A Comparative Study of Craft and Technology Education Curriculums and Students' Attitudes towards Craft and Technology in Finnish and Estonian Schools

Ossi Autio & Mart Soobik

This paper is based on a comparative study of craft and technology education curriculums and students' attitudes towards craft and technology in Finland and Estonia. The study was undertaken by the Helsinki University and University of Tallinn in the year 2012. A literature review was completed, in order to examine and compare the origins of craft education in Finland and Estonia. The review highlighted that craft education in both Finland and Estonia originated over 140 years ago and was influenced by the Tsarist Russia, the Western European countries and Scandinavian sloyd pedagogy. Furthermore, despite the origins of craft education in Finland and Estonia being similar, the Estonian national curriculum placed greater emphasis on innovation, whereas the Finnish national curriculum focused on the development of students' personalities and gender issues. A quantitative survey was subsequently distributed to 148 school students in Finland, 276 school students in Estonia. It consisted of 14 questions, which aimed to ascertain students' attitudes towards craft and technology. The survey showed substantial differences in students' attitudes towards craft and technology education in the two countries: these differences may be explained by differences in the national curriculums and the different pedagogical traditions. However, these findings need to be examined further through research.

Keywords: national curriculum, attitude, pedagogical traditions, technology education, craft.

Introduction

The compulsory education in Finland provides a general education for the entire age group from 7 to 16. Moreover, there is pre-school for children aged 6. Primary school teachers teach children aged 7 to 13 (grades 1 – 6) and the subject teachers children aged 13 to 16 (grades 7 – 9). The secondary level education is divided into general education carried out at upper (senior) secondary schools and vocational education provided by various vocational schools. Both have their own curriculum. Secondary level schools cater for students from 16 to 19. The upper secondary school provides general eligibility to all higher level education. The vocational schools provide initial vocational training in practically all occupational fields. The framework curriculum for compulsory education for 2004 serves as the basis for school curricula, which are drawn up by the local education authorities and schools. The guidelines contain only the general educational aims and basic contents. Consequently, the responsibility for teaching arrangements, exact course content and the selection of teaching material has been passed down to the local level. In practice, textbooks and traditions have a strong influence on what is taught at school.

In Estonia, school attendance is mandatory for all children from age 7 until the pupil turns 17 (Eesti Vabariigi haridusseadus, 1992). In basic school, the allocated time for covering the curriculum is nine years. The stages of study in basic school are: 1st stage of study – grades 1 to 3; 2nd stage of study – grades 4 to 6; 3rd stage of study – grades 7 to 9. The standard period of study in upper secondary school is three years (Põhikooli- ja gümnaasiumiseadus, 2010). After graduating basic school, students can continue their studies in a vocational school. After obtaining secondary education in a vocational school or in an upper secondary school, students can move on to the higher education level, opting either for an institution of professional higher education or a university.

The general aim of Finnish craft education is to increase students' self-esteem by developing their skills through enjoyable craft activities; it also aims to increase students' understanding of the various manufacturing processes and the use of different materials in craft. Furthermore, the subject aims to encourage students to make their own decisions in designing, allowing them to assess their ideas and products. Students' practical work is product orientated and based on experimentation, in accordance with the development of their personality. The role of the teacher is to guide students' work in a systematic manner. They must encourage pupils' independence, the growth of their creative skills through problem-based learning and the development of technical literacy. Finnish handicraft traditions are also of importance throughout the whole curriculum (Framework Curriculum Guidelines, 2004).

In the subject of Technology the National curriculum for basic schools in Estonia stressed following.

> Subjects taught in the domain of technology in Estonia enable students to acquire the mentality, ideals, and values inherent to the contemporary society. They learn to understand the options they have in solving tasks or creating new products; find and combine various environmentally sustainable techniques. In lessons, students study and analyse phenomena and situations, as well as use various sources of information, integrate creative thinking and manual activity. As a part of the study process, students generate ideas, plan, model, and prepare objects/products and learn how to present these. Students' initiative, entrepreneurial spirit, and creativity are supported and they learn to appreciate an economic and healthy life style. Learning takes place in a positive environment, where students' diligence and development are recognized in every way. Teaching develops their skills in working and cooperating, as well as their critical thinking and the ability to analyse and evaluate. (Ainevaldkond „Tehnoloogia", 2011)

Thus, as seen above, there are many similarities between the national curriculums in Finland and Estonia; however there are also some differences. In the following sections, the authors will attempt to highlight these differences in the curriculum level and later will try to ascertain whether there are any differences in practical level between the two countries, with regards to students' attitudes towards craft and technology.

Main part of the study was to recognise the origin of craft education in Finland and Estonia to identify fundamental changes during the curriculums development. The empirical part of the study was, however, to find any differences in students' attitudes towards craft and technology in Finland and Estonia. The research questions were:

1. What are the origins of craft education in Finland and Estonia?
2. How have the curriculums developed over the years?
3. What are the differences and possible reasons in students' attitudes towards craft and technology in Finland and Estonia?

In case of the first two research questions the used study method is historical analysis, which has been obtained through the researched references. In order to evaluate students' attitudes towards craft and technology, a questionnaire was devised, consisting of 14 statements. The questionnaire was based on the PATT standards (Pupils Attitudes Towards Technology), which were designed and validated by Raat & de Vries (1986) and van de Velde (1992).

The Origin of Pedagogical Craft Education

The education of handicrafts became a part of general education in central Europe in the 19th century and the main reason for this was the founding of general educational systems and the beginning of industrialisation. New methods for manufacturing and production demanded new skills from citizens (Kantola, Nikkanen, Kari, & Kananoja, 1999) and thus teaching began to focus on practical skills and the necessary technology found within society (Kananoja, 1989). The course content was based on the use of materials and the development of skills for the production of useful artefacts. Students learnt how to 'work according to rules' and gained the various skills required for their working lives. Handicraft education brought together care and perseverance, with the aim of the growth of students' personalities.

