently, materials have been central to humans from the beginning of life. Nature uses materials to lay a foundation for life, and people develop and use materials to reform and expand their environment (Hiltunen & Hiltunen, 2014). This is the main reason that various materials are always involved in discussions about craft education.

In future-oriented craft education, a student's individual potential to influence the choice of materials, techniques, and products that he/she wishes to produce will be increased. Learning will not base on a specific material or a technique but on the student's own need for the artefact, curiosity about a new material, or the wish to succeed in making the artefact. Craft teaching will be connected with modernity and change with time. In addition, it will be separated from the traditional gender-segregated content areas. It is essential to understand that materials are only the tools used to implement the maker's ideas; they should not rule craft making (Lepistö, 2011a). Furthermore, the importance of the social context, collective dynamics, and shared practices are often neglected when individual decision-making is emphasized (Thorne, 1993). However, can craft making choices really be free? The tacit assumption in the future of the craft subject is that there should be free choice that is determined purely by the student's talent and intrinsic

motivation and unconstrained by societal forces, such as teachers, peers, parents, or traditional gender-segregated content.

Gender-segregated Craft

Craft education has a long tradition (Kantola, 1997; Marjanen, 2012) that affects the present situation in basic education and teacher education in Finland. Craft have held an official position as a school subject since 1886 (see Figure 2). Consequently, in the current teaching and learning of craft, a gender-based dichotomy exists. Before 1970, then subject of craft was divided into different content areas for boys and girls. Despite the alteration in the curriculum in 1970 from gender-based division to material-based division, that is, the division between textile content and technical content, the subject has retained its dichotomous nature. Consequently, craft are one subject but have two material areas (FNBE, 2004).

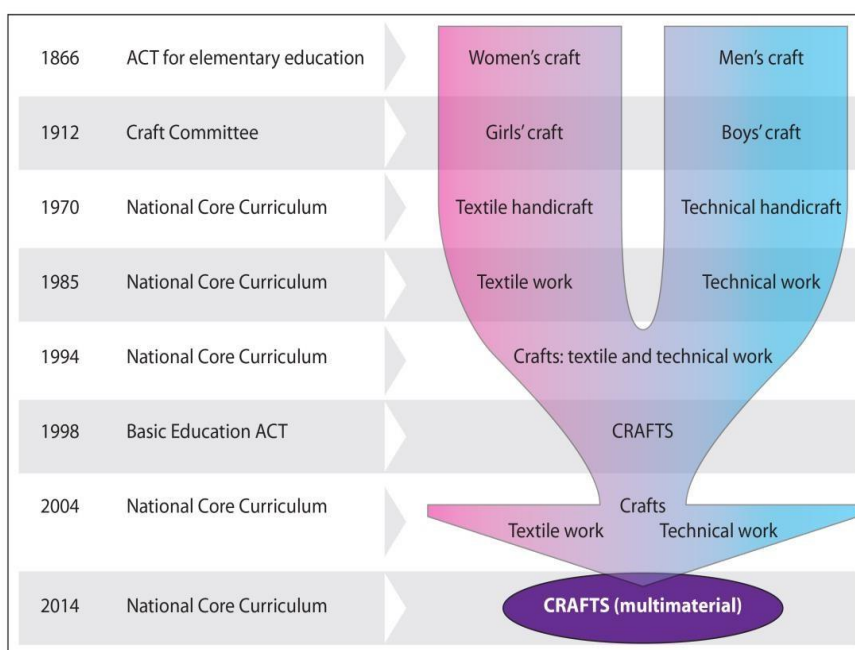


Figure 2. The historical development of craft from gender-based craft to a gender-equality-oriented, multi-material school subject (Lindfors, 2015).

The gender-based separation of the subject of craft in Finland stems from various cultural and social conditions. Overall, textile crafts have traditionally been viewed as appropriate for females, whereas working with hard materials, such as wood and metal, has been assumed to belong to males. This gender segregation, which has been sustained by both the previous and current curricula of craft education, has been sustained in Finnish culture and education (Kokko, 2009, 2011, 2012). Figure 2 shows the historical development of the craft subject, which in the beginning, was allocated separately for girls and boys. From 1970, the curricula made it possible to organize teaching practices without gender segregation, but the traditional structures of learning environments and teacher education continued to support the traditional gender-based organization of craft teaching.

