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**The perception and use of ICT in education by primary
school teachers in Finland and Japan**

Master's thesis of mathematical information technology

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Abstract: The amount of ICT in the Finnish curriculum for primary education was greatly increased in the current curriculum of 2014, and the same can be said for the new primary school curriculum of Japan, the adoption of which will begin in 2020. At this turning point in the use of ICT in both countries, it is important to take a look at how the adoption of ICT has proceeded in primary schools in both countries. The aim of this master's thesis was to find out 1) how the teachers of the two countries perceive ICT and its use in education, 2) what kind of supporting processes have been set up to support the use of ICT in education in Finland Japan, 3) how ICT is used in education in Finland and Japan in practice, and 4) what kind of challenges can there be in the use of ICT in education in Finland and Japan. This qualitative comparative research focused on the areas of Central Finland, Finland, and Kanazawa, in Ishikawa prefecture in Japan. The results highlighted many similarities between the views and experiences of the participants, such as the viewing of ICT primarily as a classroom tool, and the appreciation of practical supplementary training. Differences include the fact that in general Finnish primary school teachers found their ICT equipment to be sufficient, whereas Japanese participants did not. The use cases of ICT in both countries included office applications, but both countries also had their own specific applications in use.

Keywords: ICT, education, primary school, Finland, Japan

Suomenkielinen tiivistelmä: Vuoden 2014 opetussuunnitelman myötä ICT:n määrä kasvoi Suomen perusopetuksen opetussuunnitelmassa, ja samanlainen trendi koskee myös Japanin uutta perusopetuksen opetussuunnitelmaa, joka siirtyy vaiheittain käyttöön vuodesta 2020 alkaen. Tässä molempien maiden ICT-käytön käännekohdassa on hyvä tarkastella, miten ICT:n käyttöönotto on edennyt molempien maiden peruskouluissa. Tämän pro gradu - tutkielman tarkoituksena oli tutkia, 1) kuinka maiden opettajat kokevat ICT:n ja sen käytön opetuksessa, 2) minkälaisia tukiprosesseja on valjastettu ICT:n käyttöön opetuksessa Suomessa ja Japanissa, 3) kuinka ICT:tä käytetään Suomen ja Japanin opetuksessa käytännössä, ja 4) minkälaisia haasteita ICT:n käytössä opetuksessa voi olla Suomessa ja Japanissa. Tämä laadullinen vertaileva tutkimus kohdistuu Suomessa Keski-Suomen alueeseen ja Japanissa Kanazawan kaupunkiin Ishikawan prefektuurissa. Tulokset osoittivat monia yhtäläisyyksiä osallistujien näkemyksissä ja kokemuksissa, kuten ICT:n kokemisen ensisijaisesti työkaluna, ja käytännönläheisen täydennyskoulutuksen arvostuksen. Eroavaisuuksiin kuuluivat mm. se, että suomalaiset luokanopettajat kokivat ICT-laitteistonsa olevan riittävää, kun taas japanilaiset luokanopettajat eivät. ICT:n käyttötapauksiin kuului molemmissa maissa toimisto-ohjelmien käyttö, mutta molemmissa maissa oli myös omat sovelluksensa käytössä.

Avainsanat: ICT, TVT, koulutus, peruskoulu, Suomi, Japani

Glossary

ICT	Information and communication technology
MEXT	Japan's Ministry of Education, Culture, Sports, Science and Technology
OPH	Opetushallitus, Finnish National Agency for Education (formerly known as Finnish National Board of Education)

List of Figures

Figure 1. How Finnish and Japanese teachers described ICT in education. Center represents both countries.....	52
Figure 2. Features of teacher training and supplementary training in Finland and Japan. Center represents both countries.....	62
Figure 3. Interviewees' statements about the ICT equipment and ICT support in their schools. Center represents both countries.....	69
Figure 4. How interviewees described their use of ICT in practice in Finland and Japan. Center represents both countries.....	75
Figure 5. Summary of answers to research questions (1-4) from the interviews. Center represents both countries.	82

Contents

1	INTRODUCTION.....	1
2	THEORETICAL BACKGROUND	3
2.1	Definition of ICT	3
2.2	National education system	4
2.3	Theories of learning and previous studies	5
2.3.1	Definition of learning	6
2.3.2	Behaviorism.....	6
2.3.3	Information processing theory.....	8
2.3.4	Constructivism and social constructivism.....	8
2.3.5	Collaborative learning/cooperative learning	9
2.4	Previous studies	11
3	NATIONAL PRIMARY EDUCATION SYSTEMS OF FINLAND AND JAPAN .	14
3.1	Finland	14
3.1.1	Finnish primary education and curriculum.....	14
3.1.2	ICT in Finnish primary education curriculum.....	17
3.1.3	Teacher training in Finland	19
3.1.4	ICT in teacher training in Finland	20
3.1.5	Supplementary training of teachers in Finland.....	22
3.1.6	ICT in the supplementary training of teachers in Finland.....	23
3.2	Japan	25
3.2.1	Primary education and curriculum in Japan	25
3.2.2	ICT in primary education curriculum in Japan.....	28
3.2.3	Teacher training in Japan.....	29
3.2.4	Supplementary training of teachers in Japan.....	29
3.2.5	Mentoring and other typically Japanese working methods	30
3.3	The key characteristics of the Finnish education system with a brief comparison with the Japanese system	32
3.4	Summary of the national primary education systems of Finland and Japan.....	33
4	THE RESEARCH METHOD	34
4.1	Research method.....	34
4.2	Data collection method	35
4.3	Selection of participants.....	36
4.4	The interview procedure	37
4.5	Data analysis	39
4.6	Reliability and validity.....	41
5	HOW THE INTERVIEWEES VIEW ICT AND THE CURRICULUM	42
5.1	Finland	42
5.1.1	Teachers and teacher trainers' views on ICT	42
5.1.2	Teachers and teacher trainers' views on curriculum	45

5.1.3	Finnish exchange students' views on ICT and curriculum	46
5.2	Japan	47
5.2.1	Teachers and teacher trainers' views on ICT	47
5.2.2	Teachers and teacher trainers' views on the curriculum	49
5.2.3	Japanese exchange students' view on ICT and curriculum	50
5.3	Similarities and differences in the views on ICT.....	51
6	THE INTERVIEWEES' VIEWS ON TEACHER TRAINING AND SUPPLEMENTARY TRAINING	53
6.1	Finland	53
6.1.1	Teachers and teacher trainers' views on ICT in teacher training	53
6.1.2	Teachers and teacher trainers' views on ICT in supplementary training of teachers	54
6.1.3	Finnish exchange students' views on ICT in studies.....	57
6.2	Japan	57
6.2.1	Teachers and teacher trainers' views on ICT in teacher training in and supplementary training.....	57
6.2.2	Japanese exchange students' views on ICT training.....	59
6.3	Similarities and differences in teacher training and supplementary training....	60
7	DEVICES AND SUPPORTING PROCESSES FOR ICT IN PRIMARY EDUCATION	63
7.1	Finland	63
7.1.1	Teachers and teacher trainers' views on devices.....	63
7.1.2	Teachers and teacher trainers' views on ICT tutors and pedagogical support.....	64
7.1.3	Teachers and teacher trainers' views on technical support	65
7.2	Japan	66
7.2.1	Teachers and teacher trainers' views on devices.....	66
7.2.2	Teachers and teacher trainers' views on ICT tutors and pedagogical support.....	67
7.2.3	Teachers and teacher trainers' views on technical support	68
7.3	Similarities and differences in supporting processes	68
8	USE OF ICT IN PRIMARY EDUCATION IN PRACTICE.....	70
8.1	Use cases of ICT in Finland.....	70
8.2	The use of ICT in Japan	72
8.2.1	Use cases of ICT.....	72
8.2.2	Robotics and programming in education.....	73
8.3	Similarities and differences in the use of ICT	74
9	CONCLUSION	76
9.1	Answers to research questions	76
9.1.1	How do the teachers of the two countries perceive ICT and its use in education?	76

9.1.2	What kind of supporting processes have been set up to support the use of ICT in education in Finland and Japan?	77
9.1.3	How is ICT used in education in Finland and Japan in practice?	79
9.1.4	What kind of challenges can there be in the use of ICT in education in Finland and Japan?.....	80
9.2	Best practices and other good findings	82
9.3	Reflection	84
9.4	Reliability and validity of the research	86
9.5	Limitations of the research and suggestions for future research.....	89
REFERENCES		92
INTERVIEWS		101
APPENDICES		103
A	Finnish interviewees	103
B	Japanese interviewees	103
C	Interview questions for teachers (English)	104
D	Interview questions for teacher trainers (English)	106
E	Interview questions for exchange students (English)	108
F	Interview questions for teachers (Finnish).....	110
G	Interview questions for teacher trainers (Finnish)	112
H	Interview questions for exchange students (Finnish).....	113

1 Introduction

Because they're not going to survive in work life without technology.

There will not be a job anywhere anymore where you can really manage without using any technology at all.

(Interviewee Anna, about the future work life of today's children)

The web - and in a wider sense - the entire media culture is already part of our everyday lives and the world of our children, pupils and students. Traditionally the purpose of schools has been to coach and socialize pupils for the surrounding society and the world. Media skills are also important to possess, and one of the tasks of the teachers is to support their pupils and students in learning these skills. (Tella, Vahtivuori, Vuorento, Wager & Oksanen 2001, 38–39.) Since ICT is integrated into our lives today, it can not be ignored in schools, where pupils learn skills to be part of today's - and tomorrow's - society.

Finland and Japan have both been scoring well above average in the PISA studies, scoring remarkably close scores in science in the most recent study (Schleicher 2018, 6–9), and both countries utilize technology in different aspects of the society - yet the countries also have major cultural differences and are geographically positioned far apart from each other. The similarities and differences made the two countries interesting subjects for comparison.

The amount of ICT in the Finnish curriculum for primary education was greatly increased in the current curriculum of 2014, compared to that of the previous curriculum of 2004. The current curriculum integrates ICT especially into mathematics, but also into all other subjects. For example, in the curriculum of grades 3–6, it is stated that "ICT is utilized diversely in various subjects and other schoolwork, reinforcing collaborative learning" (Finnish National Board of Education 2016a, 261).

At the same time, Japan also aims to increasingly develop the ICT skills of its students. The Ministry of Education, Culture, Sports, Science and Technology (hereinafter MEXT) established a conference in 2010 in order to settle on the ideal form of 21st century learning to make the most of ICT, and to establish visions for ICT in education. The government's

Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society prioritized making school education suitable for the 21st century. The aim was to fully utilize ICT, so that classes become more interactive and easier to understand through teaching and learning among students themselves. Other aims included reducing the burdens of teachers and staff, as well as enhancing the children's information literacy. (MEXT 2011, 2.) These aims are implemented in practice for example in the new curriculum for primary schools, to be fully implemented in 2020, that includes compulsory programming education (Kanemune, Shirai & Tani 2017, 145).

That said, what have the two countries done in order to ensure the successful integration of ICT into primary school education? Since both countries are at a turning point in the use of ICT in education, it was a good time to gather information on the views and experiences of primary school teachers in the use of ICT. The aim of this thesis is to assemble a comprehensive picture of how Finland and Japan have planned the use of ICT in primary education, supported the implementation process and implemented their plans in practice. The focus is on the primary school teachers of the age group 6–12, and especially on the training that the teachers and teachers in training receive or have received in the use of ICT and how the teachers have implemented the use of ICT in practice. The focus of this thesis has been narrowed to concern the teachers and teacher trainers in public schools located in Central Finland, Finland, and Kanazawa, Ishikawa in Japan.

