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Changes in Attitudes Toward Craft and Technology During the Last 20 Years

Abstract

There has been technology as long as there have been human beings. We can suppose that technology was as indispensable in the past as it is now. However, nowadays, the great speed at which technological changes come and new techniques are introduced is even more evident. Technology is affecting our lives more and more. It has consequences to every human being, and we find ourselves faced with both positive and negative aspects of technology. Certainly, this has an effect on our attitudes towards technology. In this study, we tried to find out if there have been any changes in attitudes towards technology among Finnish school children during the last 20 years. The attitudes measured in 1993 were compared with the results from 2012. The number of test participants was 267 in the first measurement and 317 in the second. The age of the student respondents was 11–13 years. The measurements were done with exactly the same Likert scale attitude questionnaire in both years. Mostly positive changes were found in attitudes towards technology in girls. Unfortunately, the development was not as positive among boys. The development in attitudes can be explained by the changes in technology education curriculum. From a broader point of view, the development in attitudes can be due to the changes in society as a whole.

Keywords: craft and technology; curriculum; technology education

Technology education in Finland has a long and rich history dating back to the 19th century when Uno Cygnaeus defined *sloyd* (handicraft). Since the first days of craft education, 150 years ago, students have made things using a variety of craft tools. In the beginning, work was based on copying and imitation and was mainly geared toward the development of lower level thinking skills, but craft and technology education should offer an all-around learning environment for understanding about different forms of technology and an opportunity to use the tools of modern society. As early as 1970, a committee report suggested that both technical and textile crafts should be compulsory for both boys and girls. Since then, the national curriculum has been revised several times. However, a suitable solution for the curriculum of craft education has not been found, and the interpretation and practical accomplishment of craft and technology education has faced many problems. Different solutions for the practical implementation of craft and technology education were tested in 1993, and

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students' attitudes towards technology were measured with a questionnaire consisting of 14 Likert-type statements. This article builds on that earlier study, and the results from the 1993 study were compared with a comparable sample from 2012. Measurements were made with exactly the same test instruments, and participants were selected from the same schools as the 1993 study.

The main goal of this study was to find out if fundamental changes in attitudes towards technology can be seen during the last 20 years. Furthermore, we tried to find out which elements in those attitudes were the most positive and negative. The main intention of the research was not to compare boys and girls; however, the comparison resulted in some new and interesting data. The research questions were:

1. Are there differences in students' attitudes towards technology in Finland between the years 1993 and 2012?
2. Is there a difference between boys and girls in attitudes towards technology?
3. Which elements in the attitudes were valued the most positive and the most negative?

Between the years 1993 and 2012, there have been several changes in the national curriculum concerning craft and technology education. The Framework Curriculum Guidelines (National Board of Education, 1994) for compulsory education states in its general section that the technical development of society makes it necessary for all citizens to have a new readiness to use technical adaptations and be able to exert an influence on the direction of technical development. Furthermore, students without any regard to sex must have the chance to acquaint themselves with technology and to learn to understand and avail themselves of technology. What is especially important is to take a critical look at the effects that technology has on the interaction between the man and nature, to be able to make use of the opportunities it offers and understand their consequences. The curriculum also emphasizes that extensive knowledge is necessary when participating in technology-related discussions and problem solving. Moreover, in the general part of the curriculum, it is said that the ability to use different forms of technology, especially information and communication technology (ICT), gives students the chance to use the tools of modern society and, in general, offers a versatile environment for the understanding and the development of different forms of technology.

During 2001, there was an active discussion about the role of technology education in Finnish compulsory education. Spokespersons from the industry side were active in organizing national seminars for developing technology education in Finnish schools, especially the goals and content of technology education in the curriculum. Moreover, several development projects aimed at developing the curriculum and technology education were started (Järvinen, Lindh, & Sääskilahti, 2000; Lavonen, Meisalo, Autio, & Lindh, 1998; Parikka, 1998; Santakallio, 1999).