The main objective of including craft as a subject in Finnish basic education is to develop the student's hands-on knowledge—in other words, craftsmanship—in various ways. In practice, the subject of crafts is compulsory for every student in grades 1 to 7. The National Core Curriculum for Basic Education (2004) gives the municipalities freedom to decide how the teaching of craft is organized and implemented. This has led to the situation in which the craft

subject is taught differently in different parts of the country. Craft lessons may, therefore, include both technical and textile work, or students may choose to concentrate on one or the other. The student makes this decision after the fourth grade. However, some content of the other craft area must be included in the curriculum. In practice, the fourth graders' choices are made mainly according to gender even today; most girls study textiles and most boys choose technical work (Lepistö, 2011a; Lindfors, 2012; Murtomaa & Ryyänen, 2012). This also seems to be the case in several other countries (e.g., Dakers; Dow & McNamee, 2009; Murphy, 2007; Paechter, 2007). Moreover, students' choices in other school subjects tend to be based on gender stereotypes: boys choose to study electronic-orientated or technological subjects, whereas girls choose textile-orientated or art subjects.

In addition to the content, the methodology and teaching practices also maintain the gender-segregated nature of the craft subject. Several aspects must be considered in teaching craft, such as the teaching methods, learning environment factors, and gender roles. This is consistent with the role of stereotyping in science, technology, engineering, and mathematics (STEM) because the social environment assumes certain attitudes based on gender (e.g., Shapiro & Williams, 2011). The content of traditional Finnish craft—both work technical and textile work—encourages students to use certain materials and products that are perceived as being either feminine or masculine: girls in textiles commonly use only so-called “soft materials” (fabric, yarn, etc.) in their projects, whereas boys use “hard materials” (wood, electronics, etc.) in their technical work. Consequently, girls do not learn to work with hard materials, and boys do not become familiar with soft materials (Lindfors, 2007). Therefore, the craft curriculum should not allow the possibility of dividing the subject according to gender. The courage to experiment with something new and to innovate using a wide range of materials is likely to be excluded if pupils and students must think and act traditionally based on gender-based choices.

Several studies have shown that children learn the stereotypical roles of being a woman or a man who are accepted in the community as they participate in various situations and observe their environment. They gradually adopt the general masculine and feminine practices of the community (Kokko, 2012; Marjanen, 2012; Paechter, 2003, 2007; Thorne, 1993). On one hand, girls often underestimate their technical knowledge, depend on instruction books, and need someone else's approval to become convinced of their knowledge (Luomalahti, 2005). Boys, on the other hand, tend to be confident in mastering technical subjects (e.g. Kokko, 2012) and are less dependent on instruction books. Moreover, girls are expected to have the expertise and motivation to do textile work, while the expectations for boys in working with textiles are low (e.g. Kokko, 2011). It is also known that behavioural compatibility guides students' gender-based choices (Thorne 1993), but techniques such as mixed-gender groups could contribute to changing this division (Svaleryd, 2008; Lepistö, 2010; Sigurdson, 2014). Craft teaching should also take into account the students' personal ideas about learning, support their development and interest in craft, and encourage them to be active learners. A possible solution is that craft teaching should make diverse content, materials, and techniques compulsory for all students in mixed-gender groups. In transforming gender-segregated craft into holistic, multi-material craft, it is important to consider the type of content, the methods of teaching, and the learning environment.

Method

Study Context and Participants

The study was conducted at the University of Turku Department of Teacher Education, in Rauma. It is related to the study module, “Didactics in Craft Education,” which is offered at the master's degree level as a part of the major in craft education. This five-credit ECTS study module includes theoretical discussions about the challenges of developing craft as a school subject as well as nurturing students' reflections on the topics and content they will concentrate on in the future as teachers when they develop the subject at school.

Data Collection

This study aims to explore the views of student teachers on the future of the craft subject. The students reflected on the question in essays that they wrote at the end of the didactics study module. The data were collected during the spring semester of 2014. Thirty-three students took part in the study module. Approximately half were women (N = 16) and the remainder were men (N = 17). All 33 students gave their permission to use their essays as research data. The research data, that is, the student teachers’ essays, were collected at the end of a learning module. The essays were a part of the students’ required course work. Consequently, it is possible that knowing that they would be assessed may have affected their responses, which could have weakened the validity of the study. This factor must be taken into consideration when the results are analyzed and discussed.