The research questions consist of the following:

- 1) How do the teachers of the two countries perceive ICT and its use in education?
- 2) What kind of supporting processes have been set up to support the use of ICT in education in Finland and Japan?
- 3) How is ICT used in education in Finland and Japan in practice?
- 4) What kind of challenges can there be in the use of ICT in education in Finland and Japan?

2 Theoretical background

In this chapter we will cover some of the theories related to this research. We will first focus on the definition of ICT, which is at the center of this research. We will then define a national education system, which is essential when the topic is so closely related to the education systems of the two countries. Finally, we will conclude the chapter by covering theories of learning, which form the basis for education in general.

2.1 Definition of ICT

The acronym ICT stands for Information and communication technology, but what exactly does that entail? The definitions are varied, but they are widely centered around the processing and relaying of information via different technologies.

Based on the definition of Cambridge dictionary, ICT means "the use of computers and other electronic equipment and systems to collect, store, use, and send data electronically" (Cambridge dictionary). According to UNESCO (2002, 12), informatics is "the science dealing with the design, realization, evaluation, use, and maintenance of information processing systems, including hardware, software, organizational and human aspects, and the industrial, commercial, governmental and political implications of these". Informatics technology, on the other hand, is "the technological applications (artifacts) of informatics in society" (UNESCO 2002, 13). ICT is, then, the combination of informatics technology with other related technologies, specifically communication technology.

ICT can, however, also be considered as more than a mere instrument, as it can include many roles and purposes. In an educational context, ICT can be seen to mean "a school subject in which students learn to use computers and other electronic equipment to store and send information" (Cambridge Dictionary). Aside from the viewpoint of tools, the functions of technology and media can be seen as intelligent partners, new kinds of context for work, study and communication among others, as well as empowering mediators - at its best, ICT can develop a person's operating environments and enable their own professional and social development (Tella, Vahtivuori, Vuorento, Wager & Oksanen 2001, 25–27). In other words,

ICT is a complex term that can include both the diverse technology and tools, as well as their various use cases.

Learning to use ICT effectively has its own challenges. Different ICT tools and applications are used in different ways. For example, video meetings require precise planning and timing, whereas group work software usually requires understanding of information management, publishing functionalities and discussion forum. (Tella, Vahtivuori, Vuorento, Wager & Oksanen 2001, 27–28.) That is why the user has to practice and build up experience with the use cases of a variety of different tools in order to develop diverse skills with a diverse set of tools.

In addition, people's previous experiences shape the adoption of new things. A new messenger, application or communication situation is usually structured in the mind of the user on top of the usage experience of previous applications. That is why new tools often suffer from being used in the same way as software or tools that are previously known to the user. (Tella, Vahtivuori, Vuorento, Wager & Oksanen 2001, 28.)

The required skills change as the development of hardware and software move onwards, and technology-specific resources become outdated. However, the pedagogic thinking that is needed to use both hardware and software does not change as quickly. (Beauchamp 2017, 7.) Perhaps this could also be the core strategy in the adoption of ICT in school environments.

2.2 National education system

The basic definition for an education system is sometimes easily forgotten, even in works where the comparison of systems is in a central role. In addition, the comparison of education systems between two countries often lends itself to another pitfall that might go unnoticed - countries usually have more than one education system, co-existing within national boundaries. For example, the United States has state-specific systems of education, and many countries (for example Belgium, Canada and Vanuatu) have different systems operating in different languages, or schools run by for example religious bodies such as the Roman Catholic Church (Bray et al 2014, 140–141). Our focus in this thesis lies solely in the national education system.

Although the term national education system is a common one, it is surprisingly difficult to define. The difficulty lies primarily in the "absence of a single criterion by which the existence of a national system may be tested" (Kandel 1933, 83). After all, the education of each nation has generally developed without a plan and without an idea of a system (Kandel 1933, 85). Kandel (1933, 83-85) goes over possible definitions ranging from the administrative point of view to the common national ideal, pointing out the issues with each given definition, before finally settling on one that is based on the concept of equal opportunity. According to Kandel (1933, 85), a national education system "may be defined as one in which free and equal opportunities are afforded to all according to their abilities in which education is actuated by certain common purposes".

Another, more recent definition is given by Archer (1979, 54), who defines a national education system as "a nationwide and differentiated collection of institutions devoted to formal education, whose overall control and supervision is at least partly governmental, and whose component parts and processes are related to one another". Archer's analysis was based on Denmark, England, France, Japan and Russia. The definition is viable for the two countries of comparison in this thesis, since Finland is a European country comparable to others included in the research, and Japan was considered directly. In this thesis we will be focusing on the national education systems of Finland and Japan according to this definition, and more specifically, narrow the field of research down to public schools operating in the national languages in both countries.

2.3 Theories of learning and previous studies

In Finland, teacher education is research-based. What this means is that educational theories, research methodologies and teaching practice are all included in teacher education. Finnish teacher trainees need to be able to carry out original research as well as carry out theoretical and methodological studies in a systematic manner during their studies. Research-based teacher education has direct consequences in teaching. (Sahlberg 2015, 116–118.) Sahlberg (2015, 131) summarizes this situation by saying that "Research findings establish the professional basis for teachers to teach and work effectively within a complex society." Wilson and Peterson (2006, 4) acknowledge that theories of learning influence teaching, and

emphasize the teachers' role as "They interpret, adapt and combine those theories as they use them in practice".

2.3.1 Definition of learning

Before turning into theories of learning, we will have a look at the definition of learning. The Merriam-Webster dictionary gives the word "learning" three definitions: first of all, "the act of experience of the one that learns", secondly "knowledge or skill acquired by instruction or study" and thirdly, "modification of a behavioral tendency by experience (such as exposure to conditioning)" (Merriam-Webster). Marton et al. (1993, 277) have studied the general conceptions of learning of open university students in the UK and have found out that people look at learning from six perspectives. These are learning to increase one's knowledge, learning as memorizing and reproducing, learning as applying, learning as understanding, learning as seeing something in a different way and learning as changing as a person (Marton et al. 1993, 283-284). However, the dictionary definition of learning or the intuitive individual views about learning do not include the possible various interpretations of this concept, and that is why it is important to look at learning from the point of view of learning theories.

2.3.2 Behaviorism

One of the most influential theories of learning is behaviorism. The basic idea of behaviorism is "to explain human and animal behavior in terms of external physical stimuli, responses, learning histories, and (for certain types of behavior) reinforcements." (Graham 2019). Graham (2019) considers John Watson (1878-1958), Ivan Pavlov (1849-1936) and B.F. Skinner (1904-1990) as some of the most influential names in behaviorism. The main concepts of behaviorism are related to the idea of reinforcement: the chain of stimuli - response - reinforcement is considered crucial in the process. (Graham 2019.) In science, behaviorism was popular in the 1930s and in the 1940s (Kauppila 2007, 18).

The starting point of behaviorism is John Locke's concept of learner as tabula rasa, a clean slate, on which experiences form knowledge (Tynjälä 1999, 29). Looked from the

behaviorist point of view, learning consists of phenomena, which is something that can be observed, measured, documented and included in statistics. Since behaviour is something that can be observed, at the core of the concept stands a reaction to an action that can be observed (stimuli). Skinner's views have influenced learning the most: his understanding was that a student will repeat a reaction that results in a positive response and starts to avoid the kind of action that results in a negative response. The behavioristic idea of learning is based on the idea that both animals and human beings learn the same way. In the beginning, the organism itself was not included in the chain of reaction, but later on Skinner accepted that an organism can also be a part of the chain. The behavioristic theory of learning means that it is the teacher's task to present the learning items according to the plan in sections that the student can see as suitable positive stimuli that lead to reactions that the teachers have been wishing for. Learning is being measured and if the student is doing well, he/she will be rewarded, whereas if he/she is not learning, it may lead to punishment. The behavioristic views on learning can still be seen today in teaching in e.g. giving positive feedback on correct answers, returning diagnostic tests quickly, and partitioning the teaching materials. (Kauppila 2007, 18–21.) Tynjälä (1999, 30) summarizes the pedagogical learning process from the behavioristic point of view as follows: first, you set the behavioral goals, then divide up the learning material into learning components, define the suitable way to reinforce the behavior, carry out teaching (step by step) and evaluate the results.

However, behaviorism has been criticized for not paying attention to social processes in learning, students' thinking, students' emotional states, students' different purposes or the students' inner goals. The main problem of behaviorism regarding learning is the amount of intellectual responsibility that lies on the teacher and not the student. In this respect, the emphasis of learning is not in understanding, and learning by itself is not considered as a reward. The critics did not believe that behaviorism would be able to explain the cognitive processes involved in learning and also it was felt that self-directed learning could play a part in the learning process. (Kauppila 2007, 22–24.) Particularly problematic was the question about children's language learning which led to Skinner's inability to explain the process adequately in the eyes of Chomsky, who heavily criticized his view in 1959 (Phillips 2012, 23). The focus in learning moved away from learning as a solitary process and the

importance of the social environment in learning was becoming better understood. (Kaupila 2007, 24.)

2.3.3 Information processing theory

In the 1950s human information processing theory developed as an alternative to behaviorism. At the core of the information processing approach are the similarities of functions between human beings and computers: “the human can be characterized as an information-processing system, which encodes input, operates on that information, stores and retrieves it from memory, and produces output in terms of actions.” (Proctor & Vu 2012, 85).

According to Tynjälä (1999, 34), in this theory, learning is seen as a memory function but she points out that even so, the role of the learner is more active than in behaviorism because in the information processing theory, the learner is expected not just to react to various stimuli but also to actively process the information. The pedagogical applications related to the information processing theory have to do with improving the long term memory such as dividing up the information into suitable units and revision. Also, it has been considered important that the teaching materials have been arranged in a way that supports the learning process. (Tynjälä 1999, 34–36.)

2.3.4 Constructivism and social constructivism

According to Tynjälä (1999, 72), at the core of constructivism is the view that learning is based on previous learning. Gogus (2012, 42) sees constructivism as something that “specifies the theory about the nature of reality and the theory of knowledge (epistemology) founded on the basis that humans generate knowledge and meaning from their experiences, mental structures, and beliefs that are used to interpret objects and events.” Gogus (2012, 42) continues to explain that in constructivist learning, learning “happens when learners construct meaning by interpreting information in the context of their own experiences.” As we can see, this approach holds almost the opposite point of view compared to behaviorism.

Constructivist learning can be looked at from two different points of view: cognitive constructivism and social constructivism. Cognitive constructivism is based on Piaget’s theory

of cognitive development, which dates back to 1973 and which includes the child's development through major stages depending on the child's age. Schemas and mental models help the child to develop. The most important concept of this model is discovery, and it explains how children learn during these different stages. The cornerstone of social constructivism is Vygotsky's concept of the zone of proximal development which was developed in 1978. The zone of proximal development relates to children's ability to learn concepts with the help of their teachers or peers even in a situation where they would not be able to learn these by themselves. (Gogus 2012, 42.) Tynjälä (1999, 48) illustrates the concept of the zone of proximal development by comparing it to a child who is learning to walk and in the beginning can only walk assisted until little by little he/she becomes able to walk by himself/herself.

How does constructivism manifest itself in the classroom, then? According to Brooks & Brooks (1999, in Gogus 2012, 42), some of the key characteristics visible in a constructivist classroom are encouraging and accepting student initiative, encouraging students' critical thinking, inquiring students' understanding of concepts before explaining them, encouraging dialogue in the classroom, seeking elaboration after students' initial answers and providing students with time to construct relationships between issues discussed. Tynjälä (1999, 61–67) looks at the meaning of constructivism in pedagogical thinking from a wider context and summarizes the major pedagogical influences of constructivism as follows: the importance of students being active, students' previous knowledge as a source of new learning, the development of metacognitive skills, considering understanding of greater importance than learning by heart, taking into account various interpretations of the learning content, moving away from facts as such towards problem solving, taking the learning context into account, developing different kinds of representations of information, emphasizing social interaction, developing new evaluation methods, showing students that knowledge can be seen as a relative concept and last but not least, developing the curriculum.