The results obtained from the various development projects in the field of technology and from international discussion about the role of modern technology had an effect on the formulation of the goals and contents of technology education in the national curriculum framework for compulsory school (National Board of Education, 2004). Hence, the 2004 curriculum emphasized the meaning of technology from the point of view of everyday life, society, industry, and environment as well as human dependency on technology. The students should be familiar with new technology, including ICT, how it is developed, and what kind of influence it has. Students' technological skills should be developed through using and working with different tools and devices. Studying technology helps students to discuss and think about ethical, moral, and value issues related to technology. The goals mentioned in the new curriculum are compatible with the nature of literacy in technology described in the *Standards for Technological Literacy: Content for the Study of Technology* (International Technology Education Association, 2007). Although, technology education was introduced for the first time in the framework curriculum, a separate technology education subject has not been established.

Since the national curriculum's (National Board of Education, 2004) emphasis on technology, the demand for technology as a school subject has increased considerably. However, in Finland the process proceeds with great difficulty, and it may take years before technology is taught to all pupils. The curriculum states that technical craft and textile craft should be compulsory for boys and girls in Grades 3–7. However, because of practical reasons such as timetabling and the number of teachers employed in many schools, students have to select just one of the craft subjects. The main problem in Finland is that even though there is more technology-related content that our children should be familiar with, the amount of craft lessons is still the same as 20 years ago. Furthermore, because craft and technology education is nowadays divided into technologically based technical craft and artistically based textile craft, girls have more technologically based lessons than 20 years ago. Unfortunately, boys have fewer technologically based lessons than they had in 1993. We can suppose that this phenomenon has an effect on students' attitudes towards technology.

The most common definition for *attitudes* is "psychological tendencies that are expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly & Chaiken, 1993, p. 1). According to de Klerk Wolters (1989) the attitude towards technology is "a certain feeling with reference to technology, based on a certain concept of technology, and that carries with it an intention to behaviour in favour of or against technology" (p. 15).

> Dyrenfurth (1990) and Layton (1994) referred to attitudes in technology education using the concept of 'technological will'. According to these authors, technology is determined and guided by human emotions,

> motivation, values and personal qualities. Thus, the development of technology is dependent on the students' will to take part in lessons and technological decisions. (Autio, Soobik, Thorsteinsson, & Olafsson, 2015, p. 27).

Whether or not the attitude towards technology contains the cognitive dimension is often discussed. According to Ardies, De Maeyer, and van Keulen (2012), technological knowledge or "technological literacy correlates with the attitude towards technology" (p. 22).

Methods

The main aim of this research was to answer the first research question: Are there differences in students' attitudes towards technology in Finland between the years 1993 and 2012? In this kind of research, which is aimed at relatively large group of students, the test instrument should be easy to use and suitable for large-scale research. Likert scales are by far the most used in attitude measurements. We can assume that this is mostly due to practical reasons. The Likert scales can easily be constructed, and depending on the nature and structure of the test, they usually offer an acceptable reliability and validity. As self-report instruments, they are quite simple to use, and they are not time consuming.

Research on students' attitudes toward technology has a long history. Pupils Attitudes Toward Technology (PATT) is the first instrument specifically made for this purpose. This instrument was first used in the Netherlands. Since 1984, researchers have been using it in several different formats, and a number of different instruments have been made for measuring attitudes in the field of technology (Garmire & Pearson, 2006).

In order to evaluate students' attitudes towards technology in Finland, a questionnaire was devised that consisted of 14 statements. For each Likert-type item, there were five options, from *strongly disagree* (1) to *strongly agree* (5). The questionnaire was based on the most common PATT instrument, which was designed and validated by Raat and de Vries (1985) and van der Velde (1992). The original instrument, which consisted of 78 items, turned out to be too complicated and time consuming for 11- to 13-year-old students. Hence, for this study, a shorter version of attitude questionnaire was developed. The researcher removed many items that had small item-rest correlation (i.e., correlations between item score and total score of the rest of the scale). Finally, the questionnaire consisted of the following six factors: interest in technology, consequences of technology, difficulty of technology, role pattern, technological career, and technology as school subject.

