Female Technology Education Teachers' Experiences of Finnish Craft Education

Sonja Niiranen, University of Jyväskylä, Finland
Antti Hilmola, University of Helsinki, Finland

Abstract
In order to introduce a more equitable gender balance in education and consequently in the labour market, it is highly relevant to continue to expand our knowledge of technology education and to give attention to gender related issues. The ultimate purpose of this study was to contribute to efforts to get more women to study technology and pursue technological careers by investigating their experiences. To approach this, the aim was to offer an overview of the gendered processes that girls and women may experience when studying and working in the area of technical craft and technology education.

The study was carried out using semi-structured theme interviews, and the data were collected from November to December 2014. The study group consisted of seven female teachers of technical craft and technology education working in basic education schools. A qualitative theory-oriented thematic analysis was carried out through the identification, coding, analysis and reporting of patterns within the data. The findings revealed that all of the participants had experienced gendered patterns in terms of divisions of labour, construction of symbols and images and interactions between women and men. It is hoped that the findings of this study will facilitate the implementation of supportive interventions in the future.

Key words
technology education, technical craft, women, girls, gendered processes, experiences

Introduction

Technology is playing an increasingly important role in all realms of life—in peoples' private lives, as citizens and consumers and in their work lives (Ardies, 2015). Whenever and wherever each of us was born and spent our early years, we have been profoundly influenced by the technologies we have encountered (Keirl, 2011:237). Therefore, it can be claimed that technology is an important part of our daily lives, and the experiences we have with technology have an impact on personal interests, career aspirations and social role patterns related to technology (Volk, 2007:191). Technology education has been developed to help people with technology by providing them the tools and skills they need to understand and utilise it. It has been suggested that problem-based activities can assist people to become critically literate to address issues through active engagement in both: tool-related hands-on and discursive practices of technology (Wilkinson and Bencze, 2011). Another concept related to technology education is the term STEM (Science, Technology, Engineering and Mathematics), which has become established in the field of education, and technology is one of the subject areas included under the STEM umbrella. All over the world knowledge and understanding of the subjects involved in STEM are considered vital for young people in an increasingly science- and technology-driven society, and STEM education is seen as a new 'arms race' that governments are prepared to invest heavily in (Banks and Barlex, 2014). The call for improved STEM education continues under the auspices of strengthening the flow of qualified people into the STEM workforce and enhancing STEM literacy for the general population (Ritz and Fan, 2015).

In Finland, there is still no special subject called technology education in basic education; rather, the education of the topic is currently decentralised and taught through various subjects (Autio et al., 2011; National Core Curriculum for Basic Education 2004 (hereinafter NCCBE 2004); National Core Curriculum for Basic Education 2014 (hereinafter NCCBE 2014)). Technology as a concept was introduced – but not defined – for the first time in the Finnish Framework Curriculum for Comprehensive Schools in 1985 as a component of the craft subject, 'technical work and textile work' (Rasinen et al., 2011:99). NCCBE 2004, which is still in effect, introduced seven cross-curricular themes in Finnish education, one of which is 'Human beings and technology', that self-evidently addresses *technology education*. Cross-curricular themes are to be integrated into different subjects; thus, it appears that much of the technological content of the 'Human beings and technology' theme is studied during crafts lessons, in particular technical craft and they share same specific aims (Järvinen and Rasinen, 2015). In NCCBE 2004, it is stated that the compulsory subject of craft should encompass core technical and textile content for all pupils at grades one to seven. Craft education is a practical subject with hands-on activities, and pupils actively practise

experimentation, investigation, invention, problem solving and design skills. In craft education workshops (technical and textile), pupils are working with different materials and techniques when working with their projects.

However, in craft studies, pupils may be given the chance to specialise in either technical or textile craft according to their interests and inclinations after grade four (NCCBE 2004:242). The gendered division in craft creates a situation whereby girls who study textile craft in these grades are often left out of the technology-related activities that are part and parcel of technical craft. In fact, girls in grades seven to nine rarely choose to study technical craft or anymore have the option to study it (Niiranen and Niiranen, 2015). It has been claimed that Finnish basic education is still demonstrating a very traditional image of gender roles to their pupils (Berg et al., 2011:98; Kokko, 2008). In spite of many years of curriculum work around gender equality, craft education is still often gendered because girls mainly study textile craft with a female teacher, while boys study technical craft with a male teacher (Kokko and Dillon, 2011; Niiranen and Niiranen, 2015).