2.3.5 Collaborative learning/cooperative learning

Collaborative learning and cooperative learning are used to refer to the same kind of phenomenon, i.e. learning that takes place in small groups or pairs to collaboratively reach their

learning outcomes (Udvari-Solner 2012, 33). Collaborative learning is based on constructivist theories, social learning theories as well as the pedagogy of social justice. In addition to Vygotsky's theory of social constructivism, collaborative learning relies on Bandura's social learning theory dating back to 1977. The key point in this theory is that individuals can develop their behavioral and intellectual repertoires by observing what it is that others do, and that observation gives them an understanding of how the new things being learned will work in practice. The third influential name in developing collaborative learning was Paulo Freire, who in 1970 introduced the discourse of social justice in order to bring changes in the learning process. His key ideas for the education process included student-centeredness, relevance, multiculturalism, democracy and dynamic teaching. From the point of view of collaborative learning, students become agents in their own learning at the same time as taking part in a dialogue and finding ways to solve problems, supported by their teacher. (Udvari-Solner 2012, 22.)

The authority and the responsibility in terms of learning is shared within the members of the group. In practice, "Opportunities to organize, clarify, elaborate, or practice information are engineered, and listening, disagreeing, and expressing ideas are as important as the "right answers.'" (Udvari-Solner 2012, 33). Effectively, in this type of teaching students are no longer passive recipients, but they become active participants in learning instead. Collaborative learning can be organized in the form of formal learning groups, informal learning groups and study teams. (Udvari-Solner 2012, 33.) When these three groups are in operation, there are five central elements that are important to include in learning: positive dependency from each other, face-to-face supportive interaction, individual responsibility, social skills and the processing of the group (Johnson & Johnson 2002, 108–110).

Group investigation is one of the teaching methods included in collaborative learning. It has four different characteristics. The first one is the research. The pupils are presented with a problem and they need to find an answer by working together. The second characteristic is interaction: keeping in contact with other pupils, speaking, helping one another and support from small groups are considered as part of the process. The third characteristic is interpretation. Given that the information pupils are gathering comes from different kinds of sources, they need to come together to combine their information and create a joint interpretation of

the information. The fourth necessary characteristic is internal motivation. In this type of learning pupils have a chance to make individual and joint decisions when it comes to choices that they are going to make in terms of their research. (Sharan & Sharan 2002, 156–159.)

2.4 Previous studies

In this chapter, we will take a look at some of the previous studies concerning the comparison of the education of Finland and Japan, especially primary education, as well as the role of ICT in education in either of the countries.

OECD, the Organisation for Economic Co-operation and Development, carries out quantitative international comparative research in education regularly in many forms. These reports include Finland and Japan, as they are also OECD member countries. The most notable OECD publication is PISA, the OECD's Programme for International Student Assessment, which "assesses students' knowledge and skills in reading, mathematics and science" (Schleicher 2018, 4). As mentioned in chapter 1, Finland and Japan have both been scoring well above average in PISA, and their scores in science are very close to each other in the newest study (Schleicher 2018, 6–9). Some other publications include Education at a Glance (OECD 2019), which "provides data on the structure, finances and performance of education systems across OECD countries and a number of partner economies", and TALIS - The OECD Teaching and Learning International Survey (OECD 2018), which "asks teachers and school leaders about working conditions and learning environments at their schools to help countries face diverse challenges". In the most recent Education at a Glance, the significance of ICT comes to view, as qualifications in ICT and the capability for using ICT for problem solving resulted in excellent employment prospects (OECD 2019, 65). Still, on average, only 4% of tertiary-educated adults hold a qualification in this field - the average being slightly higher in Finland at 6% (OECD 2019, 44). On the other hand, according to TALIS 2018 country comparison, 28% of Japanese teachers feel prepared to use ICT for teaching, whereas the percentage of Finnish teachers comes up to only 21.5% (OECD 2018). It also comes up that Japanese teachers had the longest working hours out of all the OECD

countries, much of the work time being hogged by administrative work and extracurricular activities (OECD 2018).

A notable research in comparing ICT in primary school in Finland and Japan is Comparative study of information education in Japan and media education in Finland in elementary schools by Ohashi et al (2014). This study compares the Finnish and the Japanese primary school curricula in terms of information education (Japan) and media education (Finland), finding many similarities such as both being taught in cross-curricular settings, and that in objectives, pupil-centered learning activities are emphasized (Ohashi et al. 2014, 107).

In addition, Bruce Lander (2019, 25) has compared the Finnish and the Japanese primary school situation in his recent follow-up study “Technology in education: What can we learn from Finland”. He has visited e.g. the University of Jyväskylä Teacher training school in Finland. Based on the teachers’ interview and classroom observation during the visit in the primary school he noticed differences in the classroom layout, which in Japan was traditional but in Finland not. He also noticed a difference in the amount of technical equipment in Finnish classrooms in comparison to Japanese classrooms, especially in the use of iPads in the class in which the pupils appeared quite skilled. Based on his interview with the teachers, he concluded that pupils start to acquire digital literacy at a younger age in Finland than in Japan. In his view, Finnish pupils are also exposed to more English than Japanese pupils through technology and various media. He also noted that digital material seemed to be readily available to students in the form of digital textbooks. (Lander 2019, 34–41.)

Another notable mention is Pedagogy and ICT Use in Schools around the World published in 2008, which reports findings from the International Association for the Evaluation of Educational Achievement (IEA) SITES 2006 study that surveyed "the kinds of ICT-related pedagogical practices adopted by the participating countries and how these countries were using ICT" (Pelgrum & Law 2008, 9). In this study, when asked if there are ICT-specific requirements for being certified as a teacher, the response from Finland was none, whereas Japan reported ICT-based pedagogy (Anderson & Plomp 2008, 47). On the subject of hardware and software provision, both countries reported that the government funds internet connectivity. In addition, Finland reported that hardware and software funding was an integral

part of the school budget, whereas Japan reported that matching or partial funding was provided by a government unit. (Anderson & Plomp 2008, 52–54.) The ICT in education comparison was the newest we could find that included both Finland and Japan, but since the survey data is 14 years old at the time of writing, the results might no longer reflect the current situation. More recent research of ICT in primary schools in Finland, and especially Keski-Suomi region, includes research conducted by Kenttälä et al (2017). According to the study, just like in SITES 2006 where Finland had computers connected to the internet in all schools, also in 2016 all schools in Keski-Suomi had computers connected to the internet. The amount of computers had increased from 2010 to 2016, with each school having an average of 55 computers. (Kenttälä et al 2017, 9) According to the research, 57% of the teachers in Keski-Suomi used ICT with their pupils at least once a week (Kenttälä et al 2017, 32).

Finnish teachers' and Japanese teachers' views and perceptions on different issues in education have received increased interest recently. Akie Yada (2020) has researched the self-efficacy of Japanese and Finnish teachers regarding inclusion and Sarja et al. (2017) have researched the views of foreign language teachers in Finland and Japan. Pirskanen et al. (2019) have done multicultural research on teachers' perceptions of children's socio-emotional behavior during the transition period from preschool to primary school, including Finland and Japan. Finnish and Japanese teacher educators' views on their professional learning has been studied by Green (2019) and Finnish and Japanese student teachers' views on global perspectives have been studied by Uematsu-Ervasti (2019). Earlier studies include Reiniäinen and Isoaki's (2007) comparison of explanatory variables of high school pupils' science achievement in Finland in Japan.

3 National primary education systems of Finland and Japan

In this chapter, theoretical background is continued by providing descriptions of the current national education systems in Finland and Japan. The aim is not to go over the education systems of both countries in detail, but to provide sufficient context for the purposes of this thesis. At the end of the chapter, we will highlight certain characteristics of the Finnish education system and offer a brief comparison from a Japanese point of view.

3.1 Finland

In this chapter, we will go over the main points of the national education system of Finland. We will start by briefly going over the basics of the Finnish education and curriculum, including what age the education begins, and which subjects are taught. We will then focus on the role of ICT in the Finnish curriculum. Next we will move onwards to teacher training and supplementary training, each first presented from a general point of view, and then in the context of ICT.

3.1.1 Finnish primary education and curriculum

The Finnish compulsory education starts with one year of pre-primary education, beginning in the year when the child turns six. Children begin basic education when they are seven years old. (Finnish National Agency for Education 2018, 1.) Basic education includes grades 1–9, 1–6 being taught by the same classroom teacher in most subjects and 7–9 by separate subject teachers (Finnish National Agency for Education 2018, 1). Education must be organized for all 6–16 year-olds by the municipality (Finnish National Agency for Education).

As stated by the Finnish National Agency for Education, "all schools follow a national core curriculum, which includes the objectives and core contents of different subjects". In addition, municipalities as well as schools make their own local versions of the curriculum based on the national core curriculum. (Finnish National Agency for Education.) Municipalities in general have considerable autonomy, being able to decide about the arrangement of

schooling in their area and how to make use of their funding (Finnish National Agency for Education 2018, 1).

In grades 1 and 2 the pupils take eight separate subjects - mother tongue and literature (the official languages Finnish or Swedish, or language minorities Sámi or Roma; another language may also be used, if chosen by the guardian and offered by the education provider), mathematics, environmental studies, religion or ethics, music, visual arts, crafts and physical education. (Finnish National Agency for Education 2018, 1; Finnish National Board of Education 2016a, 177–254.) In addition, according to new changes to the curriculum published in 2019, the first foreign language or the second national language in the A syllabus is also introduced in the first grade starting from January 2020 at the latest (Opetushallitus 2019 b, 3–30). From 3rd grade to 6th grade the compulsory subjects increase to include the other national language (Swedish or Finnish), one other foreign language (most commonly English) and history (Finnish National Board of Education 2016a, 264–473). 7th grade onwards the subject environmental studies is replaced by biology, geography, physics, chemistry and health education (Finnish National Board of Education 2016a, 475). The list of compulsory subjects increases to also include social studies, home economics and optional studies (Finnish National Board of Education 2016a, 474–765). The purpose of optional studies in basic education is to "deepen learning, expand the scope of the studies and strengthen the pupils' capabilities for further studies". They are also meant to give the pupils a chance to develop their skills based on their interests. (Finnish National Board of Education 2016a, 161.)

The key areas in the current national curriculum of Finland are the active involvement of pupils, meaningfulness, joy of learning and interaction. In addition to developing school culture, the goal of the curriculum is “to promote instruction with an integrative approach.” Effectively, this includes the following goals: first of all, gaining an understanding about “the relationship and interdependencies between different learning contents”, secondly, to “be able to combine the knowledge and skills provided by different subjects to form meaningful wholes” and thirdly, to “be able to adopt and use these in collaborative learning”. In an important role in reaching these goals are multidisciplinary learning modules, which are used to integrate learning as well as interaction between various subjects. (Finnish National Board of Education 2016b)

The national curriculum also defines transversal competences. Transversal competence is defined as "an entity consisting of knowledge, skills, values, attitudes and will" (Finnish National Board of Education 2016a, 33). Competence is also defined as "an ability to apply knowledge and skills in a given situation" (Finnish National Board of Education 2016a, 33). The curriculum states that the pupils' adopted values and attitudes, alongside their willingness to take action, affect how they will use their skills and knowledge in a given situation. Changes in the surrounding world mean that transversal competences become even more necessary. Thus, each subject is supposed to build the pupil's competence through its own subject matter. (Finnish National Board of Education 2016a, 33.)