Uno Cygnaeus (1810-1888) (Finland) and Otto Salomon (1849-1907) (Sweden) were major leaders in the development of a systematic sloyd model for school education: they emphasised the advantage of constructing objects through formal educational methodology (Kantola et al., 1999). In his letters Cygnaeus continually stresses that the aim of the basic education will be development of child's sense form and beauty and general dexterity (Kananoja, 1999). Soon after, Gygnaeus began to teach sloyd in Finnish schools and the sloyd pedagogy was also adopted in Sweden, where the didactics of sloyd education were further developed by Salomon between 1849-1907 (as a holistic system focusing on methods with which students could produce useful artefacts). In 1875, Salomon opened a sloyd school in Nääs, which became a world training centre for sloyd teachers (Alamäki, 1999). The Sloyd model was later disseminated by Salomon, as a result of the thousands of teachers from all over the world who attended his classes. Sloyd had a significant impact on the early development of manual training, manual arts, industrial education and technical education in many countries (Bennet, 1926).

In the 19th century Estonia was a part of the Russian Empire and for this reason Russia greatly influenced local educational life and craft's education.

> In Russia, the educational explanation and popularization of Craft is greatly due to the Minister of Finance of the time, Mr Vyshnegradsky. Having analysed and compared the industrial development in Russia and in the Western Europe, he concluded that Craft as a subject in general education schools could considerably increase the country's competitive ability in industry. In the document „The project of the general normal plan of vocational education in Russia", published in 1884, the term craft in the sense of an educational subject is used for the first time in the Russian educational history. In order to develop the so called Russian system, by the request of Vyshnegradsky, in 1884 the Ministry of Education sent the lecturer K. Cirul and two other men to a six-weeks course organised by the Teachers' Seminar in Nääs, Sweden, where they familiarised themselves with the theory and practice of teaching the subject. Along with K. Cirul, Johan August Karell (1877-1947), an Estonian teacher, was a lecturer and developer of the methodology of Craft in the Teachers' Institute. Between 1906 and 1921 he organised nation-wide summer courses for Craft teachers in St Petersburg and he published several Craft-related books both in Russian and Estonian. (Lind, 1997)

The Development of the Craft Curriculum in Finland

The Finnish educationalist Gygnaeus (1810-1888) founded public schools in Finland in 1866 (Kananoja, 1989). At this time, Gygnaeus also introduced craft as a pedagogically-based compulsory subject, in an attempt to improve general education in Finland (Thorarinsson, 1891). In 1866, educational Sloyd (known as craft education today) became a compulsory subject in Finland (Kantola, 1997).

Manual training in Finland was established in two ways: males in rural communities were required to take the programme and teaching centres had to offer related courses (Vaughn & Mays, 1924). With the implementation of this system of universal education for all citizens, Finland became the first nation to make handwork an integral part of a national scheme of elementary education (Bennett 1926; Kananoja, 1989; Kantola, 1997).

Gygnaeus drew a sharp distinction between handicraft or manual arts as part of the general curriculum and handicraft as part of a technical or specialised education (Kananoja, 1989). Furthermore, he insisted that handicrafts should be taught by regular teachers, rather than specialised craftsmen (Bennett, 1937). Unfortunately, Gygnaeus' ideas for teaching craft were not adopted. In the Committee Report of 1912, the aims of teaching handiwork were based on the ideas of Mikael Soininen, who stated that craft education should be based on the general aims of handicraft training. These aims were in practice the same until the year 1970 (Anttila, 1983).

Industrialisation in Finland occurred between the years 1920–1960 and, at the same time, the craft national curriculum began to focus on industrial skills, as such skills were required in society (Kananoja, 1989); little emphasis was placed on the development of students' personalities and the enjoyment of craft work. However, the policy of fulfilling the needs of an industrialised society did not last long. In the Committee Report of 1970, it was claimed that craft education was outdated and, influenced by the Norwegian 'Forming' model, the education authorities decided to make craft part of the subject area for art. The Committee Report also emphasised the importance of sexual equality for the first time: it was considered that craft education could develop the important skills needed for everyday life in both sexes. At this time, the name of the subject was changed from craft education to technical craft or textile craft and it was recommended that the number of lessons taught should be considerably decreased. However, these plans never came to full fruition, as the result of a protest by the society of craft teachers. Thus, the impact of the Committee Report, in terms of how the subject was taught in schools, was of little significance.

Technology education was first introduced in the Framework Curriculum Guidelines in 1985, yet its impact on the subject of craft was insignificant. Handicraft skills were still considered of great importance; however, electronics and engineering were incorporated into the subject. The authorities wanted to further develop technology education, but, in practice, this was difficult. They also wanted to preserve the link to the heritage of Finnish craft and support student equality.

In the 1994 Framework Curriculum Guidelines, it was asserted that technology was an important aspect of the development of a modern Finnish society. The importance of developing technical literacy in students was emphasised, in order to enable students to adapt to new circumstances and take part in the development of new technologies within a modern Finnish society. It was deemed that students of both sexes should benefit from familiarity with modern technology. However, technology education was not established as a specific subject and the technological aspect of craft education was not particularly supported. Instead, there was more emphasis on gender equity and sustainability was also introduced into the curriculum.

In the beginning of 2000s, a discussion took place between the authorities and the spokesmen of the craft industry, with regards to the importance of incorporating technology education as an active part of general education in Finland. Unfortunately, these assertions were not taken into account in the Framework Curriculum Guidelines of 2004, with technology merely mentioned in the craft curriculum. Nevertheless, technology was introduced as part of a specific cross-curricular theme, entitled 'The Human Being and Technology'. Although, technology education was introduced for the first time in the framework curriculum, a separate technology education subject was not, however, been established. Technology education should be taught in all subjects as an integrated subject. Compared to the previous curriculum, few changes were made. The importance of developing students' handicraft skills was underlined, as in the Committee Report of 1970, within the context of the complete process of handiwork. In addition, the development of students' personalities and the growth of self-esteem were also emphasised.

The Development of the Craft and Technology Curriculum in Estonia

According to the Schools Act in 1803 and 1804 an upper secondary school was to be established in each provincial town; among other subjects the study program included technology and technical drawing (Andresen, 2003). In Estonia the first parish school (Parochialschule) for boys was established in 1804 in Kanepi by Johann Philipp von Roth and in addition to general subjects also craft was taught (as cited in Hirvlaane, 2000). Officially, craft as a general education subject has been in the Estonian general education school curriculum since 1894 (Cirkuljarõ, 1894). At the end of the 19th century two subjects with different orientation developed in Estonian schools: craft (wood and metal work) for boys and handicraft for girls, which integrated textile work and home economics (Lind, Pappel, Paas & Ojaste, 2007). Schools functioned on the principles of „activity schools" (Arbeitschulen), which were common in the Western Europe (Põld, 1993b). Põld (1993a) published his first comprehensive article on craft – „Work Education in School" – in Estonia in 1910. He favoured maximum application of work education principles at school, which did not mean only craft, but the principle, which should include the whole school and would guide the learner towards independent thinking and activity through work and through physical work, in particular (Põld, 1993a).