Although it was compulsory for the participating students to write the essay, their participation in this study was voluntary. The essays were written in a web-based session during which all the study materials were available to the students. The length of the essay was not determined. Students could choose to write the essay in pairs (N = 13) or individually (N = 7). The essays (N = 20) were submitted electronically by email, and when they were received, they were printed for assessment.

The student teachers’ task was to introduce a theme, an objective, and/or content that they considered important for developing the craft subject in the future based on the societal relevance of the craft and its ability to enhance the learning of their future students. The answers were neither right nor wrong. The student teachers were asked to use the literature, lecture notes, personal experiences, and other relevant references in their reflection. Because this required a broad interpretation, it was a challenging task for some students, but most were able to express their views and reflections clearly. An average essay covered two pages, amounting to qualitative data of around 40 pages of A4 size paper.

Data Analysis

We conducted the data analysis using inductive category development content analysis (Mayring, 2000), which can be adapted to fit qualitative studies. The aim of the content analysis was to create a clear and uniform description of the student teachers’ views on the future of the craft subject. We first divided the qualitative data into parts, and then we collected and reconceptualized them in a logical whole (Mayring, 2000; Tuomi & Sarajärvi, 2009). The task was to identify the central themes that emerged from the data and to reintegrate similar themes in order to derive a coherent explanation (Krippendorff, 2004). We first reduced the qualitative data, that is, the essays, to essential expressions (see the examples in Table 1) that represented the research question: What kinds of views do student teachers have of the future of the craft subject?

Quotation	Essential Expression
<i>One of the most important functions of craft is, in my opinion, the pleasure that the maker derives when he/she is making craft.</i>	Feeling pleasure
<i>The teacher should also understand that instead of learning the skills perfectly, the joy of working with one’s hands should be the most important.</i>	The enjoyment of making craft

Table 1. Examples of the reduction of the research data.

After the data were reduced, we grouped the essential expressions into subcategories (see the examples in Table 2).

Essential Expression	Subcategory
<i>Feeling pleasure</i> <i>The fulfilment obtained from making craft</i> <i>The fun of making craft</i> <i>Well-being</i>	Feeling the positive effects of making craft

Table 2. Examples of subcategories.

By conceptualizing the linguistic expressions in the data, it was possible to proceed to the theoretical concepts and conclusions (Mayring, 2000; Tuomi & Sarajarvi, 2009). Consequently, we analyzed and formulated the data collected from the essays as shown in Table 3.

Subcategory	Upper Category	Main Category
The feeling of the positive effects of craft making Enjoyment	The positive effects of craft making on the brain	Source of pleasure
Persistence Previous experiences Routine	The feeling of safety and persistence	
The meaning of craft making for an individual Self-expression Balance	The meaning/relevance of craft making and the craft product to the individual	

Table 3. Examples of the upper and main categories.

The objective of the analysis was to understand and describe the significance that the student teachers placed on the future of craft teaching and learning. The possibilities for developing craft education and the craft subject were analyzed based on this significance. The analysis of the research data consisted of a dialog between the findings of earlier studies and the researchers' analysis. We joined concepts and analyzed them in order to obtain answers to the research question. When a new theory was formed, we compared the theory and the conclusions with the empirical data available (Mayring, 2000; Tuomi & Sarajarvi, 2009). For this interpretation and consideration, we referred to previous research and a wide range of studies (e.g. Kojonkoski-Rännäli, 1995, 2014; Lepistö, 2004, 2010, 2011; Lindfors, 2007; Marjanen, 2012; Pöllänen, 2009, 2011, 2012; Rönkkö, 2011; Seitamaa-Hakkarainen, 2009; Sennett, 2008; Sigurdson, 2014). The quotations that supported the results and conclusions were assigned only to the students' gender (e.g. two male students or female students) in order to maintain the anonymity of the respondents.

Results

In the qualitative analysis, the significant themes were *craft as a holistic process, reflective action readiness, entrepreneurial behaviour, versatile skills, multi-materiality, and source of pleasure*. Excerpts from the student teachers' essays that described the theme in question are presented as quotations to support the conclusions drawn from them (e.g. Denzin & Lincoln, 2005).