The transversal competences of the national curriculum, identified with letter T and numbered from 1 to 7, are as follows: "Thinking and learning to learn (T1)" (Finnish National Board of Education 2016a, 33), "Cultural competence, interaction and self-expression (T2)" (Finnish National Board of Education 2016a, 34), "Taking care of oneself and managing daily life (T3)" (Finnish National Board of Education 2016a, 35), "Multiliteracy (T4)" (Finnish National Board of Education 2016a, 36), "ICT competence (T5)" (Finnish National Board of Education 2016a, 37), "Working life competence and entrepreneurship (T6)" (Finnish National Board of Education 2016a, 38), "Participation, involvement and building a sustainable future (T7)" (Finnish National Board of Education 2016a, 39).

As an example of collaborative learning, Seitamaa-Hakkarainen et al. (2010) researched how knowledge-practice based approach to technology-enhanced learning worked amongst Finnish 4th and 5th graders. The pupil project took 13 months in total and the theme of the project was the "Past, Present and Future of the Artefact". In this project, many school subjects were integrated and the students' task was to work with artefacts and analyse them from the point of view of the cultural context, explore physical phenomena and design artefacts for future. The pupils were asked to create their own ideas for studying artefacts and design activities and trips in collaboration with the teacher. The project can be considered successful in that genuine knowledge-creating materialized during the time of the project. In the beginning the pupils needed a lot of guidance and coaching from the teacher but towards the end this decreased. The outcome was that pursuing both material and conceptual artefacts

provided pupils with important educational experiences. (Seitamaa-Hakkarainen et al. 2010, 109, 114–115, 130–132.)

As an example of how phenomenon-based learning is seen from a teacher's point of view, we have chosen the teacher's instructions for the primary school Ethics course from the pages of Finnish National Agency for Education. There the starting point is phenomena in the real world, which is being explored via the method of progressive inquiry, and learning is based on problem-solving. The point in learning is that it is changing and not just increasing information. In this sense they claim that knowledge cannot be transferred, it should be built. The task given on the page consists of exploring a concept and its meaning, and the book in use gives a six-phase model for the pupils' research process. (Finnish National Agency for Education, 2020.)

3.1.2 ICT in Finnish primary education curriculum

In the newest national primary education curriculum, which was fully adopted in all schools on August 1st 2016, ICT is not defined as an independent subject. However, Finnish National Agency of Education states in their summary of the curriculum that cooperation between subjects in ICT is encouraged, the pupils' possibilities for developing their ICT skills have been improved as part of all subjects and the use of ICT as a way of work improves the pupil's possibilities to develop their work methods and learn skills that are necessary in the future. (Opetushallitus 2019a.)

As explained in chapter 3.1.1, skills and knowledge outside of subject matter are described in the transversal competence section of the national curriculum. ICT guidelines are mainly described within transversal competence T5, ICT competence. ICT competence is stated to be an important civic skill, and both an object as well as a tool of learning. It is to be utilized methodically "in all grades of basic education, in different subjects and multidisciplinary learning modules, and in other school work" (Finnish National Board of Education 2016a, 37).

As outlined in T5 ICT Competence, "the pupils develop their ICT competence in four main areas" (Finnish National Board of Education 2016a, 37). The four areas have been cited here in full, as their significance in the use of ICT in education in Finland is extremely important.

1) They are guided in understanding the principle of using ICT and its operation principles and key concepts, and supported to develop their practical ICT competence in producing their own work. 2) The pupils are guided in using ICT responsibly, safely and ergonomically. 3) The pupils are guided in using information and communication technology in information management and in exploratory and creative work. 4) The pupils gather experience of and practise using ICT in interaction and networking.

(Finnish National Board of Education 2016a, 37)

During their studies, the pupils familiarize themselves with different ICT applications and learn to observe the significance of these applications in their daily life, interpersonal interaction and as a way of influencing. The studies include consideration as to why ICT is needed in studying, work and society, and the impact of ICT from the perspective of sustainable development and responsible consumption is also to be assessed. Pupils also learn to use ICT in international communication, and learn to perceive its significance, potential and risks in a global world. (Finnish National Board of Education 2016a, 37–38.)

In grades 1-2, T5 ICT Competence includes practicing basic ICT skills and learning to use them in studying, with an emphasis on play-based working methods. The pupils learn how to use different devices, software and services, including using a keyboard and basic text processing skills. Digital media, age-appropriate programming tasks and gamification are also mentioned. Also safe ways of using ICT, including etiquette and good working posture, are emphasized. Using search engines, trying out different tools, working on small information-gathering assignments and utilizing interactive ICT such as social networking services are all mentioned as ways to use ICT in the classroom. (Finnish National Board of Education 2016a, 174.)

In grades 3–6, T5 ICT Competence defines that ICT is supposed to be utilized diversely in different subjects, and the pupils receive plenty of opportunities to use working practices

and tools that are best suited for them personally; independence and cooperation are emphasized. The pupils learn how to use different devices, software and services, and at this point, also learn to understand how they work. The use of ICT in these grades includes processing various formats, such as text, image, video, and animation, using communication systems and educational social media services, and programming. During the use of ICT, pupils are prompted to pay attention to good working posture and suitable working periods, good manners and basic copyright principles, and to evaluate information critically. Pupils are also encouraged to use ICT in interaction outside the school, including international context. (Finnish National Board of Education 2016a, 261.)

Aside from T5 ICT Competence, ICT is also directly mentioned under some subjects. For example, in the mathematics key content C1 Thinking skills for grades 3–6 pupils "plan and execute programs in graphic programming environments" (Finnish National Board of Education 2016a, 400). Another example is the crafts key content C3 for grades 3–6, which mentions programming, robotics and automation (Finnish National Board of Education 2016a, 461).

3.1.3 Teacher training in Finland

Higher education institutions make their own decisions concerning student admissions, admission criteria as well as the contents of teacher education. Universities generally hold entrance exams, where the applicants get assessed in aspects such as "academic studying skills and aptitude for the profession" (Ministry of Education and Culture 2016). The objectives of teacher education include providing skills and knowledge to support the learning of different students and encouraging the development of one's field of teaching based on the developments in the surrounding world. (Ministry of Education and Culture 2016.)

Teacher education includes pedagogical studies as well as guided teaching practice. The guided practice is generally carried out in the schools of the universities and consists of giving lessons and familiarizing oneself with the everyday tasks and responsibilities of the school environment, as well as guidance and discussions. The goal is that using the skills learned in teacher education, the graduated teachers can solve problems independently,

utilise the most recent research in the fields of education, develop themselves professionally, and cooperate with their work community. (Ministry of Education and Culture 2016.)

The system for measuring studies in higher education in Europe is ECTS, European Credit Transfer and Accumulation System (European Union 2015, 6). One full-time academic year or its equivalent equals 60 ECTS credits (European Union 2015, 10). This is also the case in Finland, where a full-time academic year, which requires approximately 1600 hours of work, equals 60 credits according to the decree of university degrees (794/2004). This results in approximately 27 hours of work per credit.

As stated by the Decree on Teacher Qualifications in the Finnish law (14.12.1998/986), a classroom teacher is required to have one of the three following qualifications:

- 1) Master's Degree in Education, consisting of a minimum of 60 credits' worth of studies in subjects taught in primary school, and a minimum of 60 credits' worth of pedagogical studies.
- 2) Bachelor's Degree in Education and the study requirements described in 1).
- 3) A 3-year classroom teacher degree from Iceland, Norway, Sweden or Denmark.

Also qualified subject teachers that have finished the 60-credit study program of classroom subjects are qualified to teach as classroom teachers (14.12.1998/986).

Aside from University of Jyväskylä, classroom teacher training is also available in University of Helsinki, Snellman-korkeakoulu, University of Eastern Finland, Kokkola University Consortium Chydenius, University of Oulu, University of Turku, University of Lapland, Tampere University and Åbo Akademi University. Qualified teachers can freely apply for open teacher job posts anywhere in Finland. Teachers will be selected for the post based on qualifications and experience. Job interviews are a common practice in selecting a suitable candidate for the job.

3.1.4 ICT in teacher training in Finland

Because of T5 ICT competence in the national curriculum (see chapter 3.1.2), all classroom teacher studies are likely to integrate ICT into the courses that concern the subjects to be

taught. Aside from ICT integration, however, there are also separate ICT courses for classroom teacher students in their teacher programs. In the University of Jyväskylä, the degree program for primary school teachers includes two ICT courses, one in Bachelor's degree and the second in Master's degree. The courses are not graded but evaluated on a pass/fail scale. (University of Jyväskylä 2017a & b.)

The first course, taught in the Bachelor's degree phase, focuses on ICT tools that the teacher students will need throughout their degree. Its aim is to teach the students to use the university's digital services and programs, and to utilize cloud services while working independently or in cooperation with other students. The course also touches on how to use ICT ethically as a pedagogical professional, and to understand the meaning of ICT in pedagogical field's professionals' tasks. (University of Jyväskylä 2017a.)

The second course, taught in the master's degree phase, focuses more on ICT tools that the teacher students can utilize in their work in the future. The course delves into ICT requirements in the national curriculum and tackles for example the most important copyright issues. The course also aims to give the students understanding on the ethical challenges of ICT and how to respond to them, and how to understand children's media world and utilize it in their teaching. And last but not least, how to use the newest technology in their work as a teacher. (University of Jyväskylä 2017b.)

As an example of other universities' ICT training, Tampere University curriculum for bachelor's in education includes an ICT course of 2 ECTs called "Introduction to Computing". The parts that are mandatory for teacher students consist of "Theme 1: University's IT environment", which includes Moodle, basics of Office 365 and data security at the university, and "Theme 3: Managing and publishing text-based information", which includes word processing and web tools such as Sway, Dropbox, Blogger and Google Drive. (Tampere University 2019a.) In master studies, the curriculum does not include a separate ICT course, but a course of 10 ECTs called "Advanced theme studies in education: Assessment and teaching of transversal competences" is likely to also include content from the transversal competence T5, ICT competence. (Tampere university 2019b.)

As another example, the University of Helsinki curriculum for bachelor's in education includes 3 ECTS worth of ICT studies under general studies. This consists of two courses, "Student's digital skills: orientation" (2 ECTS), which includes for example the computer environment of the university and information seeking, and "Student's digital skills: advanced skills" (1 ECTS), which includes basics of modifying and presenting data. There is another ICT-related course under optional studies, titled "Foundations of Media Education" (5 ECTS). The course content includes theory of media education, ICT possibilities and limitations in teaching, and utilising ICT and critical media literacy skills in teaching. (University of Helsinki 2019a.) The master studies have one ICT course available under optional studies, called "Pedagogical basics of programming and robotics" (5 ECTS). It includes familiarising oneself with technologies such as Bee-Bots, ScratchJr, Lego Mindstorms EV3, GoGo Board and Micro:bit. (University of Helsinki 2019b.)

3.1.5 Supplementary training of teachers in Finland

In a survey of European schools in 2012 (European Schoolnet 2012, 16) only 8% of 4th grade teachers in Finland had spent over 6 days in professional development activities during the past two years, while the EU average was 48%. The Finnish National Agency of Education has gathered data on teachers' participation in supplementary training since 2008. In 2016 42906 teachers answered the survey, out of which 27140 were classroom teachers. The survey concerns the participation in supplementary training for the year 2015. (Opetushallitus 2017, 153.) In 2015 approximately 77.4% of all teachers and teaching staff participated in supplementary training. Out of classroom teachers, 80.8% participated in supplementary training. (Opetushallitus 2017, 154.) The classroom teachers' active participation in training during 2015 might be explained by the new curriculum, which was published in 2014 (Opetushallitus 2017, 155).