In the independent Republic of Estonia (1919-1940) consistent work was started with the aim of developing the content and organisation of education (Läänemets, 1995). The lessons plans of the seven-year school included the subject of handicraft, which was taught 2 lessons a week in every class (Haridusministeeriumi määrus tunnikava kohta, 1919). The curricula established in 1928 include a subject called Craft (Algkooli õppekavad, 1928). In the primary school curriculum of 1938 it is noted that the aim of craft is, above all, to create and increase the will to work, the joy of working, as well as interest and respect towards values created by work, to develop practical thinking and manual skills and aesthetic taste and taste to work, also the organisation of work permitting individuality is regarded highly important (Algkooli õppekavad, 1937, pp.74-78).

In 1940, the Republic of Estonia was incorporated in the Soviet Union. According to the study programs established in schools after WW II, Craft lessons focused on making study aids, including objects for other subjects, as schools lacked means and tools for the subject (ENSV Haridusministeeriumi Koolivalitsus). In the program of the 1954/1955 academic year, the objective of Craft was to develop students' personality, their skills, the ability to handle simpler tools and materials, using accomplishable techniques. In addition, socialist approach to work and collective working was developed in students (Keskkooli programmid 1954/55 õppeaastaks…, 1954).

The directives of the 20th Congress of the Party (1956) state that polytechnic education must be developed in general education schools, guaranteeing that students familiarise themselves with the most important contemporary industrial and agricultural sectors and ensuring a tight connection between teaching and public work, as well as to cultivate communistic approach to work in the young generation (Štšukin, 1956, p. 3). Beginning from the 1959/1960 academic year all classes had two craft lessons per week (from grades 1 to 11).

At the beginning of the 1960s an innovation in the study plans was students' work for the public good, as well as practical training and practical production practice, at the beginning of the 1980s the trend was towards establishing inter-school production practice plants and the number of Craft lessons per week was increased to four (Rihvk, 1985). At that time various types of tools were made in craft lessons, e.g. surfaced pointers, tin dustpans, which were needed either at school or in the household. Also creative building works were done within decorative wood carving and metal working art. The main aim was to prepare young people, who in the future would mostly become labourers and start working in a public economy sector.

On August 20, 1991 the Supreme Council of the Republic of Estonia passed the decision that Estonia no longer belongs to the Soviet Union and is an independent republic. In 1992 the Ministry of Education established the Craft programs for Grades 5 to 9 in general education schools (Eesti NSV Haridusministeerium, 1992). Classes were divided into two groups (boys and girls) and the program intended for a material-technological system in craft for grades 5 to 9, which meant that teaching various techniques is carried out through producing object of common need, whereas the goal orientation towards the usefulness of the objects for the society was essential. The program for boys had ten different parts: general technical training, woodwork, metal work, decorative wood carving, metal working art, electro-technical work, design and technical modelling, gardening and agriculture, and cording. Four different parts of it were expected to be taught (Eesti NSV Haridusministeerium 1992, pp. 4-5).

In 1996 the Estonian national curriculum for basic and secondary education was adopted. In grades 1 to 4 boys and girls had craft lessons together. Craft for boys intended for treating four different general topics in equal shares in each class - 16 general technical training lessons, 18 woodwork lessons, 18 metal work lessons, and 16 lessons of optional works per year (Eesti põhi- ja keskhariduse riiklik õppekava, 1996).

The 2002 curriculum established that the craft syllabus for basic schools has four different syllabi: handicraft for grades 1 to 3; handicraft, home economics, and craft and technology education for grades 4 to 9. The main content of craft and technology education was connecting national experience, innovation, and modern technology with students' purposeful creative practical work. During the lessons students acquired basic knowledge and practical skills in the sphere of national work traditions and the present-day engineering and technology. The content of teaching had seven parts: engineering through time; technical literacy; design and technical creation; processing materials; finishing; electric hand tools, and types of work. (Põhikooli ja gümnaasiumi riiklik õppekava, 2002). The types of work were described in more details in the teacher's book (Nagel, Rihvk & Soobik, 2001).

The regulation established by the government of the republic in 2011 states that the subjects of technology domain are craft, technology education, and handicraft and home economics. Craft is taught in grades 1 to 3 (girls and boys together). At the 2nd stage of study the students are divided into study groups based on their wishes and interests, selecting either handicraft and home economics or technology education studies. This allows students to study in greater detail the subject that they are interested in. The division into study groups is not gender-based. Technology education is taught in grades 4 to 9 (mostly boys), handicraft and home economics in Grades 4 to 9 (mostly girls). The content of technology education has five recurring parts: *technology in everyday life; design and technical drawing; materials and processing these; home economics* (study groups are exchanged); *project works* (girls and boys together). In order to make the subject more interesting and necessary, the groups of handicraft and home economics and technology are exchanged. Exchanging the study groups is organised in the way that the group consisting mostly of girls studies Technology Education and the group consisting mostly of boys studies Handicraft and Home Economics. To some extent both of the groups thus study Handicraft and Home Economics and Technology Education. Girls and boys from both of the groups take part in project works, although practically it might seem like a more profound learning of some topics. The actual technology studies part forms approximately 65% of the total duration, home economics 10%, and project work 25%. The teacher decides how to arrange these parts during the school year in cooperation with the teacher of handicraft and home economics. The studies are organised by switching between the study groups. (Ainevaldkond "Tehnoloogia", 2011)