The opportunities women have to shape their own lives have dramatically increased in the past few decades (Quaiser-Pohl and Endepohls-Ulpe, 2012). Technology-oriented fields, however, are still a rather male-dominated area, nor has an effective approach for achieving a higher number of women in natural science and technology careers yet materialised in EU countries. The reluctance of women to enter occupations in the natural sciences or technology has already been established in number of previous studies (e.g. Klapwijk and Rommes, 2009; Mammes, 2004; Sander, 2012; She Figures, 2012). Even though gender equality and non-discrimination have long been critical concerns in Finnish education, there has been little research to date about girls' attitudes or motivations towards technical craft, technology education, nor females' experiences or career aspirations in relation to technology oriented fields. In order to introduce a more equitable gender balance in education and consequently in the labour market, it is highly relevant to continue to expand our knowledge of technology education and to give attention to gender related issues. The current study seeks to identify the inequality women may experience when studying and working in a technology-oriented field. Specifically, the study focuses on investigating the gendered processes that exist in the area of craft, especially in relation to technical craft, as being a representative part of technology education in basic education.

Gender issues

Technology has a deeply gendered history, and the discourses relating to gender and technological activity reflect this fact by labelling it 'masculine' and 'not a place for a woman' (Layton, 1993:35 in Murphy, 2006). In general, Western masculinity is associated with independence, self-reliance, strength and leadership, and femininity with conformity, passivity, nurturing and concern for people (Riggs, 1994). When attempting to represent masculinity and femininity, we tend to place them in opposition; in other words, what one is, the other is not (Murphy, 2007:240). Blaine (2007) argues that even if categories help us to economise our cognitive resources and develop stereotypes, we simultaneously risk discarding a great deal of individual information. Also, these group-based beliefs do not provide very accurate information about the individuals who belong to the group (Blaine, 2007). The concept of gender must be always seen in a socio-cultural context and from that perspective, embedded beliefs, values, stereotypes, prejudices and practices mark what is socially expected from men and women (Madureira, 2012).

Even at a young age, children experience social processes that expose them to ideas of what it means to be a girl or a boy in their society, and they start to construct their identities through observation of others and participation in communities such as peer groups (Paechter, 2007). Additionally, other people in their lives, such as parents and educators, also have an influence on reinforcing the development of early gender-typed attitudes and behaviours or punishing those that contradict gender norms (Turja et al., 2009). When defining gender, we see it as it has been presented in Gendered Innovations (2013:9) as a 'socio-cultural process that refers to cultural and social attitudes that together shape and sanction 'feminine' and 'masculine' behaviours, products, technologies, environments, and knowledge'. We also agree with Goffman (1979), who claims there is no gender identity but a learned capacity to provide and absorb depictions of masculinity and femininity (McDermott, 1996, citing Goffman in Murphy, 2007:240).

All organisations have inequality regimes, which can be defined as loosely interrelated practices, processes, actions and meanings that result in and maintain class, gender and race inequality (Acker, 2006). Acker (1990) argues that an organisation or any other analytic unit, for example, a family, has gendered patterns based on distinctions between masculine and feminine or male and female. These patterns include advantages and disadvantages, exploitation and control, action and emotion, and meaning and identity (Acker, 1990:146). She also describes how

these social processes are often complex and gendering occurs in various interacting processes that are parts of the same reality in practice, although analytically distinct (Acker, 1990). According to her, the first set of processes is the *construction of divisions of labour* (Acker, 1990:146). These processes are allowed behaviours, allowed locations in physical space and allowed power, including institutionalised means of maintaining divisions in the structure of labour markets or in the family. The second set of processes is the *construction of symbols and images* (Acker, 1990:146) that explain, express or reinforce divisions between women and men, and take many forms for example in language, ideology, dress. The third set of processes, that produces gendered social structures involve *interactions between women and men* (Acker, 1990:146–147) including all of those patterns that result in the enactment of dominance and submission. These processes help to produce *gendered components of individual identity*, which may include awareness of other aspects of gender such as choice of appropriate work, language use or clothing, and presentation of self as a gendered member of an organization (Acker, 1990:145–147).