The same problems with the original 78-item instrument were also noticed by Ardies, De Maeyer, and van Keulen (2012). They wanted to develop an instrument that was easier to use and needed less time from teachers using it in

the classroom. "The idea was to investigate the possibilities of using a 'subset of scales' with a maximum [of] 5 items for each scale" (p. 24). Their instrument consists of "six subscales and 24 items of attitudes towards technology. The six items are: Career Aspirations, Interest in Technology, Tediousness of Technology, Positive Perception of Effects of Technology, Perception of Difficulty[,] and Perception of Technology as a Subject for Boys or for Boys and Girls" (p. 22). Hence, the instrument used in this research in 1993 and 2012 seems to be congruous with previous and later developed PATT instruments. From this point of view, the internal consistency of the questionnaire was relevant. According to the researcher's observations, it was easy to use and not time consuming. In addition, the students could fully concentrate on answering all of the items. Reliability of the questionnaire was 0.85 in 1993 and 0.84 in 2012.

To find out whether there were any differences between the measurements in 1993 and 2012, the researcher employed a two-tailed *t*-test with the same variance because there was no hypothesis of the development in attitudes towards technology based on the previous research. Instead, boys and girls were compared with a one-tailed *t*-test because there is plenty of research evidence available about the difference. The number of test participants was 267 in the first measurement and 317 in the second. The age of the student respondents was 11–13 years. In both samples (1993 and 2012), the schools were the same. Those schools were originally selected to ensure that schools with different curriculums as well as rural and city schools were represented.

The sample from 1993 was based on a research design in which different solutions for the practical implementation of craft and technology education were tested. At that time, only a few schools were using a curriculum in which textile and technical craft was introduced to both boys and girls. These schools were selected for the sample from 1993, and the same schools were selected in 2012. To ensure that different curriculum solutions and schools from rural and city areas were represented, some country schools were selected. These country schools used a traditional curriculum. In practice, this curriculum included traditional wood and metal work as well as engineering projects with electronics, mostly for boys, and textile education, mostly for girls. In 2012, all schools with 11-year-old students had moved to a new curriculum that provided textile and technical craft for both boys and girls. The number of research participants in technical and textile craft as well as participants in city and country schools is presented in Table 1.

Table 1
Number of Participants in Technical and Textile Craft in City and Country Schools

	Technical			Textile			Both		
	City	Country	Total	City	Country	Total	City	Country	Total
					1993				
11-year-old girls	0	0	0	0	23	23	22	0	22
11-year-old boys	0	46	46	0	0	0	22	0	22
13-year-old girls	0	4	4	0	20	20	37	0	37
13-year-old boys	9	48	57	1	0	1	35	0	35
					2012				
11-year-old girls	0	0	0	0	0	0	27	31	58
11-year-old boys	0	0	0	0	0	0	32	58	90
13-year-old girls	0	7	7	0	20	20	48	0	48
13-year-old boys	0	26	26	0	1	1	67	0	67

Results

In this section, the results are first presented in general, discussing the differences in attitudes towards technology between the years 1993 and 2012. Then, the results are discussed in more detail, discussing specific items of the questionnaire while also taking into account differences between 11- and 13-year-old students.

Significant differences in students' attitudes towards technology were found in Finland between 1993 and 2012. The average response in our Likert-style (1–5) questionnaire to 14 items was 2.88 among Finnish girls in 1993 and 3.24 in 2012. The development in girls' attitudes was statistically significant ($p < 0.01$). For boys, the average response was 3.54 in 1993 and 3.75 in 2012 ($p = 0.04$). Furthermore, it can be seen that for girls, the development in attitudes was positive in almost all statements and statistically significant ($p < 0.05$) in 10 out of 14 statements. For boys, statistically significant ($p < 0.05$) development was found in seven items.