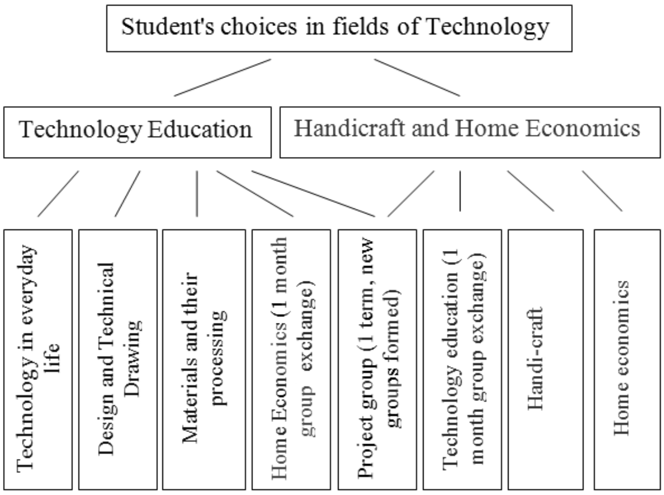

Figure 1. Student's choices in fields of Technology

The figure 1 describes the choices of Grade 4 to 9 students in the technological domain between technology education and handicraft and home economics. The teaching focusses largely on pupils' purposeful and creative innovation, where along with the joy of discovery they experience creating a selected object. Students perform interesting and imaginative creative tasks of applied nature, including the planning of a task or a product, designing and producing it, as well as self-evaluation and presentation of the work. Connections and applied outputs between the subject and spheres of life are pointed out, so that pupils get a complete understanding of the task or the product. It is important that students understand how technology works and they can take part in creating technology that corresponds to their abilities. Students' varying abilities and interests are taken into account and their initiative and motivation to learn in supported. The subject stresses the importance of inventional activity and shapes students' professional behaviours and value judgements. The objective is to value ecological attitude and local traditions, as well as attain ethical beliefs. (Ainevaldkond "Tehnoloogia", 2011).

Comparing the National Curriculums of Finland and Estonia

Craft education in both Finland and Estonia originated over 140 years ago and was influenced by the Scandinavian Sloyd pedagogy and thus the two curriculums share many similarities. Both the Finnish and Estonian curriculums have emphasised the importance of maintaining the original pedagogical value of handicraft work as the foundation of craft subjects.

In Finland, pedagogical sloyd became a compulsory school subject within the curriculum, known as craft education, in 1866. However, in Estonia, craft education was introduced already at the beginning of 1800s, but received a mandatory status in 1894. The subject in both countries has taken a similar direction; i.e., the general development of a child through a pedagogical system of manual training, the opportunity for students to make their own decisions in designing, innovation, technological literacy and gender equality.

There are also some differences between the subjects in the two countries. Analysing the Finnish curricula the smooth and even development of these can be noted. In Estonia, on the other hand, the political situation in the given period has considerably changed and thus there have been fundamental changes also in education, including the syllabi of craft and technology education. Nevertheless, the syllabi of the technological domain have been drawn up as a result of the developmental work in the last decades in Estonia, which in itself is a rather short period of time, and to a great extent these syllabi indicate the direction to the teachers and students in the technological domain. Estonia has recently placed an emphasis on innovation and technology, while the Finnish curriculum has chosen to focus on the development of students' personalities and gender equality. The main changes throughout the development of the two curriculums are presented in Table 1.

Table 1. The main changes in the national curriculums for craft in Finland and Estonia over the years.

Finland	Estonia
1866 Statute of folk school - Craft became compulsory school subject	18 1894 Russian law - Craft was officially a part of the curriculum for general education schools
1912 Committee Report - educational background for craft revised - focus on manual skills	1919 The regulation of the Ministry of Education on lesson plans - Handicraft was a compulsory subject in the curricula for seven-year schools
1952 Committee Report - focus on industrial skills - emphasis on using machines	1954 Secondary school programs - focus on polytechnic education and learning about direct labour - the objective of Craft was to develop students' ability to work, use simpler tools and materials
1970 Committee Report - craft introduced as education for work - pedagogical background (subject matter) - sexual equality emphasised	1961 Secondary school study plans - practical production practice and establishing inter-school production practice plants - in addition to Craft the study plans included students' work for the public good, as well as practical training and practical production practice
1985 Framework Curriculum Guidelines - concept of technology introduced - craft cultural heritage made important	1992 Programs for general education schools - Craft separately for boys and girls - teaching various techniques - the goal orientation towards the usefulness of the objects for the society was essential
1994 Framework Curriculum Guidelines - gender equality emphasised - sustainability became part of the curriculum	1996 Estonian national curriculum for basic and secondary education - the subject of Craft for boys - general technical training, woodwork and metal work was compulsory in all schools

2004 Framework Curriculum Guidelines - students' personality development deemed important - enjoyment in doing craftwork and self-esteem deemed important	2002 National curriculum for basic schools and upper secondary schools - Craft and Technology Education for Grades 4 to 9 (mostly boys) - pupils acquired basic knowledge and practical skills in the sphere of national work traditions and the present-day engineering and technology.
2016 New Framework Curriculum - work groups are established for drawing up the syllabus ? - ideas on the name of the subject are exchanged ? - additional lessons are requested for the subject in primary level ?	2011 National Curriculum for Basic School - Technology Education for Grades 4 to 9 (boys and girls) -study groups is not gender-based -home economics (study groups for boys and girls) -project works (girls and boys together)

Empirical Research

The aim of the empirical aspect of the research was to answer the question: What are the differences and possible reasons in students' attitudes towards craft and technology in Finland and Estonia? Dyrenfurth (1990) and Layton (1994) referred to attitudes to 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 on the impact of their technological decisions.

In order to evaluate students' attitudes towards craft and technology in Finland and Estonia, a questionnaire was devised, consisting of 14 statements. For each Likert-type item, there were five options, from 'Strongly Disagree' (= 1) to 'Strongly Agree' (= 5). The questionnaire also featured some questions about students' backgrounds, in addition to questions that attempted to gauge students' motivation and success, in terms of craft and technology education classes. The questionnaire was based on the PATT standards (Pupils Attitudes Towards Technology), which were designed and validated by Raat & de Vries (1986) and van de Velde (1992). Based on their work different factors were found: interest, role models, effects of technology, complexity of technology, school and technology, career plans. From this point of view the internal consistency of the questionnaire is relevant. In year 2012, 148 students from Finland and 276 students from Estonia took part in the survey. The age of the student-respondents was 11 years, they studied in Grade 5. Since we have different and independent samples, we can use paired comparison to calculate the level of probability of the difference of the samples or more precisely, what the probability of these groups having differences is and in case of which questions the differences are genuine; the calculations are based on arithmetic averages (Tooding, 2007, p154).

According to Autio (1997), Fensham (1992) and Lauren (1993) boys performed better attitudes towards technology in every age group and we could assume that there would be differences in individuals' attitudes towards technology. Therefore, we tried to find out what are the main differences and possible reasons. This was done by conducting the one tailed t-test, with the same variance, on boys and girls. In the entire Finnish and Estonian groups, we employed the two tailed t-test, as we had no hypothesis based on the previous research.