Craft as a Holistic Process

According to Pöllänen (2013), holistic and intentional actions can be associated with the conscious or unconscious meaning of craft as an activity. The student teachers emphasized craft learning as an activity where students develop as independent makers. The data analysis revealed that student teachers combined conscious thinking with hands-on doing, which is a key element in understanding holistic craft.

The goal of craft teaching is the students' ability to perceive the holistic craft, the knowledge of technical assignments and systems, the ability to estimate these, and the making of the product. – Two male students

To put the elements mentioned above into action, space for the students' own planning, responsibility, and freedom is required in the craft lessons. Children's awareness of the holistic process can be recognized during the work process. Earlier studies showed that pre-school children were already able to design individual items in the context of holistic craft learning. They managed to create their own artefact images by brainstorming and designing. The creation of images was carried out through "story crafting," in which the children designed a soft toy based on stories. During the craft production, they created a visual plan and made different kinds of decisions during the process. All decisions were made based on the children's skills (Aerila & Rönkkö, 2013; Yliverronen, 2014). Planning and processing must be related to the students' knowledge and skills. The holistic craft process usually begins by motivating pupils to brainstorm by using a wide range of sources, including sensory experiences, memories, visual or written material, or other materials and tools (Pöllänen, 2009). In an educational context, such as a school subject, craft are structured by setting and achieving the objectives of the learning. These objectives are set on both the curriculum level and the individual level, which allows the students to make individual choices and actions that support the versatility and diversity of crafts (Lepistö, 2010; 2011; Lepistö et al., 2013).

Project-based craft always require that the task begin with problem solving; this should be perceived right from the elementary school teaching. – Two male students

Perhaps learning and objectives should be emphasized in crafts more than they are now, so that the practicality and learning aspects can also be made understandable to the students. – Female student

At school, a student gains knowledge about making craft and other skills that are useful in his/her everyday life. According to Syrjäläinen and Seitamaa-Hakkarainen (2014), the design process is included in the craft-making process, and craft are seen as a way of materializing design thinking.

In craft lessons, children should be taught the technical knowledge and skills they will need in the future. All students should be allowed to learn to use tools skillfully so that they can manage in their everyday life and understand the technological world. – Female student

The analysis revealed that student teachers emphasized the need for *target-oriented and holistic action* in learning craft. While learning craft, students learn to understand craft making as a

holistic process and develop their expertise in making, judging, and acting consciously. When designing a craft product, the maker shapes new ideas to create an artefact or an innovation, which cannot be developed without creativity and the courage to realize creative and uncertain ideas. In addition, the student has to set and achieve specific objectives. In the educational context, all of this is enabled under the guidance of the teacher. The level of guidance decreases as the student proceeds further in his/her learning and skills.

Reflective Action Readiness

The student-teacher respondents believed that hands-on doing helps students to apply their understanding and knowledge to everyday activities. This can be called *reflective action readiness*. Craft making challenges the individual's knowledge and skills. When hands-on doing is a holistic process, it develops the maker's ability to make independent decisions as well as to identify and apply relevant information. The student teachers also emphasized that technological understanding is a part of everyday life and, therefore, it is important for students to be familiar with technological developments.

However, the student teachers also emphasized that the ability to use technology is not enough. There is also a need for practical doing, in other words, hands-on doing and working with materials and tools. In school, the most visible phenomena in the technologically developing society are the rapid changes in information retrieval and their effects on students. The Internet and smart telephones are hugely significant inventions that create infinite opportunities. However, they pose a hidden danger: the reduction in the use of common sense. According to the opinions expressed by the student teachers, craft making is a key element in developing students' common sense (Kojonkoski-Rännäli, 1995; 2014) and applying it to practical situations.