The difference between boys' and girls' attitudes was not surprising because similar results have been reported during recent years in several studies

(Allsop 1986; Autio, 1997; Autio & Soobik, 2013; Autio, Thorsteinsson, & Olafsson, 2012; de Klerk Wolters, 1989; Grant & Harding, 1987; Johnson & Murphy, 1986; Streumer, 1988). The average values for each statement are listed in the Table 2 below.

Table 2
Average Values for Each Statement Regarding Students' Attitudes Toward Craft and Technology

Statement number		1993		2012		*p*-value	
		Girls	Boys	Girls	Boys	Girls	Boys
1.	I am interested in engineering and the phenomena related to it	2.80	3.98	3.17	4.21	0.00	0.04
2.	I spend a lot of time with engineering-related hobby activities	1.72	3.01	2.62	3.01	0.000	0.99
3.	Newspapers, magazines, and articles from the field of engineering are interesting for me	2.07	3.06	2.35	2.90	0.01	0.19
4.	Understanding engineering-related phenomena will be beneficial in the future	2.92	3.79	3.25	3.86	0.01	0.53
5.	Understanding engineering-related phenomena requires a special wit	2.93	3.35	3.26	3.53	0.01	0.12
6.	Both boys and girls may understand engineering-related phenomena	4.56	4.06	4.55	4.36	0.96	0.01
7.	Mankind has rather benefited than sustained damage from the development of engineering	3.59	3.81	3.87	4.21	0.08	0.01
8.	In the future I would like to choose a speciality or a profession related to engineering	1.95	3.09	2.30	3.23	0.00	0.25
9.	My parents have a lot of engineering-related hobbies	2.32	2.70	2.94	3.01	0.00	0.01
10.	The atmosphere in the Technology Education / craft lessons is pleasant and inspiring	3.03	3.78	3.50	4.28	0.00	0.00
11.	Technology Education /craft lessons considerably contribute to the development of my manual skills	3.58	4.27	3.69	4.25	0.57	0.87
12.	Technology Education / craft lessons develop my logical thinking	2.98	3.49	3.42	3.84	0.00	0.00
13.	I have been successful in Technology Education / craft lessons	2.89	3.48	3.35	3.91	0.00	0.00

14. Technology Education / craft lessons will be beneficial in the future for me	3.00	3.85	3.14	3.88	0.31	0.83
All 14 items	2.88	3.54	3.24	3.75	0.00	0.04

Differences in Students' Attitudes Toward Technology Between the Years 1993 and 2012

Based on the average values for the 14 items on the questionnaire, the most remarkable development was found in 11-year-old girls test group for whom the average response was 2.88 in 1993 and 3.37 in 2012 ($p < 0.001$). Although the change in attitudes was also positive for 11-year-old boys, their average responses were 3.59 in 1993 and 3.78 in 2012 ($p = 0.06$). The standard deviation was the highest among 11-year-old girls in 1993 (0.75). In general, the standard deviation was higher in 1993 than in 2012. These results are presented in Table 3.

Table 3
Differences in Attitudes Toward Technology in 1993 and 2012

	1993		2012		
Group	***M***	***SD***	***M***	***SD***	***p*-value**
11-year-old girls	2.88	0.75	3.37	0.56	$p < 0.001$
11-year-old boys	3.59	0.69	3.78	0.48	$p = 0.06$
13-year-old girls	2.9	0.46	3.14	0.52	$p = 0.003$
13-year-old boys	3.51	0.69	3.72	0.56	$p = 0.02$

In more detail, the most significant development was found for the statement "I spend a lot of time with engineering-related hobby activities." Girls' attitude in this area was 1.72 in 1993 and 2.62 in 2012 ($p < 0.001$). However, boys did not report more technologically related hobbies than 20 years ago, 3.01 in both 1993 and 2012. This may be due to the fact that especially girls are interested in technological everyday solutions (e.g., mobile phones, tablets) that were not in everyday use 20 years ago. Average values for that statement are presented in Figure 1.