Results

Based on the questionnaire we can conclude that there were some significant differences in students' attitudes towards craft and technology. The average response in our Likert-style (1-5) questionnaire to all 14 items was among Estonian girls 3.55 and boys 4.00. The average response of Finnish girls was 3.37 and boys 3.78. In more detail, it was found a significant statistical difference ($p < 0.05$) between Finland and Estonia in 10 statements. Estonian girls had significantly better results in six items whereas Finnish girls in two items. In boys test group Estonian boys performed significantly better in seven items as their Finnish peers did so in none of the items compared to their Estonian peers.

Comparing the differences of the arithmetic averages in the results of Finnish and Estonian students the difference in the arithmetic averages is the biggest and the most significant is case of question number 10 (Estonian girls M = 4.32, Finnish girls M = 3.56, difference between the arithmetic averages 0.76), which shows that compared to Finnish girls Estonian girls consider the atmosphere in the lessons more pleasant and inspiring. In respect to the scale of differences the previous question was followed by question number 11 (Estonian girls M = 4.56, Finnish girls M = 3.85, difference between the arithmetic averages 0.71), where Estonian girls had more faith in the lessons developing manual skills than Finnish girls. It could be explained by the fact that traditionally manual skills have been highly valued and credited in Estonia. The third biggest difference in arithmetic averages was in the answer to question number 2 (Finnish girls M = 2.71, Estonian girls M = 2.02, difference between the arithmetic averages 0.69), according to which Finnish girls spend a lot of time with technological hobbies compared to Estonian girls. It could be due to the fact that compared with Finland, there are less opportunities for technological hobbies in Estonia. The fourth biggest difference was in question number 3 (Estonian boys M = 3.50, Finnish boys M = 2.83, difference between the arithmetic averages 0.67), where Estonian boys gave higher assessments to the statement that newspapers and magazines from the field of technology are interesting, compared to Finnish boys. It could be explained by the fact that in Finland there are many other interesting newspapers and magazines that the young people read. The fifth biggest difference in arithmetic averages was in the girls' assessments to question 14 (Estonian girls M = 4.09, Finnish girls M = 3.51, difference between the arithmetic averages 0.58), according to which Estonian girls had more faith in the lessons being beneficial for the future than did Finnish girls. The difference could be due to the fact that in Estonia people have to do many housekeeping jobs themselves, whereas in Finland pertinent services are more widely used and there are also other forms of business, which make housekeeping easier and help people more. The sixth biggest difference in arithmetic averages was boys' assessments to question number 5 (Estonian boys M = 4.16, Finnish boys M = 3.51, difference between the arithmetic averages 0.56), according to which Estonian boys gave higher assessments to the question whether understanding engineering-related phenomena requires a special wit. This is difficult to explain. It is possible that in Estonia, a bigger focus is on the meaning and importance of technical specialities.

Most remarkable differences among boys and girls were found in statement number:

- 10. The atmosphere in the Technology Education / Handicraft and Home Economics lessons is pleasant and inspiring. Difference between Estonian and Finnish girls ($p<0.001$)
- 11. Technology Education / Handicraft and Home Economics lessons considerably contribute to the development of manual skills. Difference between Estonian and Finnish girls ($p<0.001$)
- 2. Spends a lot of time with engineering-related hobby activities
- 3. Newspapers, magazines, and articles in the field of engineering are interesting
- 5. Understanding engineering-related phenomena requires a special wit. Difference between Estonian and Finnish boys ($p<0.001$)
- 14. Technology Education / Handicraft and Home Economics lessons will be beneficial in the future. Difference between both Estonian and Finnish boys and girls ($p=0.001$)

The highest average values in the whole questionnaire were found in statement number:

- 6. Both boys and girls may understand engineering-related phenomena (4.62 / Finnish girls).
- 4. Understanding engineering-related phenomena will be beneficial in the future (4.43 / Estonian boys).
- 11. Technology Education / Handicraft and Home Economics lessons considerably contribute to the development of manual skills (4.56 / Estonian boys and girls).

The lowest values were in statement number:

- 2. Spends a lot of time with engineering-related hobby activities (2.02 / Estonian girls).
- 3. Newspapers, magazines, and articles in the field of engineering are interesting (2.35 Finnish girls)
- 8. In the future would like to choose a speciality or a profession related to engineering (2.40 / Finnish and Estonian girls).

The averages and standard deviation, number of respondents for each statement and differences between the test groups, with regards to the measurement of students' attitudes towards craft and technology, measured by t-test, are listed in the table 2 below:

Table 2. Average (Mean), standard deviation (SD), respondents (N) and Statistical Significance (p-value) for each statement, with regards to the measurement of students' attitudes towards craft and technology, measured by t-test.

Statement number	Gender	Estonia			Finland			p-value
		Mean	SD	N	Mean	SD	N	
1. Is interested in engineering and the phenomena related to it	girls	3.32	1.08	133	3.45	0.92	55	0.432
	boys	4.40	1.00	142	4.30	0.79	93	0.417
2. Spends a lot of time with engineering-related hobby activities	girls	2.02	1.23	134	2.71	1.05	55	0.000
	boys	3.44	1.31	137	3.06	1.16	93	0.024
3. Newspapers, magazines, and articles from the field of engineering are interesting	girls	2.87	1.29	129	2.35	0.99	55	0.003
	boys	3.50	1.21	135	2.83	1.12	93	0.000
4. Understanding engineering-related phenomena will be beneficial in the future	girls	3.59	1.07	133	3.45	0.98	55	0.407
	boys	4.43	0.96	140	3.95	1.04	93	0.000
5. Understanding engineering-related phenomena requires a special wit	girls	3.50	1.24	132	3.55	0.81	55	0.768
	boys	4.16	1.01	134	3.60	1.03	93	0.000
6. Both boys and girls may understand engineering-related phenomena	girls	4.42	0.98	133	4.62	0.68	55	0.117
	boys	4.22	1.04	142	4.29	1.12	93	0.615
7. The mankind has rather benefited than sustained damage from the development of engineering	girls	3.89	1.08	131	3.85	0.93	55	0.853
	boys	4.29	1.02	139	4.25	1.11	93	0.736
8. In the future would like to choose a speciality or a profession related to engineering	girls	2.41	1.09	131	2.40	1.05	55	0.944
	boys	3.39	1.29	140	3.26	1.11	93	0.422
9. Parents have a lot of engineering-related hobbies	girls	2.61	1.25	132	2.98	1.03	55	0.035
	boys	2.96	1.40	140	3.09	1.15	92	0.441
10. The atmosphere in the Technology Education / Handicraft and Home Economics lessons is pleasant and inspiring	girls	4.32	0.99	131	3.56	0.98	55	0.000
	boys	4.11	1.08	141	4.24	0.89	93	0.335