Students' "reflective action readiness" is in danger of declining with new technological changes. Students today don't have to challenge themselves with the acquisition of information or the learning/adaptation of the information because everything is taken care of automatically with the help of technological devices. –Two male students

By using common sense, pupils are guided through intuition and invention to the use of knowledge and skills, which can be considered reflective action readiness for the future. This skill is required for the development of the entire society. In craft education, the innovative design process develops contextual problem-solving skills and the critical optimization of solutions in the material world (Lindfors, 2010). It helps students to understand their own thinking and to reflect on the learning process. This innovative pedagogical process cannot proceed without critical consideration (see Figure 1). It has also been found to extend students' experiences of their own abilities to overcome challenges, find solutions, and develop their skills (Lindfors & Hilmola, 2015).

The data collected showed that the student teachers perceived that craft making produces thinking individuals who are capable of taking action.

Students should be educated in innovativeness, life management and the improvement of its quality, in how to be in a responsible relationship with nature, in managing in the world of products, in the creation of product design, in artistic expression, in understanding technical systems, and to contribute to one's own and society's welfare. – Female student

During the process of pedagogical innovation, theories and solutions must be tested in practice. This makes it possible to discuss innovation at the level of the students (Salavou, 2004). Without theoretical information, such as the behaviour of materials, innovations cannot be carried out (Lindfors & Hilmola, 2015). A solution or prototype tested by practice helps students to understand their own thinking and to gain knowledge and develop the necessary skills to acquire

action readiness. Previous research (e.g., Dow, 2010; Haigh, 2007) found that while practical work or prototyping increased the number of guiding images and nurtured a person's creative thinking (Kangas, Seitamaa-Hakkarainen, & Hakkarainen, 2013), it was also a process of entrepreneurial behaviour, which is explained in the following section (Lepistö & Rönkkö, 2009).

Entrepreneurial Behaviour

In entrepreneurial pedagogy, the entire learning process can be seen as learning by doing (Cope & Watts, 2000). Enterprise education is a process through which students' participation, interaction, decision-making, and problem-solving skills develop (Rönkkö & Lepistö, 2015). Decision-making seems to be one of the connecting themes between crafts and enterprise education (Rönkkö & Lepistö, 2016). It relates to actions (Cope, 2005) in which a student takes risks, experiments, accepts mistakes, and receives feedback (Gibb, 2005). The teaching methods used aim at fostering participation, activity, and target orientation (Rönkkö & Lepistö, 2015). Learning bridges different subjects and learning environments (Kumpulainen et al., 2010). The application of the expertise gained by hands-on doing to pupils' world of experience promotes active participation. Craft lessons should include excursions and visits to enterprises, cultural resorts, and other partners in the surrounding areas (FNBE, 2014). The student teachers emphasized that students should be allowed to decide what they are taught in crafts instead of being passive recipients of the information delivered by the teacher.

Motivating students in the class to carry out craft processes becomes easier if the projects relate to the students real-world experiences. – Two female students

Students should have shared experiences of success and understand how they can adapt previously learned information to new situations and problems. – Two male students

According to the student teachers, the students' ability to operate in the future will be in danger if they receive all solutions ready-made without doing anything themselves. They will become passive, causing "the maintenance of the brain" to stagnate. When student is experimenting and creating something new, he/she has to use the skill of "seeing differently" (Lepistö & Rönkkö, 2009, 2013). This means that for innovative actions to take place, a student needs the ability and courage to create completely new artefacts, even using crazy ideas. However, it is common that students want to avoid failure in school, which can prevent them from experimenting and trying new things. The willingness to innovate is essential in both craft making and technology. There is a "special significance in promoting human creativity and innovation, particularly when conceptual ideas and material aspects of the process reciprocally support one another" (Syrjäläinen & Seitamaa-Hakkarainen, 2014, p. 30).

In this project, innovation is seen as a new way to think of the productive activity of crafts. The issue is no longer that a certain product is made using certain technologies; now students themselves affect what is done and how it is done. – Two female students

In craft learning, the students' decision-making is based on their prior experiences, personal skills, self-confidence, and social environment, which includes other students and friends (Rönkkö & Lepistö, 2016). The student teachers perceived that collaboration during the educational craft process would help the students to learn social skills that would be important in their working life and in society in future.