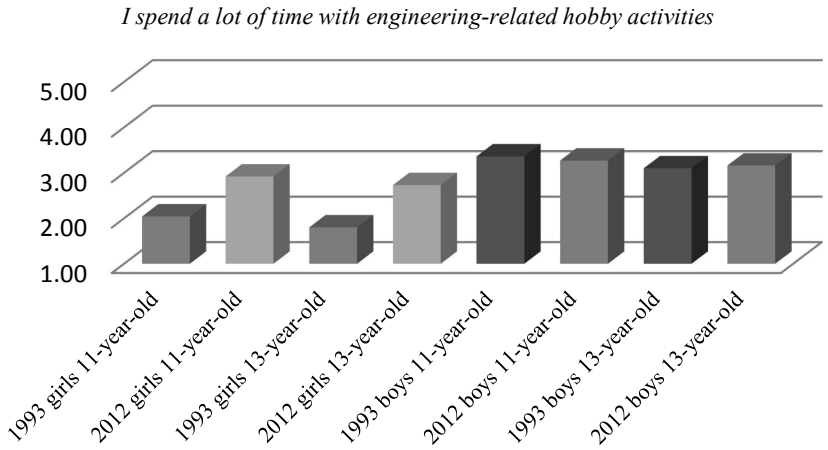

Figure 1. Average values for the statement: "I spend a lot of time in engineering-related hobby activities."

The development of a technological environment is most probably seen also for the statement "My parents have a lot of engineering-related hobbies" (for girls, 2.32/2.94, and for boys, 2.70/3.01). Because parents have more technology-related hobbies, it is obvious that there are more examples from parents and role models in general. Support of students' autonomy is evident when an authority figure respects and takes the subordinate's perspective, promotes choices, and encourages decision making (Ratelle, Larose, Guay, & Senecal, 2005). Furthermore, if parents and teachers are more aware of technological phenomena, they can tell students what they are good at or not good at with more information on which to base such conclusions (Eccles, 2009).

Another very positive sign in attitudes was seen for the statement "The atmosphere in the Technology Education / craft lessons is pleasant and inspiring" (girls 3.03/3.50 and boys 3.78/4.28). It is not surprising that "both boys and girls are attracted to [craft and] technology education because they enjoy working with their hands and like the independence and chance for creativity provided by these classes" (Silverman & Pritchard, 1996, 48). It seems that several other school subjects have more motivational problems than technology education (Shernoff, Csikszentmihalyi, Schneider, & Shernoff, 2003). The development at attitudes in this study was slightly negative only in one statement "Newspapers, magazines and articles from the field of engineering are interesting for me" (boys 3.06/2.90). In practice, no difference was found in two statements: "Technology Education/craft lessons considerably contribute to the development of my manual skills" (boys 4.27/4.25) and "Both

boys and girls may understand engineering-related phenomena" (girls 4.56/4.55).

Difference Between Boys and Girls in Attitudes Towards Technology

As mentioned earlier, several differences in attitudes were found between boys and girls. The highest statistical difference ($p < 0.001$) between boys and girls was found for the statement "I am interested in engineering and the phenomena related to it." The highest average value (4.34) was found among 11-year-old boys in 2012, followed by 13-year-old boys in 2012 (4.07) and 11-year-old boys in 1993 (4.01). The lowest average value, 2.53, was for 11-year-old girls in 1993; however, their attitudes' improved the most with a 3.43 in 2012. The difference between boys and girls interest areas can also be seen in practice, at least in Finland, because 88.2% of the boys still want to choose only technical craft studies, and the girls (62.9%) concentrate on textiles (Autio, 1997, 2013b). From the statistical point of view, this statement had the highest correlation (0.76, $p < 0.001$) to the average of other statements. In the factor analysis, this statement explained 57.7% of the total variance. Average values for the statement "I am interested in engineering and phenomena related to it" are presented in Figure 2.