11. Technology Education / Handicraft and Home Economics lessons considerably contribute to the development of manual skills	girls	4.56	0.92	131	3.85	0.97	55	0.000
	boys	4.56	0.97	138	4.25	0.87	93	0.014
12. Technology Education / Handicraft and Home Economics lessons develop logical thinking	girls	4.12	1.06	130	3.60	0.78	55	0.001
	boys	4.24	1.14	140	3.84	0.85	93	0.003
13. Has been successful in Technology Education / Handicraft and Home Economics lessons	girls	3.99	1.06	134	3.49	0.88	55	0.002
	boys	3.93	1.06	138	3.80	1.01	93	0.344
14. Technology Education / Handicraft and Home Economics lessons will be beneficial in the future	girls	4.09	1.12	134	3.51	1.02	55	0.001
	boys	4.39	1.04	142	3.90	1.02	93	0.001
All 14 items	girls	3.55	0.56	134	3.37	0.56	55	
	boys	4.00	0.62	142	3.78	0.48	93	

Conclusion and Discussion

Craft education in both Finland and Estonia originated over 140 years ago and was influenced by the Scandinavian sloyd pedagogy. In the beginning, the subjects largely focused on students copying artefacts, using a variety of handicraft tools: the purpose of this was to improve their' manual skills, rather than their thinking skills.

Today, the focus is also on developing students' thinking skills, which enables them to work through various handicraft processes (from initial ideas to the final products). This work is based on the idea generation of students and is thus expected to increase their self-esteem and ingenuity.

Significant differences in students' attitudes towards craft and technology were found in the two countries. The Estonian students' attitudes towards craft and technology were more positive. Analyzing the results of the empirical study more precisely we can claim that in case of many questions (10 altogether) there is a statistically significant ($p < 0,05$) difference between the answers given by Estonian and Finnish students.

In question number 2 it appeared that the answers given by Estonian girls had considerably lower results than Finnish girls. This could be due to the fact that in Estonia there is a lack of technical hobbies, especially for girls. In case of boys the situation is the opposite – Estonian boys spend more time with hobbies than Finnish boys. This could be explained by a wider choice of different, not just technological activities, Finnish students have compared to their Estonian peers.

Question number 3 shows that compared to Estonian students, Finnish boys and girls in particular do not take an interest in the newspapers and magazines of the field of engineering. This again could be due to the fact that in Finland the choice of Finnish-language magazines from various fields other than technology is considerably wider than such magazines in Estonia.

Question number 4: Estonian boys have higher than average opinion that understanding engineering-related phenomena would be beneficial in the future. This could be due to the fact that in Estonia it has been thought for a long time that engineering is mainly for boys and thus Estonian boys think that in the future they would be engaged in technical fields and understanding engineering is important for them. In any case, the responses were consistent with the similar question (number 14) concerning the benefits of technology education lessons in school.

Question number 5: Estonian boys had a considerably higher than average opinion that understanding engineering-related phenomena requires a special wit. This could be explained by them thinking that topics related to engineering are more difficult and require understanding and wit. In addition Estonian boys had more technology education lessons than average and therefore they may have been given more challenging problems in the field of technology.

Question number 9: compared to Finnish girls Estonian girls have a more modest opinion on their parents having technical hobbies. This could be explained by the fact that in Estonia technical hobbies are not particularly widespread among people. It could also be that boys have a wider understanding of technical hobbies while girls do not.

In case of questions 10 to 14 we can observe that in Finland both boys and girls study the same subject which has contents from both technical - and textile craft, while in Estonia it was administered to both the handicraft and home economics group and the technology education group. Every year, both groups study Handicraft and Home Economics and Technology Education to smaller or greater extent. Hence, due to the translation of specific terms concerning technology, Estonian girls may have assessed these questions rather from the point of view of handicraft and home economics than from the point of view of technology education and maybe that is why the questions 10 to 14 have higher assessment results in Estonian groups. However, higher assessment results are notable in most other statements and the difference seems to be similar between Finnish and Icelandic girls as well (Autio, Thorsteinsson and Olafsson, 2012).

Question number 11 received higher assessment from Estonian boys probably because compared to Finland, in Estonia the focus in teaching is still largely on manual skills. Question number 12 has received higher assessment from Estonian boys probably because technology education has many tasks that are related to developing students' logical thinking, which requires reflection and devising. Question number 14 has received higher assessments from Estonian students as compared to Finnish boys, because in Estonia men are still used to doing technical renovation and mending jobs themselves. In Finland there may be more possibilities to hire special companies to do jobs such as mending technical equipments and doing refurbishing.

The Estonian students' attitudes towards craft and technology were more positive in all groups. In addition, the difference was statistically significant also among girls test groups. This is an interesting finding as the Finnish curriculum has put large emphasis on gender equity since 1970. Finnish girls seemed to be aware of the gender equity and their highly agree with the statement: both boys and girls may understand engineering-related phenomena. However, only a few girls are willing to challenge stereotypes about non-traditional careers for women, as it could be conducted from responses to the statement: in the future would like to choose a speciality or a profession related to engineering. In addition, only few girls seemed to have technological hobbies or had interest in technological magazines. What's more in Finland the boys still want to choose technical craft studies and the girls' textiles. A practical solution to get both sexes to choose both subjects has not been found.

It indicates that the Estonian curriculum that includes two different craft subjects: the technologically based 'technology' and the art based 'handicraft and home economics' is still a relatively suitable setup, when study groups are not gender-based. In addition, the innovation and technology part: technology in everyday life; design and technical drawing; materials and processing these; home economics (study groups are exchanged); project works (girls and boys together) works fine for both boys and girls. Moreover, the comparable results from Autio, Thorsteinsson and Olafsson (2012) shows that Icelandic girls performed better attitudes than both Estonian and Finnish girls. Hence, Finnish and Estonian craft and technology education curriculum could also benefit from Icelandic system with two different subjects: art based textile education and innovation based technology education, compulsory for both boys and girls.