In my opinion, making craft affects not only a person's skills but also even more his/her attitudes, values, and ability to interact with other people. – Female student

In our opinion, craft making that emphasizes individual performance does not develop the abilities required for facing the challenges of working life, communal life, and cooperation in the future— Two female students

The results showed that according to the student teachers, *entrepreneurial behaviour*, as a learner-centric and collaborative activity, should be the basis of teaching crafts. A holistic enterprise education (Remes, 2001) includes the educational equivalents of the forms of enterprise: individual work (self-motivated), the interaction of a group (internal), and materials (external). The congruent and comprehensive view of the enterprise and craft processes can be divided according to the following pedagogic levels: 1) learning is personal and significant as an experience; 2) learning is an interactive process; and 3) carrying out a holistic creation process of a product or task (Lepistö, 2011b).

Versatile Skills and Multi-materiality

The student teachers emphasized that the learning of holistic craft should include all kinds of materials and techniques. Meaningful learning experiences and a liberal learning environment are needed. The students thought that breaking the traditional conceptions and boundaries of craft making (textile and technical work) is “the only way to survive.” This is logical and coherent in their studies in the teacher programs of craft education. If a pupil has to choose between technical and textile work, it means that all other content is excluded (Lepistö, 2011a; Lepistö et al., 2013).

Crafts as a subject should neither be limited nor based on an old division of technical work and textile work, because those are content areas just like technology in the subject of craft. Neither of these content areas can form the craft subject alone, but they support each other and make sensible and versatile learning experiences possible for the students. – Two male students

The present model in teacher education maintains the division of the craft subject. At universities as well as in basic education, there is always something left out when you can choose between technical and textile work. – Female and male student

The student teachers wrote that learning and mastering different techniques could connect the content of technical and textile craft. These learning experiences would support each other (Lepistö, 2011a; Lepistö et al., 2013; Svaleryd, 2008; Sigurdson, 2014). In the future, students will learn craft by the hands-on method and become familiar with a variety of materials and techniques, and they will learn to understand and apply them open-mindedly. In addition, it is important to utilize all acquired knowledge in other subjects and learning environments (e.g., phenomenal learning) (Lepistö et al., 2013; FNBE, 2014). Some present craft learning environments, such as wood and metal workshops, are viewed as masculine places and therefore are not considered appropriate for girls (Sigurdson, 2014). The same phenomena can be seen in the discussion that because of the lack of male role models in so-called feminine areas, these environments are not appropriate for boys (e.g., Carrington & McPhee, 2008; Buschor et al. 2014).

Students are encouraged to use communication technology in the planning, making, reflection, and documentation of the craft process as well as in the production and distribution of communal information (Kangas et al., 2013). Even today, the use of various materials plays an important role in the way crafts are taught. By using technology, makers can operate with different materials and systems. In craft making, materials are always needed (e.g. Sennett, 2008).

Physics, chemistry, mathematics, and the phenomena of other natural sciences can bring comprehensive support for learning as an experimental function in the content of craft. – Two male students

In our opinion, it is important that in the future, the content of basic education will include tradition. Technology develops all the time, and the danger is that traditional skills will disappear. Craft teachers should see and realize the brilliant possibility of connecting traditions with modern technology. Society changes, so the teaching of craft must answer society's demands. – Male and female student

The results showed that the student teachers perceived that the active development of the craft subject is needed in relation to social change and globalization. In the future, craft teaching will focus on the students' own experiments and participation, and it will aim to develop their exploratory, creative, active, and entrepreneurial skills (FNBE, 2014). The student teachers also highlighted that technical and skilled expertise in craft production and the so-called mastery of the basic skills are still important in multi-material and versatile craft learning.

All students should be allowed to learn how to use tools so that they could think of them as well as the tools for the control of their basic workday as tools for understanding the technological world. – Female student

The results revealed that craft should be *multi-material and a subject for learning versatile skills*. Children learn to use computers, tablets, and smartphones easily and quickly. These devices should also be used as components in craft education, at least in the planning and information retrieval stages. Furthermore, it is important that in the future, the content of craft in basic education include and maintain culture and traditions. Craft making could then play the role of a culture developer (Lepistö et al., 2013).