The term supplementary training covers a wide range of training. According to the data gathered in 2016 (Opetushallitus 2017, 153–154), the supplementary training of teachers and teaching staff consisted of the following:

- degree-oriented training (aiming at for example Bachelor's, Master's, Doctorate)

- qualification-oriented training (for example pedagogical studies, special education teacher studies, career counselling studies)
- staff training organized by the employer, professional exchange (at least a week of exchange, domestic or international)
- other supplementary training (for example voluntary training, government-funded training or training organized by a trade union)

Apart from organized supplementary training, teachers and teaching staff also participate in informal learning, which was not as well recorded in the data collection. Examples of these include participating in mindfulness courses or trying out new sports as a physical education teacher. (Opetushallitus 2017, 153–154.)

3.1.6 ICT in the supplementary training of teachers in Finland

In 2012, 59% of Finnish 4th grade teachers had received ICT training provided by the school staff within the past two years, while the EU average was 40%. Unfortunately, at least at this time Finnish teachers were not likely to learn about ICT in their own time (36% versus EU average 70%), nor participate in online communities (15% versus EU average 25%). (European Schoolnet 2012, 17.)

One of the major recent changes in the education field, that is also reflected in the supplementary training of teachers, is the utilization of digitalization from the perspective of pedagogy and professional development (Opetushallitus 2017, 163). The Finnish Ministry of Education and Culture started up a "New Primary School" project in 2016. One of the aims of the project was to enable every school in Finland to have a tutor teacher, e.g. ICT tutor, who supports other teachers in actualizing the change in school culture, implementing new pedagogy and utilizing digitalization in a useful way. The aim was to enable the ratio of one tutor teacher for every 220 pupils, in the 2500 primary schools of Finland. The allowances for the project were available for applying starting September 2016. (Opetus- ja kulttuuriministeriö 2016.) The entire budget for spreading the tutor teacher network to Finnish schools during 2016-2018 was 23 million euros (Opetus- ja kulttuuriministeriö 2017a).

In 2016, about 250 municipalities and 40 other training organizers received allowance, covering almost 80% of the municipalities already during the first phase (Opetus- ja kulttuuriministeriö 2017 a). In the second phase, 280 tutor teacher projects and 24 regional coordination projects with experience from tutor teacher activity received funding (Opetus- ja kulttuuriministeriö 2017b). In the spring of 2018, over 90% of municipalities were involved in tutor teacher activity. In order to ensure the continuation of the tutor activity, the funding was extended by The Finnish National Agency for Education for 2019 by 10 million euros. The Finnish National Agency for Education also ordered a research covering tutor teacher activity, the emphases of future development and the long-term effects of the activity to be carried out in 2019–2021, to be used in the development of tutor activity. (Opetus- ja kulttuuriministeriö 2019, 64.)

As a concrete example of the project, in Central Finland where this research takes place, there exists a region-wide Digital tutor network. The project is funded by Finnish National Agency for Education and 21 municipalities in the region of Central Finland are involved. The network organizes meetings of ICT tutors as well as supplementary training sessions, and assembles ICT-related teaching material onto their website. Some of the topics of the training sessions in 2018-2020 included Micro:bit basics, Micro:bit programming with Python, Google Classroom, Android tablets in teaching, Office 365: OneDrive and Forms, OneNote in teaching and computational thinking for different grades. (Keski-Suomen tutoropettajaverkosto 2020.)

In a survey conducted in 2017 with responses from 2162 teachers, the majority of responding teachers had participated in ICT training during the previous school year - only 15% responded that they had not participated in any. A third of the respondents had spent 3–6 hours in ICT training, and a quarter less than 3 hours. The remaining quarter of the respondents had spent more than 6 hours in ICT training during the previous school year. Over 70% of the respondents found that the training they had received was useful or somewhat useful. 76.5% of the responding headmasters reported that their school has an ICT tutor. (Karakainen et al 2017, 54–57.) Aside from official supplementary training, one of the informal learning methods mentioned in chapter 3.1.5 includes learning ICT skills independently online or with personal devices (Opetushallitus 2017, 153–154).

3.2 Japan

In this chapter, we will go over the main points of the national education system of Japan. We will start by briefly going over the basics of the Japanese education and curriculum, including the duration of each level of education, and which subjects are taught. We will then focus on the role of ICT in the Japanese curriculum. Next, we will move onwards to teacher training and supplementary training. Finally, the chapter is concluded with the concept of mentoring, which is an important part of the teacher's role in Japan, as well as certain typical Japanese characteristics in education.

3.2.1 Primary education and curriculum in Japan

The Japanese school system consists of three years of optional kindergarten, six years of primary school (elementary school), three years of lower secondary school (junior high school) and three years of senior secondary school (high school). Compulsory education is a minimum of nine years: six in primary and three years in lower secondary education. (NCEE a; Kanemune, Shirai & Tani 2017, 144.)

The broad guidelines for each school subject from preschool education through senior high school are established by MEXT, together with university professors and the Central Council for Education. The curriculum is revised approximately once every decade. The current curriculum was revised in 2008 and fully implemented in 2013, whereas the curriculum currently under revision will be rolled out in stages starting in 2020. (NCEE a.)

Teacher guidebooks for each subject are prepared by ministry specialists with input from experienced teachers. Books produced by the textbook publishers follow the national curriculum very closely, and MEXT examines and approves each book before it can be used in schools. Local boards of education select which texts will be used in schools from the Ministry-approved textbooks. (NCEE a.)

Japan's primary school curriculum is divided into three categories: compulsory subjects, moral education and special activities (NCEE a). Compulsory subjects consist of "Japanese language, Japanese literature, arithmetic, social studies, science, music, arts and handicrafts,

programming and PE" (NCEE a). The goal of moral education is to teach the students to respect each other, the environment and the rules of society, as well as to understand the importance of life and learn general self-control. Special activities consist of activities and ceremonies involving cooperation, such as graduations and field trips. The curriculum for each grade is adjusted to continue each year from where the previous grade left off. (NCEE a.) Although teachers are allowed to make adaptations, "they are expected to follow the national curriculum" (NCEE a).

English is taught in fifth and sixth grade through informal activities - however, in the 2020 curriculum, English will become a graded subject in the fifth and sixth grade, and informal activities will instead begin in third and fourth grade (NCEE a). In primary school, each class is assigned a homeroom teacher, who teaches a majority of the subjects (Kanemune, Shirai & Tani 2017, 145). When it comes to junior high school, "students learn mainly Japanese language, mathematics, science, social studies and English language" (Kanemune, Shirai & Tani 2017, 145). Different teachers teach different subjects (Kanemune, Shirai & Tani 2017, 145).

According to NCEE, "many primary and secondary schools are open six days a week" (NCEE a). In addition, cram school or juku may be attended up to 12 hours a week to prepare for exams. This results in Japanese students spending a lot more time in schooling than students in many other countries. MEXT has attempted to decrease the hours spent in cram schools, but the attempts have remained ineffective. The students need to take entrance exams for admission to upper secondary schools, senior high schools and universities, and the admission to senior high schools is highly competitive. (NCEE a.) This could be a reason why the popularity of cram schools persists.

In Japan, at the core of the education system since 1998 has been the concept of "Zest of life". This consists of a holistic view of education, including three main areas "Chi-Toku-Tai", which mean first of all academic prowess and moral, physical and mental health (Kimura & Tatsuno 2017, 2). In order to reach the "Zest of Life", education should learn 21st century competencies, which include three domains. These are basic literacy, collaborative thinking ability and practical ability to act for the world. Basic literacy is at the core of the

competencies and enables thinking to act as a tool; this includes literacy, numeracy and information literature, not forgetting the manners and morals that are needed in connection with ICT. The next circle, encompassing also the basic literacy is the collaborative thinking and problem solving ability. This includes the ability to find and solve problems, critical thinking as well as logical thinking, metacognition, adaptive learning skills and also creativity. The largest circle, encompassing the other two adds the practical ability to act for the world to the picture. This consists of three parts: independence and autonomous action, relationship building and responsibility for building a sustainable future. (Kimura & Tatsuno 2017, 5.)

The three domains described earlier are related to one another. Basic literacy is at the core and is considered to be the foundation of learning and also at the basis of the other two domains, giving students a direction. Thinking abilities are seen as generic skills and can be used in deepening one's knowledge. The last domain, the practical ability to act for the world is crucial in personal value formation and also in developing one's personal attributes. (Kimura & Tatsuno 2017, 5.)

In order to reach the 21st century competencies in practice in the classroom, certain patterns of teaching are going to be emphasized. These include first of all, the recommendation of "active learning" in the classroom, which is considered to be at the core of learning; secondly, integrated studies, which are cross-curricular and have to do with such issues as family and society, as well as local communities, the environment and global issues and thirdly, special activities including school events and trips as well as clubs. (Kimura & Tatsuno 2017, 19.) The concept of active learning originates at Bonwell & Eison (1991, 19) where they define it to mean, something that "involves students in doing things and thinking about things they are doing" and effectively, this means that the following points should be considered:

- "Students should be involved in more than listening.
- Less emphasis is placed on transmitting information and more on developing students' skills.
- Students are involved in higher-order thinking (analysis, synthesis, evaluation).
- Students are engaged in activities (e.g., reading, discussing, writing).

- Greater emphasis is placed on students' exploration of their own attitudes and values." (Bonwell & Eison 1991, 19).

MEXT proposals to link active learning and ICT have also been criticized by LeTendre (2017), who expresses concern over whether the curriculum reforms could in practice lead to a tighter frame for teachers to develop their teaching related to ICT. This is caused by the Japanese collaborative "Lesson study" method receiving a tighter framework and moving further from a tool that could be used in dynamic teacher-initiated professional development, not to mention innovation. The method in its proposed form also focuses on the lesson and not the possible uses of ICT outside the classroom. LeTendre (2017) is also concerned that by not providing clear guidelines for ICT and active learning, teacher's innovation and creativity might be limited. (LeTendre 2017.)

3.2.2 ICT in primary education curriculum in Japan

The existing curriculum for primary school does not include ICT education, and thus the majority of teachers have not been trained in teaching ICT. However, tablets and electronic blackboards have been making their way into the schools. (Kanemune, Shirai & Tani 2017, 145.) In addition, the new curriculum that will be fully implemented at primary schools starting 2020 includes compulsory programming education. There will not be a separate subject for ICT, but students will learn programming integrated into for example arithmetic and science. (Kanemune, Shirai & Tani 2017, 146.)

In junior high school, computer literacy and basic robot programming are taught in a mandatory subject called Technology, which belongs to the subject Technology and Home Economics. The content includes basic robot programming, for example with robots focused on line tracing. (Kanemune, Shirai & Tani 2017, 145.) In high school, the mandatory subject Information boils down to two optional subjects called Information Study for Participating Community and Information Study by Scientific Approach, latter of which includes programming. Schools can choose which of the two subjects they will teach, but only approximately 20% have chosen to teach Information Study by Scientific Approach. (Kanemune, Shirai & Tani 2017, 146.)

3.2.3 Teacher training in Japan

In Japan to become a teacher a degree from an institution of higher education is required. To gain access to a teacher training program in Japan, the candidates need to take the National Test of University Admissions. The institutions in question must teach courses and have a syllabus that is accepted by MEXT (the Ministry of Education, Culture and Sports). In addition, national universities often have their own entrance examinations. (NCEE b.)