Research question and methods

The aim of this study was to examine the inequality that women may experience when studying and working in today's technology-oriented field. Specifically, it focused on investigating the gendered processes that might exist in the area of craft education, especially in relation to technical craft in Finland. The study was carried out using semi-structured theme interviews, and the data were collected from November to December 2014. Potential participants were asked whether they wanted to participate in the study by email or social media (Facebook group of technical craft teachers), and interviews were carried out with those who volunteered. All candidates who were asked to participate in the study decided to do so. The study group consisted of seven female teachers of technical craft and technology education who had graduated from various universities in Finland. All the participants were working in schools of basic education teaching technical craft to pupils in grades three to nine (ages nine to 15). Three of the participants had studied to become primary school teachers (grades one to six; ages seven to 12) in university, and had studied 25 or 60 European Credit Transfer and Accumulation System (ECTS) of technical craft and technology education. The remaining four teachers had studied to become secondary school teachers (grades seven to nine; ages 13 to 15) in university, and had studied 60 to 240 ECTS of technical craft and technology education. The participants were 26 to 54 years old and had been working as technical craft and technology education teachers for between one and 29 years. According to numbers from the teacher education departments from 2010 to 2014, in Finland, an average of 12 female and 44 male teachers graduated annually with a qualification in teaching technical craft to grades seven to nine.

The semi-structured theme interview consisted of questions concerning background information (e.g., age and studies in general), whether participants had studied technical craft, textile craft or both in school from grades three to nine, and to what extent they had studied it. Then participants were asked to reflect on various themes concerning their basic educational studies, and their studies of technical craft and technology education at university. The themes of the questions were: 'How was it like to study technical craft at school and what was your attitude towards it?', 'Why did you want to become a technology education teacher?', 'How were your craft teachers and were they males or females?', 'Did you experience any gendered actions during your studies at school or at the university or later on as a technical craft teacher?'

In the analysis phase, qualitative, theory-oriented thematic analysis was carried out through the identification, coding, analysis and reporting of patterns within the data (Braun and Clarke, 2006). It is a widely used method for examining material with descriptive content, especially in the case of relatively unknown phenomena (Schreier, 2012). In order to achieve a better response to the theoretical assumptions, Acker's (1990) theory of gendered processes was used in the analysis. In the theory-oriented qualitative theme analysis, the first step was to formulate explicit definitions and coding rules for each category by determining which textual examples will be coded under which category. In the second step, the identified themes were listed based on the frequency of their occurrence, and grouped and categorised under headings of gendered processes theory (Acker, 1990). In the abstraction phase, general descriptions of each category were created with original examples from the data.

Results

All seven of the participating female technical craft and technology education teachers had studied technology in the form of technical craft for only short periods during their basic education in grades three to seven. In addition, one of them had chosen or had access to technical craft courses in grades eight to nine. We used Acker's (1990) theory of gendered processes to identify what social

structures or processes women might have experienced in relation to technical craft and technology education during their own school time and later on in their role as technology education teachers. It was evident that to some extent, almost all of the participants had experienced gendered patterns as divisions of labour (Acker, 1990:146) at school when choosing textile craft. While all of them had studied textile craft in grades five to seven, many described aspects of allowed behaviours or institutionalised means of maintaining divisions in crafts as follows:

Teacher 1: *I chose textile craft because I felt that it was the way it should be done; however, I also liked textiles a lot.*

Teacher 2: *The atmosphere then was that technical craft was for the boys and something else was for the girls.*

Teacher 3: *I would have needed some encouragement or a friend with me to choose technical craft.*

Teacher 4: *Girls and boys were separate, girls in textile and boys in technical craft.*

Teacher 5: *I did not get much help or encouragement from the technical craft teacher, so I chose textile craft because it was easier for me.*

Teacher 6: *I wanted to choose technical craft, but I was told at home to choose textile craft.*

Teacher 7: *At that time, there was not any decision making about this question.*

The second process category, namely, *construction of symbols and images* (Acker, 1990:146), was also a feature of the women's lives in terms of how divisions between females and males were expressed and reinforced. Almost all (with the exception of one) of the participants remembered having only male technical craft teachers during their basic education (grades one to nine). Two of them had a female technical craft and technology education teacher at university. This result reveals that craft education has been very gendered and undeniably have had a 'male' label. Some of the participants also remembered that the products they were guided towards during technical craft lessons were gendered for female pupils, for example, a doll's bed, and that almost all the products were pre-designed by a teacher (male) and therefore they were perceived to have a male perspective for using them. Some of the women remembered gendered appearing actions by their teachers, such as never receiving help at all from the teacher during the lesson or the teacher's unwillingness to help them solve problems or show them how to do something. One of the participants reported that it was only the teacher who could use the machines, while they as pupils (girls only) used hand tools.