Source of pleasure

The student teachers emphasized that craft making gives a person joy and has a positive influence on his/her brain. Some participants wrote in their essays that teachers should also understand that instead of learning skills perfectly, the joy of working with one's hands should be the most important achievement in the learning of craft. This is consistent with previous studies on brain research. Working with one's hands is relaxing, reduces stress, and helps to increase concentration (Huutilainen, 2012b). Moreover, craft making activates the brain cells, helps improve memory, and keeps the mind alert. According to Huutilainen (2013a), there is evidence that craft making has positive effect on the brains of both children and the elderly. Making crafts by using one's hands is a delicate task for the brain: it allows for threedimensional thinking, enhances creativity and problem-solving skills, and it improves the link between the two halves of the brain (Huutilainen, 2012b).

One of the most important functions of crafts, in my opinion, is the pleasure that the maker can feel when he/she is doing craft. – Female student

Why must we always think about what the child still has to learn in craft? Why have we become only performers? Why can we not just enjoy the process sometimes? Quiet moments with different materials. . . . [D]o we always have to have something ready? Why can one not just knit something and then dismantle it, if it brings pleasure? – Female student

Previous experiences and routines give a feeling of safety and persistence to students. The data analysis revealed that the meaning or the relevance of craft making and craft products for an

individual is considered one the most important aspects of learning crafts. Craft making is a pleasant and pleasing activity that also produces concrete and economic products. Craft making is an accomplishment, a guide for future actions, and a helper in changing moods and achieving a sense of self-control (e.g., Pöllänen, 2013; Kojonkoski-Rännäli, 2014).

The most important educational objective of crafts is the holistic, balanced development and growth of a student's sense of self. He/she will have the possibilities of having success and failure and experience a connection to the world through his/her hands, both experimentally and materially. – Male and female students

The results revealed that *craft making is a source of pleasure and success* for the maker. However, the learning should be meaningful and significant. What is learned and why it is learned are important to understand. The teacher should try to see situations through a student's eyes. It is not always important to focus on developing knowledge and skills; it is also important that teachers see situations from the students' perspective.

Discussion

The aim of this study was to clarify the concept of multi-material craft by presenting research data about student teachers' perceptions of craft as a school subject. The data were analyzed in order to answer the research question, "What kinds of views do student teachers have on the future of the craft subject?" History shows that the gender division and content dichotomy between textile work and technical work (see Figure 2) continue to be strict and stable, despite changes to the curricula after 1970. During the past few years, the demand for developing multimaterial craft and using design and modern technology has increased in the craft-teacher education program at the University of Turku. The focus is on understanding the concept of the holistic craft learning process, the role of usability and appropriateness in designing a product or solution, pedagogical innovation processes, and creating future-oriented teaching methods. All these changes and challenges require the development and regeneration of craft as a subject in teacher education (Lepistö et al., 2013).

It is important that student teachers understand the concept of the holistic craft process (Kojonkoski-Rännäli, 1995; Lepistö, 2004; Pöllänen, 2009), carry out pedagogical innovation processes in craft education, and learn to teach craft in a future-oriented way. Hence, the learning objectives and content of craft education as well as traditional ways of teaching craft were questioned during the teaching module of this study. Rapid societal changes, expanded use of technology, and environmental challenges have forced those who set the curricula of basic education to consider educational outcomes critically. However, in basic education, the subject of craft needs to be developed actively in order to encourage teachers to create teaching models that support the holistic learning process in relation to future-oriented solutions in diverse material spaces instead of continuing to support students' gender-based selections. The curriculum (FNBE, 2014) outlines objectives and goals, but teachers need to promote theme by developing new teaching models.

On the societal level, it is important that gender-segregated craft teaching will be replaced (see Shapiro & Williams, 2011; Stout et al., 2010). There have also been changes in craft teacher education. Same-gender teachers (male teachers of technical work for boys and female teachers of textile work for girls) do not have the same status as they held previously. These changes can be seen in the teachers and role models in other school subjects (e.g., Carrington & McPhee, 2008; Buschor et al., 2014), as well as in other academic fields, such as science, technology, engineering, and mathematics (Stout et al. 2010). Teachers should no longer promote the idea of gender-based craft making. The responses of the student teachers indicated that they want to abandon the practice of maintaining this gender dichotomy in craft. The results did not reveal any

opinions that would support the idea of the gender-segregated teaching of craft. Furthermore, the student teachers did not anticipate any unsolvable problems in organizing lessons on multi-material craft. This result must be considered in relation to the fact that approximately half of the respondents were male, and the other half were female. The respondents believed that the gender dichotomy has restricted the development of the craft subject. This result is consistent with their craft studies in the teacher program of craft education. The responses of the student teachers clearly showed that they were in favor of the view that holistic, multi-material, and versatile craft should be part of the learning process. They also perceived that craft making is an important source of pleasure and mental well-being. In addition, they understood entrepreneurial behaviour and reflective action readiness as everyday skills that are needed in a fast-changing world.