As far as the studies are concerned, the teacher trainees need to study subject areas as well as pedagogy. The process of becoming a teacher also includes a teaching practicum which lasts for a minimum of three weeks and takes place after graduation (NCEE b.)

After graduation, teachers take a hiring exam. This is organized by the prefectural board of education, which also often requires several additional tests including interviews and essays before the teacher can be hired - the teachers who get a good score in these tests will be hired first. (NCEE b.)

When teachers have been hired, they spend a year with reduced teaching responsibilities and they are being mentored by a more experienced teacher. The teacher's first year is a trial year, after which they can be hired as a full-time teacher. The prefecture hires teachers and each prefecture has several municipalities. As a new teacher, the teaching assignments change every three years. (NCEE b.)

3.2.4 Supplementary training of teachers in Japan

Since 2009, Japanese teachers have been required to “prove that they are up-to-date on skills and practices”. This is something that Japanese teachers need to do every ten years to be able to renew their teaching certificates. This means that they must have taken part in a professional training for a minimum of 30 hours. MEXT arranges workshops for administrators and head teachers at the national level, and at the prefectural level training programs are arranged for teachers who have been teaching for five years, ten years or 20 years. The prefectural board of education also plans daily in-service training for teachers. (NCEE b.)

Also, informal learning is considered as important in Japan. Principals of different schools arrange teachers' meetings where teachers who have a different amount of experience can learn from one another. Together, teachers "identify an area of need in the classroom, research intervention options and create a lesson plan". This is then put into practice in a classroom by one teacher, with other teachers observing. The lesson is followed by an evaluation discussion where the lesson plan may further be adjusted. (NCEE b.)

3.2.5 Mentoring and other typically Japanese working methods

In Japan, mentoring is seen as an important part of teacher development. Asada (2012a, 139) sees mentoring as "a school-based form of ongoing professional development that leads to fundamental changes in values, in skills, as well as knowledge and understanding about teaching in school." Asada (2012a, 139–140) draws attention to the Japanese concepts of "uchi" and "soto", which he defines as inner self (and related matters) and outsiders respectively. Part of being an outsider includes a certain element of respect and is visible in relationships which include mentoring. The concepts of "uchi" and "soto" and their presence in Japanese society mean that as part of "uchi" you are seen as a colleague and this means that members of the same group will support you in your actions. Within "uchi" there is a sense of hierarchy where the senior members hold greater importance. When a new teacher comes to school, it is the responsibility of an experienced teacher to guide the newcomer when it comes to teaching. This model closely reminds that of apprenticeship. (Asada 2012a, 141.)

When it comes to teacher trainees (student teachers), they can easily end up in a situation where they practice in schools but the university teachers, who have trained them, do not often visit the lessons they teach at schools and thus they have different teachers teaching them in the teaching practice (Asada 2012a, 142). When they become teachers and start teaching in a new school, they face an informal mentoring system (Shonin-ken) that is seen as an in-service teacher training program. There are two steps in this program: one that takes place in the school and another which takes place outside the school in the prefectural training institute for education. In the school, the mentor is looking after four new teachers, whereas in the training that takes place outside the schools the new teachers receive lectures on such topics as the education act, teaching methods and classroom management. The

mentoring that takes place in the schools can have a lot of variation in between different schools, but it seems that most often a new teacher gains an understanding about teaching through observation and imitation. Some of the things included in the mentoring process are giving positive feedback to the new teacher for a year and showing the new teacher how to think reflectively about teaching. (Asada 2012a, 144–148.)

The question about the status of the new teacher can be looked at from two points of view. First of all, even though the new teacher is new, he/she is still considered to be a teacher and as such, should have an equal status in terms of other teachers, who have more experience. However, the new teacher is expected to observe and imitate the teaching of a more experienced teacher and therefore model their own teaching according to that of a more experienced teacher. (Asada 2012a, 144–145.) This is related to the concept of “uchi” mentioned earlier. As an “uchi” you are a colleague and you can expect to be supported by other colleagues. However, seniority plays a part here in that the novice teacher takes instructions from the experienced colleague and easily sees the mentor as the ideal teacher, following his/her lead in practical matters of teaching. (Asada 2012b, 58.) Asada (2012a, 145) points out that especially in primary school each class is an individual system of its own, which leads to the situation where there is no interaction or co-teaching with other primary school teachers.

Tsuneyoshi (2018, 22) draws attention to two typically Japanese models of learning that emphasize working together and which “reflect an organizational culture which values group cooperation.”. The first one of these is “lesson study” (originally “jigyu kenkou”, meaning lesson research) which refers to the collaborative learning of teachers that was briefly mentioned in chapter 3.2.4. The goal of this method is to improve the lessons together. In practice it means that teachers come together and discuss a lesson. The second one is “tokkatsu” (a shortened form of Japanese “tokubetsu katsudo”), which refers to the collaborative learning of children. This is related to non-cognitive learning activities that take place in the school and can include activities such as serving lunch, having lunch together, taking part in cleaning in school and also various school events and different kinds of classroom activities. (Tsuneyoshi 2018, 22–24.)

3.3 The key characteristics of the Finnish education system with a brief comparison with the Japanese system

In this chapter we very briefly summarize the typical characteristics of the Finnish education system and draw a short comparison to the Japanese system. Sahlberg (2015) has researched extensively the Finnish education system. In his view the main differences of the Finnish education system in the global context can be described through five major factors. First of all, in the Finnish comprehensive school all pupils have equal opportunities in terms of education. Secondly, all teachers must have a master's degree, and teaching as a profession is respected and a popular choice when entering university. Thirdly, Finland does not rely on nationalized standardized tests but has trust in the teachers' ability to teach and evaluate their pupils effectively. Fourthly, Finland has made an effort to enhance the equity of educational outcomes by making special education available, ensuring that the curriculum is balanced and thus accessible to multiple intelligences as well as holding on to teacher qualifications. As the fifth factor, Sahlberg points out that schooling in Finland has been continually adjusted to respond to the needs of both the individuals and the society. (Sahlberg 2015, 179–184.)

Seiji Fukuta, who has worked as a professor of comparative cultural studies at the Tsuru university, has a special interest in Finnish education and has written extensively about the topic. He has made a comparison of the Finnish and Japanese education systems. The first difference he sees between the two countries is the purpose of the education. In his view, the purpose of the Finnish education is “to nurture character and instill a sense of independence among individuals”. However, in Japan the purpose of studying seems to be “to achieve high scores in exams and...entrance into high-ranking schools and universities.” The second difference he points out has to do with the high level of education amongst the Finnish teachers, who all hold a Master's degree, and the “relative freedom on what and how to teach”. As the third point he mentions that because of the lack of testing, Finnish students are motivated by desire to learn instead of competition. He emphasizes the importance of the purpose of learning by saying that learning for the sake of passing exams is not enough for students to remember what they have learned. (Otake 2008.)

3.4 Summary of the national primary education systems of Finland and Japan

The national primary education systems of Japan and Finland have many similarities but also some differences, as covered in chapters 3.1.1, 3.1.2 and 3.2.1. In Japan, children start school when they are six years old. Even though in Finland children start the actual school when they are seven years old, the pre-primary education starts when they are six years old. In both countries, the primary school lasts for six years. In Finland, the national core curriculum must be followed but teachers have a lot of freedom when it comes to teaching in practice. In Japan, the local board of education makes the choices concerning e.g. teaching materials. In both countries, the school subjects are very similar with the exception of foreign language studies starting earlier in Finland. ICT is not a school subject in either country in primary school but is integrated into other subjects when possible.

As stated in chapters 3.1.3, 3.1.4 and 3.2.3, teacher training is arranged in universities in both countries, but in Japan a bachelor's degree is enough to become a teacher whereas in Finland teachers need a Master's degree. ICT courses are available in teacher training in both countries but there are only a few of them. In general, in Finland one course is compulsory but in Japan an ICT course is part of optional courses. As covered in chapters 3.1.5, 3.1.6 and 3.2.4, supplementary training is arranged in both countries for teachers who are working in schools. In Finland taking part in supplementary training is optional but in Japan, a certain amount of supplementary training is compulsory for teachers. Mentoring and lesson study are a part of Japanese supplementary training as stated in chapter 2.3.5, whereas tutoring is more common in Finland. As described in chapter 3.3, the national primary education in Finland aims at offering equal opportunities for everyone and relies on the teachers' abilities instead of national testing in providing results. In Japan, however, national tests are common, especially in the form of entrance exams in school transitions.

4 The research method

In this chapter we will go over the research method and data collection method used in this thesis, and why we chose the methods in question. Next, we will cover how the participants were selected, how the interviews were conducted and how the interview data was processed and analyzed.

4.1 Research method

The research method used in this thesis is qualitative comparative research that falls under comparative education research and international education research. Although comparative research often includes quantitative methods, in comparative education research also qualitative studies are often carried out, as qualitative methods often bring out the cultural and social context better; in quantitative methods cross-national statistical data can suffer from bias, where the units of analysis are compared without consideration for local context (Bray et al. 2014, 76–77). Instead of gathering and comparing statistics, our aim was to find out how teachers and teacher trainers perceive ICT and feel about the use of it, how they use ICT in practice in their classrooms, and what kinds of aspects influence, support and hinder their use of ICT in education, in their own cultural context. A fundamental purpose of qualitative research is "to capture the research subject's perspective and views of values, actions, processes, and events" (Bray et al. 2014, 75). Thus, we felt that qualitative methods fit our research goals better than quantitative methods would have.

It should also be noted that quantitative international comparative research in education is already performed regularly by for example OECD, whose publication *Education at a Glance* (OECD 2019) is a comprehensive source of information from a statistical point of view on the state of education in all of the OECD countries, including Finland and Japan. Creating our own statistical analysis between the two countries would have felt unnecessary in comparison to such extensive and detailed research, produced with a significantly larger amount of available resources than what would have been possible to utilize in the framework of this thesis.

We did not find an existing qualitative comparison between Finland and Japan which would be focused on the views and experiences of primary school teachers in the use of ICT in education. Considering this, we found the subject to be a valuable addition to comparative education research, and a topic worth looking into.

4.2 Data collection method

Interviews are often used in educational research, since they allow direct engagement with the research participants (Atkins & Wallace 2015, 86). The interview as a research method can deepen the answers given by the subjects and also enable the researchers to get clarification to the subjects' answers (Hirsjärvi & Hurme 2008, 35): they allow the interviewer to probe and clarify and to check that the participants have understood what is being said (Atkins & Wallace 2015, 86). Interviews also provide flexibility in the types of information that can be gathered, ranging from views and opinions to factual data (Atkins & Wallace 2015, 86). Compared to a questionnaire, interviews also have the benefit of being able to control the order of the questions (in questionnaires, subjects can possibly peek ahead) and providing descriptive examples, as well as revealing connections between phenomena (Hirsjärvi & Hurme 2008, 36).

In structured interviews, the questions and their order have been entirely predetermined. In unstructured interviews, the questions are not predetermined but instead open, and the entire interview, including follow-up questions, is built around the answers of the subject. A semi-structured interview is something between the two, with varying definitions. For example, questions might be the same for everyone, but the order might vary. Or the questions are predetermined, but their wording can be modified on the spot. Or the questions are predetermined, but the interviewees can answer freely. (Hirsjärvi & Hurme 2008, 44–47.) Semi-structured interviews may also leave it up to the interviewer how closely the interview guide has to be followed and how much they will follow up on interviewees' answers when opportunities arise (Kvale 2007, 57).

We chose interviews as the data-collection method for two major reasons. One was to ensure conceptual equivalence. We could not be certain that all of the interviewees shared our view

of what ICT stands for and what it entails, and that the concept would be understood exactly the same way in both countries. We wanted to find out how the interviewees define ICT before they could look up a definition or before they were provided one, but to also ensure that throughout the rest of the interview, the interviewees would have the same understanding of the concept. Thus, an interview, where the interviewee could not go back to change their first answer after receiving the given definition, seemed like the best choice.