The third set of processes, *interactions between women and men* (Acker, 1990:146–147), appeared to be most evident in terms of the women's own schooling, but also later in their studies at university and while working as technical craft teachers. All seven participants experienced gendered patterns involving the enactment of dominance, submission, questioning or wondering from male teachers, colleagues, technical support staff at school or boys at school. We further divided this set of processes into three sub-categories: 1) *Belittling and questioning:* This describes a situation where a person speaks to another in a way that patronises or belittles the other person on the basis of gender by using questions such as the following: 'Oh my, do you really know how to do this?', 'Do you actually know what this is?', 'Well that should be done this way, you know' or 'Well you don't need it anyway, so I don't have to show you that'. 2) *A request to prove skills*: This describes a scenario where a woman is asked to prove her skills, for example, 'If you can't prove that you are adequately skilled and really able to do this…' or a scenario where someone is looking for specific qualifications but gets 'angry' because a person is qualified but is a woman. In this context, however, some of the participants experienced women being used as a good example of a technology teacher on the basis of their superior skills. 3) *Denial*: This describes the behaviour of a person who will not cooperate at all or will not accept a woman as a colleague without receiving an extra compensation.

In terms of *gendered components of individual identity* (Acker, 1990:147), six of the participants presented the aspects or assumptions of a woman's technical craft identity as a member of that group. The most evident assumption was related to the expectation of having excellent technical skills. As one participant said 'I did not believe that my own skills were good enough to study it' and another one expected that 'all boys must be so dexterous and good in that'. One participant stated that 'there might have been rarely one girl, in technical craft, who was also very skilled'. One participant saw this in a way that 'as I have been a skilled girl who can do all these things, it was not a problem for me to be a girl in technical craft'. Also, possessing traits of masculinity such as being relaxed and not taking things too seriously was mentioned

in one participants' response as she expressed that 'I am, myself, quite relaxed and do not stress easily and I also do not want to be with people who take things too seriously. I felt that male students are not like that and knew that many of them were going to study technical craft, so I thought that studying with them would be nice'. Also, one participant said 'often female students were working with a male student in order to get some kind of help and support, but I did not have one to work with. – I wanted to show that I can do it alone and manage without male help'.

Discussion

Based on various studies, it is evident that an increase in the number of women in technical careers has not yet been achieved in EU countries, and the reluctance of women to enter occupations in the natural sciences or technology is still a challenge that many educators confront all over the world (e.g. Klapwijk and Rommes, 2009; Mammes, 2004; Sander, 2012; She Figures, 2012). The ultimate purpose of this study was to contribute to efforts to get more women to study technology and pursue technological careers by investigating their experiences. To approach this, we offer an overview of the gendered processes that girls and women may experience when studying and working in the area of technical craft and technology education.

It seems that many of the women in this study experienced gendered patterns as *divisions of labour* (Acker, 1990:146), when choosing what craft to study (if they even had that choice). Even though all of them studied textile craft, their statements revealed aspects of allowed behaviours or institutionalised means of maintaining the divisions in crafts (see the statements above in the Results section). Kokko and Dillon (2011) state that children's perceptions of craft and the value they place on them are substantially shaped by their experiences at school and at home. The same finding was evidenced in a study of women's career orientation in technology-related fields by Niiranen and Niiranen (2015). Many (11/20) of those women chose textile craft instead of technical craft in primary school due to a tacit assumption at school that girls should automatically choose textile craft or based on other reasons such as parents' encouragement, peers' decisions or group pressure (Niiranen and Niiranen, 2015). Based on a performed re-analysis of the assessment data of Finnish National Board of Education 2010 by Hilmola (2015), many schools in Finland still guide pupils to choose between technical and textile craft after grade four (see also NCCBE 2004). The data of 4,792 pupils revealed that even though the division between technical and textile craft still exists, more girls are choosing technical craft than before, but boys are not choosing textile craft. According to those data, 52.4 % (1,275) of the girls studied only textile craft and 59.4 % (1,444) of the boys studied technical craft. 9.1 % (221) of the girls but only 0.7 % (18) of the boys chose opposite to the prevailing trend for their gender, with the girls opting for technical craft and the boys opting for textile craft. Depending on the school's policies, some pupils did not choose between the crafts but studied both equally. In the data for the 4,792 pupils, 37.6 % (915) of the girls and 38.7 % (940) of the boys studied both crafts. (Hilmola, 2015.) The finding of this study related to the divisions of labour and the numbers of the 2010 assessment data show that evidently girls have been, and still are, prepared to participate in future technologies by choosing textile craft. One might ask whether girls need encouragement to opt for a wider range of technical subjects, rather than those defined by the role of a traditional homemaker. This marked gender difference in crafts must have an effect on girls when they are planning their futures.