The critical side of the study is that the study group consisted only from 11-year-old students. Although, students' attitudes are assumed to be rather stable during the school years (Arffman & Brunell, 1983; Bjerrum Nielsen & Rudberg, 1989), Autio, Thorsteinsson and Olafsson (2012) found that there was significant statistical difference between 11 and 13 year old Finnish girls in attitudes towards technology. Younger girls performed better attitudes towards technology. Furthermore, no statistical difference was found between younger and older Finnish and Icelandic boys or between Icelandic younger and older girls.

Another critical point of the empirical part was the use of a relatively small sample of students. However, 424 students seemed to be enough as the results are consistent with previous studies (Autio, 1997; Autio, Thorsteinsson & Olafsson, 2012). In addition, the questionnaire measures only students' attitude, not their absolute technological will which is shaped and guided by human emotions, motivation, values and personal qualities. The concept attitude is just a single one part of a larger concept, which is 'technological competence'. Attitude is a crucial part of the competence as it depends on technological knowledge and technological skills in real life situations.

The reasons behind the dissimilarities found between the two countries may be due to differences in the curriculums and in different pedagogical traditions. On the other hand, the political situation has considerably changed in Estonia and the motivation for further development seems to be ambitious also in education, including the syllabi of craft and technology education. However, further research is needed before the authors can reach their final conclusions.

References

Ainevaldkond „Tehnoloogia“ [Subject field „Technology”]. (2011). RT I, 14.01.2011, 1. Retrieved from https://www.riigiteataja.ee/aktilisa/1200/9201/1009/VV1_lisa7.pdf.

Algkooli õppekavad [Curricula for primary schools]. (1928). Tallinn.

Algkooli õppekavad [Curricula for primary schools]. (1937). Tallinn.

Alamäki, A. (1999). *How to Educate Students for a Technological Future: Technology Education in Early Childhood and Primary Education*. Publication Series B: Research Reports No. 233, Turku: The University of Turku.

Andresen, L. (2003). *Eesti kooli ajalugu. Algusest kuni 1940. aastani* [History of the Estonian school. From the beginning until 1940]. Estonia, Tallinn: AS BIT.

Anttila, P. (1983). *Työ ja työhön kasvatettavuus [Work and the education to work]*. Tutkimus koulun työkasvatuksesta ja siihen vaikuttavista tekijöistä. helsingin yliopiston kasvatustieteen laitos. Tutkimuksia 100.

Arffman, I. & Brunell, V. (1983) *Sukupuolten psykologisista eroavaisuuksista ja niiden syistä [Psychological gender differences and the reasons for them]*. Jyväskylän yliopisto. Kasvatustieteiden tutkimuslaitoksen selosteita ja tiedotteita 283.

Autio, O. (1997). *Oppilaiden teknisten valmiuksien kehittyminen peruskoulussa [Student's development in technical abilities in Finnish comprehensive school*]. Research Reports No. 117. Helsinki: The University of Helsinki, Department of Teacher Education.

Autio, O., Thorsteinsson, G. & Olafsson, B. (2012). A Comparative Study of Finnish and Icelandic Craft Education Curriculums and Students' Attitudes towards Craft and Technology in Schools. *Procedia - Social and Behavioral Sciences 45 (2012), 114-124.*

Bennett, C. A. (1926) *History of Manual and Industrial Education up to 1870, Peoria*: The Manual Arts Press.

Bennett, C.A. (1937) *History of Manual and Industrial Education 1870 to 1917.* Peoria IL: The Manual Arts Press.

Bjerrum Nielsen, H. & Rudberg, M. (1989). *Historien om jenter og gutter. Kjonnsosialisering i ett utvecklingspsykoligisk perspektiv*. Oslo: Universitetslaget

Cirkuljarõ po Rižskomu učebnomu okrugu za 1894 g. No 6.

Committee Report (1912). Helsinki: Kouluhallitus.

Committee Report (1970). Helsinki: Kouluhallitus.

Dyrenfruth, M. J. (1990). Technological Literacy: Characteristics and Competencies, Revealed and Detailed. In H. Szydlowski & R. Stryjski (Eds.) *Technology and School: Report of the PATT Conference* (pp. 26-50). Zielona Gora, Poland: Pedagogical University Press.

Eesti Vabariigi haridusseadus [Education Law of the Republic of Estonia]. (1992). RT 1992, 12, 192. Retrieved from https://www.riigiteataja.ee/akt/968165?leiaKehtiv

Eesti NSV Haridusministeerium. Üldhariduskooli programmid. Tööõpetus V- IX klassile [Programs for general education schools. Craft for Grades 5 to 9]. (1992). Eesti Vabariigi haridusministeerium.

ENSV Haridusministeeriumi Koolivalitsus [Educational authority of the Ministry of Education of the ESSR]. Rahvusarhiiv, f.R-14. Nr 4, s.12.

Eesti põhi- ja keskhariduse riiklik õppekava [National curriculum for basic schools and secondary education]. (1996). RT I 1996, 65, 1201. Retrieved from https://www.riigiteataja.ee/akt/29725#.

Haridusministeeriumi määrus tunnikava kohta [Regulation of the Ministry of Education on lesson plans]. (1919). Tallinn.

Hirvlaane, M. (2000). Kanepi koduakandi päeva puhul üks vana lugu Kanepi ajaloost [On the occasion of Kanepi neighbourhood days an old story about the history of Kanepi]. In M. Hirvalaane (Ed.), *Johann Philipp von Roth* (pp. 38-40). Estonia, Põltsamaa: OÜ Vali Press.

Fensham, P. (1992). Science and Technology. In Jackson, P. (Ed.) *Handbook of Research on Curriculum.* New York: MacMillan.

Framework Curriculum Guidelines (1985). Helsinki: Kouluhallitus.

Framework Curriculum Guidelines (1994). Helsinki: Opetushallitus.

Framework Curriculum Guidelines (2004). Helsinki: Opetushallitus.

Kananoja, T. (1999). Letters of Uno Cygnaeus and Otto Salomon the 22nd of June 1877- 1st of January 1887. In: T. Kananoja, J. Kantola & M. Isskainen (Eds.), *Development of Technology Education – Conference-98* (pp.32-57). Finland, Jyväskylä: University Printing House Jyväskylä.