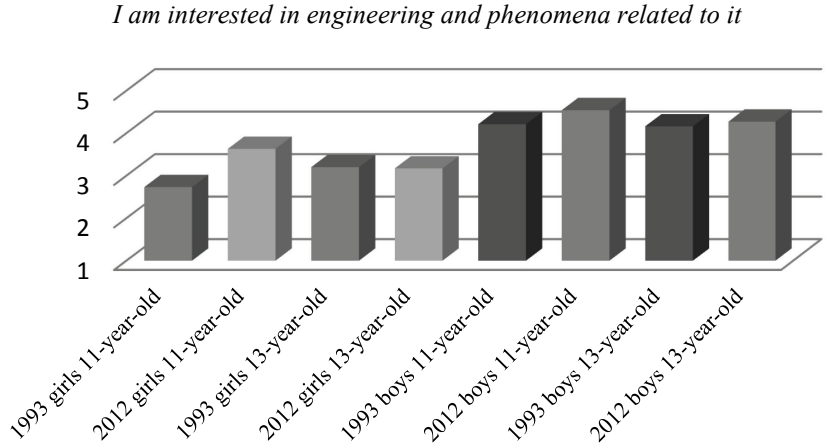

Figure 2. Average values for the statement: "I am interested in engineering and phenomena related to it."

Most positive and negative elements in attitudes towards technology

Analyzing the results more precisely it can be seen that the highest average values were given for the statement "Both boys and girls may understand engineering-related phenomena" (girls 4.56/4.55 and boys 4.06/4.36). This is a clear sign that gender issues are important in Finnish technology education, and both boys and girls are aware of them. Average values for the statement "Both boys and girls may understand engineering-related phenomena" are presented in Figure 3.

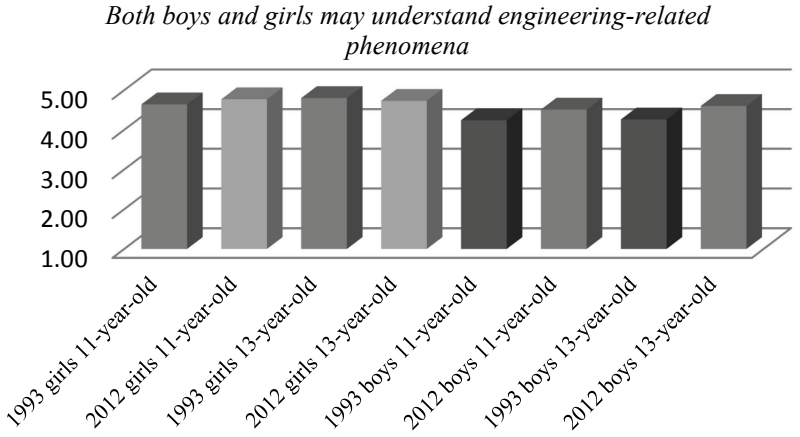

Figure 3. Average values for the statement: "Both boys and girls may understand engineering-related phenomena."

Relatively high average values were also found for the statements "Technology Education/craft lessons considerably contribute to the development of my manual skills" (boys 4.27/4.25), "The atmosphere in the Technology Education / craft lessons is pleasant and inspiring" (boys 3.78/4.28), "I am interested in engineering and the phenomena related to it" (boys 3.98/4.21), and "Mankind has rather benefited than sustained damage from the development of engineering" (boys 3.81/4.21).