Limitations

The research data, that is, the student teachers' essays, were collected at the end of a learning module. The essays were a part of the students' required course work. Consequently, because they were aware that their responses would be assessed, the student teachers might have modified their opinions to reflect the researchers' requirements. Because this limitation could potentially weaken the validity of the study, this factor was taken into consideration when the results were interpreted and discussed.

The student teachers were asked to validate their arguments, which allowed them to present and argue their views widely in an academic manner. As fourth-year student teachers, they had previously completed several study modules in the teacher education program at the University of Turku in Rauma. Both researchers are teachers of craft education in Rauma and therefore may have influenced the student teachers' thinking. It is likely that several discussions between the teachers and students included themes in developing the craft subject, both in basic education and in teacher education. Because it is understood that the students' education affected their views, it can be considered a limitation of this study. However, the focus of the craft teacher education program is to nurture the student teacher's knowledge and skills for their future work. Therefore, it can be expected that the student teachers, who are nearing completion of the program, have formed their own concepts and did not seek to please the researchers.

The results were achieved through a detailed analysis of the data by two researchers. Another researcher was also the teacher in the learning module. Hence, the other researcher assumed the main responsibility for conducting the data analysis. The data set was large enough to conduct a content analysis, which was conducted thoroughly. The researchers sought to ensure that the interpretations and conceptualizations accurately reflected the informants' views. The categories were formed gradually (see Tables 1–3). The subcategories were revised within a feedback loop and eventually reduced to the main categories. They were then checked for reliability (e.g. Mayring, 2000). The original research data were in Finnish. The citations were translated into English to document the credibility of the analysis and the results; however, it was a challenging task to achieve fluent translations of all the sentences in the citations.

Another critical empirical point is that this was a case study. We were interested in the craft student teachers' perceptions that were formed during their craft studies, their everyday, hands on experiences in craft making, and the teacher training practices used during their bachelor's and master's degree studies. For this reason, the research results cannot be generalized to all craft education situations and contexts (Mayring, 2007). However, the results were consistent with the findings of previous studies (Lepistö et al., 2013; Lindfors, 2012).

Conclusions

According to the results, holistic craft, reflective action readiness, entrepreneurial behaviour, multiple skills, multi-materiality, and source of pleasure are the main solutions suggested by the student teachers with regard to the future of craft. These results indicate that the future of both

craft taught at school and in teacher education should be critically reconsidered. The student teachers perceived that multi-material holistic craft as a learning process would be a source of pleasure as well as a promoter of reflective action readiness and entrepreneurial behaviour. These all can be seen as preconditions for innovative craft learning. Consequently, *we can start to talk about innovative craft* (Lindfors & Hilmola, 2015). The results allow us to regard craft education as an academic discipline that has successfully challenged the gender-based dichotomy in the learning of craft as well as traditional models of teaching. Based on the results of this research, we predict that future craft teachers will promote non-segregation and multi-materiality in their professions. However, more research is needed. For instance, a future study could be conducted to determine the kinds of challenges that young teachers face during the first years of their work in promoting multi-material craft.

The expertise and the willingness to apply this practice actively to new challenges and solutions are the foundations of a nation's welfare and success. Innovative craft could be one answer to society's needs by developing reflective action readiness, entrepreneurial behaviour, and well-being. On the teacher's part, the pedagogical innovation process requires pedagogical expertise and the ability to understand the principles of inventive activity and processes. The improvement in expertise also requires the development of the education system. This, in turn, requires educational research and knowledge-based policymaking in the education field. The results of this study signal a change in society, which curriculum developers and school administrators should heed. Future craft teachers will bring to their schools the idea of the innovative teaching and learning of craft. It will then be important to consider whether lesson organization, classes, teacher resources, and learning environments support the realization of innovative craft. In order for these developments to be implemented to their full potential, further research and development projects related to these topics are needed.

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