In connection with crafts, the guideline in Finland's new National Core Curriculum for Basic Education 2014 is that craft should be a common subject for girls and boys during compulsory lessons in grades one to seven. As a common subject, craft should include both technical craft and textile craft for all pupils at the basic education level. The objectives of the above guideline dictate that it will not be possible to teach craft based only on the contents of either technical craft or textile craft; rather, the contents of both crafts will be needed when NCCBE 2014 is implemented. There is also a distinct argument that in the teaching of a craft, methods relating to both technical work and textile work are used. The main change from NCCBE 2004 is the fact that the core contents of technical craft and textile craft will no longer be taught or referred to separately. Pupils' own interests will be emphasised in the future, but the interpretation of this in practice remains to be seen when the new curriculum will come into effect in 2016. Considering the above mentioned finding on divisions of labour and the numbers of the 2010 assessment data (Hilmola, 2015), this change is a positive one in order to provide girls with equal opportunities to experience technological issues at school.

The set of gendered processes, construction of symbols and images (Acker, 1990:146), take many forms that express and reinforce the division between women and men. Almost all of the participants in this study remembered having only male technical craft teachers during their basic education. A study by Ikonen and Kukila (2015) of Finnish female technical craft teachers'

experiences and perceptions of crafts revealed similar evidence; all 12 participants reported that they only had male technical and female textile craft teachers (Ikonen and Kukila, 2015). The image of technology as a masculine domain has been striking, but in addition, what pupils do during lessons and how work is pedagogically organised affect girls' perceptions of technology. Some of the participants in our study reported gendered actions on the part of their teachers. One way to develop technology education is to focus on gender-sensitive learning experiences that recognise girls' and boys' different interests as individuals. To achieve this, attention should be paid to assumptions about what girls and boys can and want to do, and pupils should be offered the support needed to develop new learning habits. Furthermore, technical craft should be expanded to include a broader view of technological practices in order to help pupils to see the relevance of their studies (see Murphy, 2007:250). We see teachers playing a key role in dismantling gendered practices and renewing the image of technology education, because they are best placed to alter pupils' perceptions and indeed their whole identity.

The set of gendered processes, interactions between women and men (Acker, 1990:146–147), appeared to be very present during the women's school time but also later in their university studies, job application endeavours and work as technical craft teachers. All seven participants had experienced gendered patterns such as belittling or questioning, being asked to prove themselves or being the victims of denial at some point in their lives. Mainly, the comments were made in situations where female technical craft teachers were applying for a new job or had just started in a new teaching role. Educators should take care of their students and understand that there are individual differences between needs, behaviours and attitudes of girls and boys, women and men. As Kirsti Lonka, a professor of Educational Psychology said on 7th October 2015 at the Women in Tech forum, 'Embrace the difference and diversity between men and women. There is talent in everyone, gender doesn't matter if you master the skills.' (Lonka, 2015).

One aim of schools, as institutions, is to respond to global economic challenges and help pupils see the breadth of possible study and career options. Might improved technology and craft education increase the number of students who enter higher education as STEM majors? Therefore, we argue that in the spirit of the forthcoming NCCBE 2014 in which multidisciplinary issues and integration are addressed, technical craft should be broadened towards the approach of STEM. In Finland this could mean that already project-based craft education would integrate and lean more strongly on using knowledge from science and mathematics in solving real-world technology and engineering problems. The hands-on nature of this subject helps students conceptualise scientific and technological knowledge and bring it into real world uses (see also Ritz and Fan, 2015).

Although this study provided insights of female technical craft teachers' experiences, the study was limited to just seven participants, with varying career lengths. It would have been very interesting to describe gendered issues in a chronological order in terms of experiences in different eras (e.g. in the 1980s, 1990s and 2000s), but the data was too limited for that. However, this process has proved that further investigation in the area is needed. It is clear that the women in this study struggled to establish a firm foothold in a technology-oriented field; as one of them asked, 'Does it have to be such a rocky journey when one has a true will to be a female technical craft teacher?' Finally, we hope that this study will provide some perspectives on girls' and women's experiences of technology, and that these perspectives can be used for the implementation of supportive interventions.

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