The lowest average value was found for the statement "In the future I would like to choose a specialty or a profession related to engineering" (girls 1.95/2.30). Although attitudes have changed in a positive direction, it seems that the probability "of even considering these [engineering-related] occupations as appropriate is much lower for females than for males" (Eccles, 2007, p. 202; see also Autio, 2013a). Additionally, for this statement, there was still a difference when compared with boys (3.09/3.23). Furthermore, Eccles (2007) states that

> It is quite likely that males will receive more support for developing a strong interest in physical science and engineering from their parents, teachers, and peers than females. In addition, it is absolutely the case that all young people will see more examples of males engaged in these occupations than females. (p. 202)

Average values for the statement "In the future I would like to choose a specialty or a profession related to engineering" are presented in Figure 4.

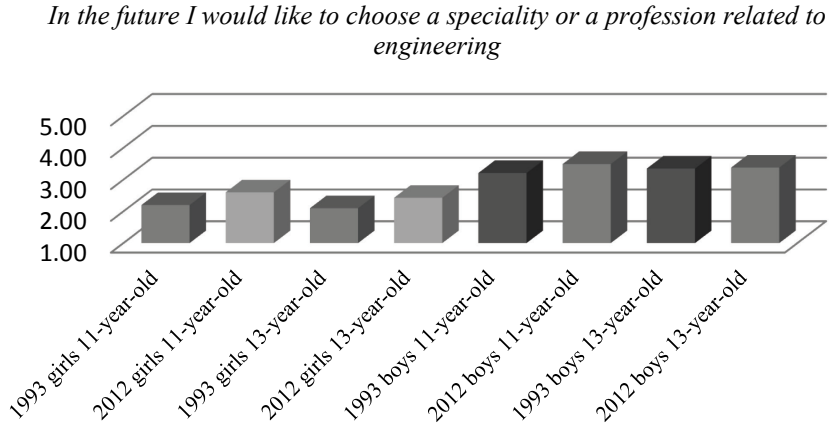

Figure 4. Average values for the statement: "In the future I would like to choose a specialty or a profession related to engineering."

Another low average value compared with the other statements was found for the statements "I spend a lot of time with engineering-related hobby activities" (girls 1.72/2.62 and boys 3.01/3.01) and "Newspapers, magazines, and articles from the field of engineering are interesting for me" (girls 2.07/2.35 and boys 3.06/2.90).

Discussion

The critical side of this research is that it is based on self-reports and measures only students' attitude, not their absolute technological will, which is shaped and guided by human emotions, motivation, values, personal qualities, and real-life choices regarding technology. In addition,

> The concept attitude is just a single one part of a larger concept, which is 'technological competence'. However, attitude is a crucial part of the competence as it has remarkable effect on [building] technological

> knowledge and technological skills in real life situations.. (Autio et al., 2015, p. 32)

Moreover, to achieve a relevant comparison, the measurements were made with the same attitude questionnaire in 1993 and in 2012. Because the questionnaire was not updated during the last 20 years, there has been some criticism, for example, that the statements should be fully neutral in terms of gender aspects. Moreover, the conceptual framework between attitudes and interest should be taken into account. These results should be observed and interpreted in the context of Finnish craft and technology education. Some criticism could be raised because the selection of the schools was made already in 1993 and the sample was discretionary rather than incidental. However, the difference between schools in Finland is very small, as reported in the 2012 PISA results (Kupari et al., 2013).

The main point of this research is that Finnish students' attitudes towards technology were definitely more positive in 2012 than in 1993. The average response in our Likert-style (1–5) questionnaire to all 14 items was 2.88 for Finnish girls in 1993 and 3.24 in 2012. The development in girls' attitudes was statistically significant ($p < 0.01$). Unfortunately, the development among boys was not as positive; the average response of boys was 3.54 in 1993 and 3.75 in 2012.

The most promising results were found for the statement "I spend a lot of time with engineering-related hobby activities" because girls seemed to have much more technology-related hobbies than 20 years ago. It can be concluded that this was because of changes in the technological environment in general as well as changes in the curriculum. There are plenty of different technological solutions (e.g., mobile phones, games consoles, tablets, interestingly themed construction kits) available for all children nowadays that did not exist 20 years ago. This will be a challenge for the curriculum development in the future. How can technology education benefit from the fact that especially girls are interested in technological everyday solutions rather than technological details, as reported in several other studies (Eccles, 2009; Mitts, 2008; Weber & Custer, 2005; Wender, 2004).