Kananoja (1989). *Työ, taito ja teknologia. Yleissivistävän koulun toiminnallisuuteen ja työhön kasvattamisesta [Work, skill and technology. About education to work and functionality in comprehensive school]*. Turun yliopiston julkaisuja 72.

Kantola (1997). *Gygnaeuksen jäljillä käsityönopetuksesta teknologiseen kasvatukseen [In the footspeps of Uno Gygnaeus from handicraft to technology education]*. Jyväskylän yliopiston julkaisuja 133.

Kantola, J., Nikkanen, P., Kari, J. & Kananoja, T. (1999). *Through Education into the World of Work. Uno Cygnaeus, the Father of Technology Education.* Jyvaskyla University, Institute for Educational Research. Jyväskylä: Jyväskylä University Press, pp. 9 -17.

Keskkooli programmid 1954/55 õppeaastaks. Tööõpetus. Praktilised tööd õppe-katseaias. Praktilised tööd õppetöökojas [Secondary school programs for the 1954/1955 academic year. Craft. Practical works in the test garden. Practical works in the workshop]. (1954).

Lauren, J. (1993). Osaavatko peruskoululaiset luonnontietoa. In Linnankylä, P. & Saari, H. (Eds.). *Oppiiko oppilas peruskoulussa? [Do students' learn in comprehensive school?]*. Jyväskylän yliopisto. Kasvatustieteen tutkimuslaitos.

Lavonen, J. & Autio, O. (2003). Technology education in Finland. In G. Graube, M.J. Dyrenfurt & W.E. Teurkauf (Eds.) *Technology education: International Concepts and Perspectives*. Frankfurt am Main: Peter Lang GmbH, 177-191.

Layton, D. (1994). A School Subject in the Making? The Search for Fundamentals. In D. Layton (Ed.) *Innovations in Science and Technology Education* (Vol.5). Paris: Unesco.

Lind, E. (1997). Töökooli ideede levik Eestisse 19.sajandi lõpul ja 20. sajandi alguses [The Spread of the Ideas of "Arbeitsschule" in Estonia at the End of the 19th Century and at the Beginning of the 20th Century]. In E. Lind & H. Vihma (Eds.), *Acta Universitatis Scientiarum Socialium Et Artis Educandi Tallinnensis. Proceedings of the Tallinn University of Social and Eduvational Studeis. The features of development of aesthetic education in Estonian school A7 Humaniora* (pp. 17-28). Estonia, Tallinn: Tallinna Pedagoogikaülikool.

Lind, E., Pappel, K., Paas, K., Ojaste, A. (2007). Käsitöööpe üldhariduskoolis. Noorte ja õpetajate arvamusuuring [Handicraft studies in Estonian General Education School. Monitoring of Yongsters and Teachers]. *Haridus*, 11-12, 33-37.

Läänemets, U. (1995). Hariduse sisu ja õppekavade arengust Eestis [About the content of education and the development of curricula in Estonia]. Estonia, Tallinn: Jaan Tõnissoni Instituut.

Nagel, G., Rihvk, E., Soobik, M. (2001). Töö- ja tehnoloogiaõpetuse ainekavast ja õpetamisest [About the syllabus and teaching of Craft and Technology Education]. In *Õpetajale uuendatud riiklikust õppekavast.* Artiklite kogumik [To teachers about the new national curriculum. Collection of articles] (pp.78- 86). Tallinn: Haridusministeerium.

Põhikooli- ja gümnaasiumiseadus [Basic School and Upper Secondary School Act]. (2010). RT I 2010, 41, 240. Retrieved from https://www.riigiteataja.ee/akt/13332410?leiaKehtiv

Põhikooli ja gümnaasiumi riiklik õppekava [National curriculum for basic schools and upper secondary schools]. (2002). RT I 2002, 20, 116. Retrieved from http://www.riigiteataja.ee/ert/act.jsp?id=1008388

Põld, P. (1993a). Töökasvatusest koolis [Work education in school]. In H. Muoni (Ed.), *Valitud tööd I* [Selected works I] (pp. 26-36). Estonia, Tartu: Tartu Ülikool, Eesti Akadeemiline Pedagoogika Selts.

Põld, P. (1993b). Usupuhastus ja Eesti rahvakool [Reformation and Estonian folk school]. In H. Muoni (Ed.), *Valitud tööd II* [*Selected works II*] (pp. 99-122). Estonia, Tartu: Tartu Ülikool, Eesti Akadeemiline Pedagoogika Selts.

Raat, J. & de Vries, M. (1986). *What do Girls and Boys think about Technology?* Eindhoven, University of Technology.

Rihvk, E. (1985). Üldkooli tööõpetuse kolm aastakümmet [Three decades of Craft in general schools]. *Nõukogude Kool*, 7, 34-38.

Salola, F. (1909). Kasvatusopillinen veisto-oppi. Opas veistonopettajaksi aikoville. Helsinki: Raittiuskansan kirjapaino.

Štšukin, S. (1956). Polütehnilise õpetamise tähtis lüli [Important link in polytechnic education]. *Nõukogude Õpetaja*, nr 13, 3.

Tooding, L. M. (2007). *Andmete analüüs ja tõlgendamine sotsiaalteadustes* [*Data analysis and interpretation in social sciences*]. Tartu, Estonia: Tartu Ülikooli Kirjastus.

van der Velde, J. (1992). Technology in Basic Education. In Kananoja, T. (Ed.) *Technology Education Conference*. Helsinki: The National Board of Education (151-170).

Vaughn, S. J. & Mays, A. B. (1924). *Content and Methods of the Industrial Arts*. New York & London: The Century Co.

Dr Ossi Autio is a senior lecturer in technology education at the University of Helsinki. Since 1982 he has been working in primary schools, upper secondary schools and vocational schools as a teacher in technology education. Since 1989, he has been teaching technology education at the University of Helsinki. His main research interests are students´ technical abilities and practical solutions for creative problem solving in technology education.

Mart Soobik, MA, is a PhD student at the Department of Educational Science, Institute of Educational Sciences, University of Tallinn. He is the head of the Estonian Association of Technology Education, www.tehnoloogia.ee. Soobik has contributed to national curricula in the subjects of Technology

Education, he is arranging and carrying out advanced training courses for teachers. His research interest is within Technology Education.

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