The second major reason for the choice of the interview was to enable the participants to express their views more broadly than is possible using only a survey or questionnaire. Semi-structured interview was chosen as the more specific interview method, since as stated above, it makes it possible to deviate from the pre-planned questions more easily if it seems that the participants have something important to say that has not been taken into account by the interviewers in advance (Kvale 2007, 57). In our case, the linear requirement only concerned the beginning of the interview, and for the rest of the interview we wanted the interviewees to be able to speak freely whenever a relevant idea came to mind, in case it would provide valuable information.

4.3 Selection of participants

This research does not focus on how ICT is used in schools in the capital or rural areas of Finland or Japan, since we thought it would be more interesting to gain an understanding on how things look from the point of view of medium-sized schools, where the advancements in ICT usage are not necessarily the best in the country, nor the worst. Our main focus lies in the use of ICT in the primary schools of Central Finland and Kanazawa in Ishikawa, Japan, but since the comparison could not be made out of context, the research also delves into the major cultural differences between the two countries. Thus, in this thesis, we compared the national education systems and school cultures of Finland and Japan, as well as the views and experiences of teachers and teacher trainers located in the regions of Central Finland and Kanazawa.

The participants for this research came from Central Finland, and Kanazawa, Japan. In Central Finland, the majority of the interviewees were from the town of Jyväskylä. Both

Jyväskylä and Kanazawa have a university with a teacher training department and an affiliated teacher training school, which made them suitable for comparison. Three Finnish teacher trainers (all females) and four Japanese teacher trainers (three males and one female) working at the teacher training department were interviewed. Also one Finnish project researcher with their research focus on educational science and background in primary school was interviewed.

To make our results more reliable, we aimed for triangulation of sources, which means "examining the consistency of different data sources within the same method" (Patton 1999, 1193). The participants for this research were chosen in such a way that their views would cover the teacher trainers' points of view as well as the teachers' points of view, which would then in turn be complemented by the views of students who have gained experience of education systems both in Finland and in Japan, visiting each other's countries as international exchange students. Some of the students were also teacher trainees.

4.4 The interview procedure

The Finnish teacher trainers and project researcher (four females) and primary school teachers (three males and one female) were interviewed in May 2019. The Japanese teacher trainers (three males and one female) and primary school teachers (two males and two females) were interviewed in July 2019. In addition, three female Japanese students who had studied in Finland were interviewed in May and August 2019 and two Finnish exchange students (one male and one female) who had studied in Japan were interviewed in August 2019. All of the interviews were recorded by the interviewers, since according to Hirsjärvi & Hurme (2008, 92), this ensures the smooth progression of the interview without interruptions where the interviewer has to stop to take notes. The interviews were recorded as audio files to ensure that complete transcription and accurate partial transcription were possible (Atkins & Wallace 2015, 89).

The interview questions in both countries were essentially the same for interviewees who were in the same position. For example, all of the teachers who were interviewed were asked the same interview questions, the only difference between Finland and Japan being the

language in which the interview took place. Similarly, the interviewed teacher trainers had their own set of questions, and students their own.

Each interview was started off by asking the interviewee warm-up questions about their background (Appendices C-H questions A-D or A-E). We then proceeded to ask the interviewees how they would define ICT, and what came to their mind when they heard the words "ICT in education" (Appendices C-H questions 1 and 2). These questions were meant to give an understanding of how the interviewees view the topic, and on the other hand, to give us a chance to get on the same page. To ensure that both the interviewer and the interviewees had a shared understanding about what ICT consist of, a standardized definition used in this thesis was presented to the interviewees after they had given their own definition.

We then proceeded to ask questions depending on the interviewee's role to gain a better understanding of their views and experiences with ICT, and to discover answers for our research questions. For teachers, we had prepared questions about their training, teaching practices and school environment (Appendices C and F, questions 3-16). For teacher trainers, we had written questions about the ICT training of teacher students as well as the supplementary ICT training of teachers (Appendices D and G, questions 3-12). Finally, for exchange students we had prepared questions about their ICT training in their home country and the differences in the use of ICT between the two countries (Appendices E and H, questions 3-12). Despite having prepared questions, we also encouraged the interviewees to get side-tracked in related topics, whether out of their own initiative or by our prompt. The final question, regardless of the interviewee's role, was "Do you think ICT in education is useful? Why or why not?"

In Japan, the interviews were carried out with the help of a translator. The translators were mostly English teachers or university staff willing to help in the interviewing process, and their help was invaluable in enabling the communication with the Japanese teacher trainers and teachers. Since the university term was about to come to an end at the time of the interviews carried out in Japan, there was also time-related pressure due to the interviewees and translators' schedules which caused some interviews to be carried out as pair interviews.

4.5 Data analysis

To preserve the interviewees' anonymity, we created pseudonyms for all of the interviewees. In Finland it is common to use first names in communication, and thus the Finnish interviewees received first name pseudonyms to maintain a cultural context. In Japan, last name is prioritized over first name, and in formal situations, a person will be called last name with a -san suffix (Maynard 2011, 64). However, since we have familiarized ourselves with the cultural context of Japan and the position of the teachers in Japan, we are also aware of the honorific sensei, which refers to a professional of one's field, for example a teacher or a doctor, and is often used as a sign of respect. To differentiate between the teaching professionals and other Japanese interviewees (for example students), we decided to call the teachers and teacher trainers with the honorific -sensei, and other Japanese interviewees with the honorific -san.

Despite the pseudonyms, it might still be possible to identify the interviewees who participated in this research, considering that the university connections are tight-knit and the interviewees might also know one another. To further protect the interviewees' personal views as well as the information that they might have shared of their employer, we decided to report some of the results completely anonymously without pseudonyms. Anonymous summaries were also used when the teachers' identities were not relevant to the overall answers.

All of the interviews were manually transcribed from audio format into text format. When considering the analysis method, we considered analysis methods focusing on the meaning rather than methods that would focus on the language (Kvale 2007, 104). This choice was made for two reasons: first of all, the focus of the interviews is in their content rather than in the way the interviewees express themselves; and secondly, given that half of the interviewees were interviewed through an translator, it would have meant relying on the translation rather than the original expressions used in the interview, and much of the expression could have been lost in translation.

According to Kvale (2007, 104-105), analysis methods focusing on the meaning can be divided into three different methods: meaning coding, meaning condensation and meaning interpretation, which look at the meaning from slightly different points of view. We started

by coding the interviews, i.e. keywords were attached to text segments for later identification (Kvale 2007, 105). This proved to be helpful throughout the analysis process, as it ensured that important key points did not remain unnoticed. However, as a rather basic method of simply marking the data for later use, it did not fulfill our needs as the main method of analysis. After some consideration, it appeared that meaning condensation would serve our purposes the best.

Kvale (2007, 107) describes the analysis process in meaning condensation consisting of five steps: first of all, the interview is being read to gain an understanding of the big picture; secondly, the natural meaning units which as used by the interviewees are being defined; thirdly, “the theme that dominates a natural meaning unit is restated by the researcher as simply as possible, thematizing the statement from the subject’s viewpoint as understood by the researcher” after which follows the fourth stage involving the interrogation of the meaning units in relation to the study, and the fifth and last stage sees the essential themes of the interviews are formed into a descriptive statement.

The meaning condensations were formed within the groups of the interviewees - Finnish primary school teachers, Finnish teacher trainers, Finnish exchange students, Japanese primary school teachers, Japanese teacher trainers and Japanese exchange students. After forming the meaning condensations, the content was divided under four themes. The answers concerning the definition of ICT in general and in education as well as statements that had come up concerning the role of ICT in curriculum were grouped under one theme. The answers related to teacher training and supplementary training were grouped under another theme. The answers concerning the available devices, technical support and pedagogical support were grouped under a third theme. Finally, the answers related to the use of ICT in practice were grouped under the fourth theme. Within the themes, the answers were grouped by country, and the answers of the interviewees of both countries were compared to discover similarities and differences in views, experiences and customs. The similarities and differences were made into visual form by creating summaries in the shape of Venn diagrams.

4.6 Reliability and validity

In this chapter, we will consider relevant points in terms of reliability and validity of our research. Although the concepts of reliability (repeatability of the research) and validity (research matches the given definition) are common in research, they have been created for quantitative research and their use in qualitative research has been criticized - they have been seen to meet the needs of quantitative research, and to not be the best fit for qualitative research (Tuomi & Sarajärvi 2018, 120). Since our research is of qualitative nature, we have been focusing on the qualitative criteria set by Tuomi and Sarajärvi (2018, 122-124):

- the aim and meaning of the research: what was researched and why
- commitment as a researcher: why was this research important for the researcher
- collection of data: how was it collected, possible issues
- participants: how were the participants chosen
- the relationship between participants and researchers: did the participants receive the results before publication, and if so, why
- the duration of the research
- analysis of data: how was the data analyzed, how were the results reached
- the reliability of the research: why is the report reliable
- reporting: how has the research data been assembled and analyzed

These qualitative criteria will be taken into account throughout the research process and used as a basis for the evaluation of reliability and validity at the end of the research.

5 How the interviewees view ICT and the curriculum

In this chapter, we will first go over the views and perceptions of the interviewed teachers and teacher trainers concerning the definition of ICT, the use of ICT in education and whether they find ICT useful. After that, we give the teachers and teacher trainers a chance to comment on the role of ICT in the curriculum. Finally, the exchange students' views on ICT and the use of ICT in education are discussed. The sections are split between the two countries, first covering the answers of the Finnish teachers, teacher trainers and exchange students, and then moving onto the answers of the Japanese teachers and teacher trainers. At the end of the chapter, we provide an analysis for the similarities and differences between the answers of the two countries.

5.1 Finland

In this chapter we will go over how the interviewed teachers and teacher trainers in Finland define ICT and what comes to their minds concerning using ICT in education. The chapter also includes views on what kind of attitudes the teachers have discovered towards the use of ICT in their vicinity, and whether the interviewees find ICT in education useful. The second part of the chapter revolves around the curriculum, summarizing the commentary that the teachers and teacher trainers gave on curriculum. Finally, the third part summarizes the views of the exchange students. All of the Finnish interviewees were interviewed in Finnish, but references to the questions have been made to point to both Finnish and English language questions to ensure that questions and answers can be followed smoothly in English.

5.1.1 Teachers and teacher trainers' views on ICT

The first question after warm-up questions in each interview dealt with the definition of ICT (Appendices C, D, F, G, question 1). Finnish teacher trainers and the project researcher looked at this question from a very broad perspective. Technology was seen as omnipresent and it was seen to include all the technology surrounding us: mobile phones, computers tablets, robots used in teaching, cameras, digital cameras, music equipment and various

systems. The focus was on technology including e.g. communication, development and programming. ICT was seen as a tool which enables learning, communication and influencing others. In addition to equipment, ICT was seen to include the technology of learning and digitally supported action such as learning. To be able to use ICT requires multidisciplinary action. It involves a broad spectrum of components: infrastructure, technical support, pedagogical support, users as well as hardware, software and applications. Finnish primary school teachers, on the other hand, gave slightly more compact definitions. The answers were focused on technology and the communication between humans. The concept of "useful tool" came up several times, as well as multiple use cases, such as pedagogy, work or other everyday scenarios.