In addition, a positive phenomenon was noticed for the statement "The atmosphere in the Technology Education / craft lessons is pleasant and inspiring" because the average values were relatively high among both boys and girls. This corroborates the findings of previous studies. Students who typically enroll in technology education are attracted to the types of projects they will be engaged in (Weber & Custer, 2005).

Both boys and girls seem to strongly agree with the statement "Both boys and girls may understand engineering-related phenomena." This is probably because the Finnish curriculum has put great emphasis on gender equity since 1970. However, somewhat paradoxically, only a few girls are willing to

challenge stereotypes about nontraditional careers for women, as could be concluded from responses to the statement "In the future I would like to choose a specialty or a profession related to engineering." Even though there has been much development in attitudes towards technology, only a few girls seemed to have technological hobbies or had a great interest in technological articles.

Another interesting phenomenon is that girls seem to find the atmosphere in technology education at least moderately enjoyable, and they mostly agree that technology or craft education has an effect on their manual skills. However, they do not think that technology education will beneficial for them in the future, as can be concluded from the statement "Technology Education / craft lessons will be beneficial in the future for me." Moreover, there is still a significant difference between boys and girls in attitudes towards technology in general. This gender-based segregation and falling recruitment for scientific and technological studies is a common phenomena in all the Nordic countries (Sjöberg, 2003). However, it is interesting that the phenomenon is still noticeable in Finland where gender equity has been a prime educational aim for decades.

Conclusions

The main problem in Finland is that even though there is more technology-related content that our children should be familiar with, the amount of craft lessons is still the same as 20 years ago. Furthermore, because craft education is nowadays divided into technologically based technical craft and artistically based textile craft, girls have more technologically based lessons than 20 years ago. Unfortunately, boys have much fewer technologically based lessons than they had in 1993. This may be seen in the results of this study as well.

Furthermore, Finnish students' attitudes towards technology are still at a significantly lower level than in Iceland and Estonia, which have relatively different curriculum in technology education (Autio & Soobik, 2012; Autio, Thorsteinsson, & Olafsson, 2012). Moreover, 88.2% of boys still want to choose only technical craft studies, and 62.9% of girls want to choose textile craft studies (Autio, 1997, 2013b). It indicates that the curriculum, which includes two different compulsory craft subjects (technical craft and textile craft), is a suitable setup, especially for Finnish girls. Hence, it can be concluded that an ideal solution in technology education has not been found. Furthermore, the justifiable question of other points of view in equality arises: are all students without any regard to sex given an opportunity to choose study groups based on their wishes and interests, which allows them to study in greater detail the subject that they are really interested in?

Several development projects are made to promote interest in technology. According to Mammes (2004) attitudes towards technology can be significantly improved by developing special courses just for girls. "Because technology education has traditionally been such a male-oriented subject, teachers need to

be aware of the differing interests of girls and consider ways of making the environment and the subject attractive to them "(Silverman & Pritchard, 1996, p. 50). Furthermore, some researchers believe that "in school situations where only females are present, the gender-related segment becomes relatively inactive, and interests could develop independently. So if girls' interests should be turned to technology (against the gender stereotype), gender separate teaching is advisable" (Hannover, 1998; Hannover & Kessels, 2002; as cited in Wender, 2004, p. 46–47). In addition, several preconditions are recommended such as support from female role models and an atmosphere that encourages confidence and inclusion of technical problems in everyday situations that have a relationship with people (Häussler & Hoffmann, 1998). However, the problem of the inequality in the field of technology seems to be far more complicated than we used to think. It is not just technology education that is responsible for solving such a complex problem but society as a whole.

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