When inquired about the role of ICT in education (Appendices D and G, question 2), Finnish teacher trainers and the project researcher mostly spoke of the use of ICT in a pedagogical way: a tool for learning and for supporting learning. One of them pointed out that it should not be used self-evidently, but as a resource like any other. Another described the numerous uses of ICT from zeros and ones in programming to automation in cars, and hoped that as a teacher trainer she could pass on this point of view to her students, so that they might see ICT as something more than just basic word processing tools. Also different attitudes were mentioned. ICT in education as a topic was said to include a lot of beliefs, and some were passionate about it, while others dreaded it.

Finnish primary school teachers viewed ICT in education (Appendices C and F, question 2) similarly as ICT in general, the concept of "useful tool" again recurring multiple times, to be used in addition to traditional notebooks and pencils. One teacher commented that although ICT can be learned as a subject on its own, she rather sees it as a tool to support other teaching and learning goals. Also the different parties involved were mentioned: teachers and pupils with their different points of view. One teacher had a clear picture of a classroom tinkering with some devices.

When asked whether teachers and teacher trainees view ICT training with mostly positive, neutral or negative attitudes (Appendices D and G questions 6 and 7), the teacher trainers and the one project researcher did not give one definitive answer. The attitudes seemed to

range from positive to negative among both teachers and teacher trainees. One interviewee commented that many teachers feel that they really need the training, causing a positive attitude towards ICT training in general. On the one hand, another interviewee said that teachers experience fear or angst towards ICT and wish for its use to be very restricted. One teacher trainer considered that her previous group of teacher trainees had perhaps been slightly more negative, while the current one was mostly positive, but thought that perhaps the negative atmosphere before had been caused by a vocal minority, which had now been missing from the most recent group. Another pointed out that teacher trainees yearn for a practical approach, often questioning the role of ICT with a question "What does this have to do with teaching?" if the connection was not clear enough.

When teachers were asked how their colleagues view the use of ICT on a scale of positive, neutral and negative (Appendices C and F question 7), the answers also varied. Two teachers replied that they had encountered mostly positive attitudes from other teachers; one of them said that only the introduction of a new technology might cause some temporary skepticism. One took a more neutral approach, saying that primarily the value of ICT is acknowledged, and the overall attitudes might be positive wherever one might ask, but that there are also challenges. One of the teachers responded that he has seen all the extremes in attitudes, and that he has mostly witnessed criticism from teachers who would rather only use traditional tools such as pencils and notebooks.

When inquired whether the interviewees found ICT in education to be useful in general (Appendices C, D, F, G, last question), all of the interviewed teacher trainers, teachers and the project researcher responded positively - one teacher trainer and one teacher even took their answers further by saying that it is not only useful, but necessary. Reasons for usefulness included such statements as "it is part of our everyday life" (Katja), "it gives preparedness to fetch, mold, edit and create not only information, but also creative structures" (Maija), "it gives a teacher possibilities to involve and activate students and enables differentiation and automation" (Pekka) and "it makes many things easier for me" (Matti).

5.1.2 Teachers and teacher trainers' views on curriculum

Despite covering a wide range of different points of view, the role of ICT is not described in great detail in the national curriculum, and no concrete tools have been listed concerning the use of ICT. For motivated teachers, the definitions and requirements of the curriculum appear to be sufficient guidelines for daily work. When inquired about how the teachers were expected to use ICT in their work (Appendices C and F, question 3), the majority of the Finnish teachers saw that they were expected to use ICT based on the national curriculum. Despite this, there still appeared to be room for criticism concerning the curriculum. Interviewee Pekka pointed out that the curriculum leaves much room for interpretation; some teachers interpret that they do not have to use ICT at all, and others feel that they need to use it for everything. Interviewee Matti also commented that since no one monitors how teachers use ICT in classrooms, its utilization ends up being mostly dependent on the teacher's own interest and enthusiasm.

Of course, the ambiguity of the national curriculum is at least partially intentional to ensure a certain level of freedom in the implementation of ICT usage in schools, since as stated in chapter 3.2.1., schools draw up their own curricula within the framework of the national core curriculum. The school's own curriculum includes more specific guidelines for ICT, which can be adjusted according to the possibilities present at the school. For example, interviewee Seija explained that their school's curriculum includes very detailed ICT guidelines that give examples of what kind of ICT tools can be used in each grade. Interviewee Maija also described a digital passport system being used in the municipality of Lieto, where each student gets their digital passport filled up as they progress through grades 1-6. The digital passport begins from basics during the first two grades, such as logging in to the computer with one's own credentials and familiarizing oneself with the keyboard, and ends at grades 5 and 6 with for example using a keyboard fluently with two hands, practicing making short videos and creating content by coding (Lieto).

Large schools may sometimes offer ICT courses as a subject of its own, in which case the pupils' skills are graded, since progression is being observed and pupils complete assignments in order to advance in class (interviewee Maija). When ICT is not offered as a separate

subject of its own, it is not officially graded. However, due to formative evaluation, for example interviewee Seija mentioned that she evaluates pupils' ICT usage when it's closely ingrained in the school task, and pupils also do self-evaluation and peer evaluation in ICT-related assignments (Appendices C and F, question 15).

5.1.3 Finnish exchange students' views on ICT and curriculum

One of the Finnish exchange students, Elli, said that in her view, ICT includes computer skills, media criticism and media education (Appendices E and H, question 1). ICT in education (Appendices E and H, question 2) in her view consists of being able to use various sources, media and technical devices keeping a critical mind and thinking about whether they are a good thing or a bad thing together with children. Her major subject was Early childhood education and her position stemmed from that point of view. In her opinion, the attitudes of especially new teachers towards the use of ICT (Appendices E and H, question 12) were positive, but she also pointed out that older teachers who might not have such good technical skills may have a negative attitude towards the use of ICT. She thought that ICT in education is useful (Appendices E and H, question 13), but its use should be considered carefully: it needs to have a point and should not be used just for the sake of technology. She considered ICT to be a powerful tool in teaching and an easy way to find information, but she thought it important that the children are taught how to have a critical attitude towards sources and where they come from. Elli felt that ICT is used more in Finland and in Japan, and she felt that Finland it was simpler and more effective to use ICT (Appendices E and H, question 5). As an example, she gave the sign-up system for courses at her exchange university, where you had to sign up for courses online, but that was not enough to confirm your participation, and you had to go to the office for international students and confirm your choices in person.

One of the exchange students, Keijo, was an IT student specializing in the user interface design and for him, and the questions of what is ICT and what it consists of were difficult perhaps because of the point of view and insight he already possessed regarding the topic (Appendices E and H, questions 1 and 2). In his view, ICT consists of communication, use of technology and the part that includes the human being. ICT in education made him think

about ICT education and what belongs to that. In his opinion, the teacher's background has a big effect on how the teacher relates to ICT, but mostly he felt that the teachers' attitudes towards ICT are positive. Even though he is not a trained teacher, he was a programming teacher in a primary school for six months and felt positive about it. In his view, ICT in education is useful also because it can give people an understanding about what lies beneath the system. He saw this as an important factor and told a story about a student in his field who cannot tell the difference between an application and a file. He found this worrying since it shows that people do not have an understanding about how the system works. When comparing the Japanese and the Finnish system (Appendices E and H, question 5), he found the Japanese system more complicated and involving a lot more signing up and creating usernames and passwords for various different systems, which is something he was not used to in Finland and this led to for example never using some of the systems because of missing usernames and passwords.

5.2 Japan

In this chapter we will go over how the interviewed teachers and teacher trainers in Japan define ICT and what comes to their minds concerning using ICT in education. The chapter also includes views on what kind of attitudes the teachers have discovered towards the use of ICT in their vicinity, and whether the interviewees find ICT in education useful. The second part of the chapter revolves around the curriculum, summarizing the commentary that the teachers and teacher trainers gave on curriculum. Finally, the third part summarizes the views of the exchange students.

5.2.1 Teachers and teacher trainers' views on ICT

The Japanese teacher trainers answered the question about the definition of ICT (Appendix D, question 1) by mostly considering practical instances of using ICT and focusing mainly in communication, e.g. with various media using computers, iPad or smartphone. Also, the general skills needed to learn in order to use computers and ICT were emphasized. The Japanese teacher trainers put strong emphasis on ICT as something that enables communication.

The Japanese primary school teachers saw ICT (Appendix C, question 1) also as something that included mainly tools such as tablets, computers, digital cameras, smart phones, micro-phones, projectors and screens. Two teachers brought out the social aspect of studying when using the equipment by mentioning the possibilities included in students working together in small groups.

The Japanese teacher trainers saw the role of ICT in education mostly as a way to improve students' communication skills (Appendix D, question 2). Since ICT is necessary for communication, so are the skills that are needed to use it. Kobayashi-sensei had specialized in educational technology and he saw ICT in education as two-fold: something that students can use in their learning and communicating with one another, but also something that the teacher can use to benefit the students with. Overall, ICT in education was seen as a way to teach children skills that are needed in the future in their work life. ICT in education was seen to include all the technology in the classroom. However, the teacher training school teachers especially emphasized that the skills gained at school were skills for life in the sense that the ICT skills learned in school were something that they would also need in their work life.

The two of the Japanese primary school teachers (Appendix D, question 2) did not separate ICT in education from ICT in general, but saw both from the point of view of tools being used. Thus, their focus was not so much in what these two are, but more in which available tools can be included in ICT.

In general, the Japanese teacher trainers' attitudes towards ICT in education (Appendix D, questions 6 and 7) were positive. However, they also had differing opinions about their own skills, and most of them felt that they would benefit from additional training in the use of ICT. The teacher trainers who were working in the school and had not specialized in ICT either professionally or out of interest were particularly worried about their skills in teaching programming in primary school, which is a new addition in the national curriculum taking place in 2020. However, the teacher trainers who had personal interest in ICT concluded that they do not require additional training, but would instead benefit from better resources. In

general, they were all of the opinion that younger teachers were better equipped - and often also more interested - than older teachers when it came to using ICT in education.

The Japanese primary school teachers shared the teacher trainers' views concerning attitudes towards ICT (Appendix C, question 7). They saw that there is a big gap between the teachers who use ICT and those who are not comfortable with using it. One of the primary school teachers expressed her view that the teachers who have a positive attitude towards ICT also make more use of it, but the teachers that have a negative attitude towards it will only use it minimally. One of them also pointed out that without ICT skills it was not possible to teach children to use ICT, since the teachers who do not possess the skills cannot show the children what to do. One of them also considered that if the teacher has good ICT skills, it is possible to teach the pupils to even use Excel in primary school, but it was pointed out that this is not common and easier-to-use software is used for the most part.

When asked about the usefulness of ICT in education (Appendix C, question 17; Appendix D, question 13), all participants, teacher trainers and primary school teachers alike, found it to be useful. One primary school teacher pointed out that it is useful for the pupils to be able to find information by themselves and not simply expect the teacher to give it to them. She also mentioned that it is useful to be able to use ICT since it can function as a visual aid with which pupils can see whether they are doing things correctly or not (e.g. in sports). One teacher looked at this from the teachers' point of view and mentioned that if a teacher had good ICT skills, he/she can teach well, and the time spent teaching certain topics can also become shorter.

5.2.2 Teachers and teacher trainers' views on the curriculum

At the time of the interviews in summer 2019, ICT was not a subject in Japanese primary schools, but because of the upcoming changes in the Japanese national curriculum in 2020, the role of ICT was in the process of increasing. One of the teacher trainers working in a school mentioned that this also means that the resources for the schools are going to be improved, since at that time all schools did not have similar resources to use ICT. One of the teacher trainers working in a school mentioned that e.g. in their school, one screen is shared

by six different classes, so it is being regularly moved from one class to another, which makes it impossible to use ICT in teaching all the time. However, since the upcoming changes in the national curriculum mean changes in the schools' resources as well, the situation in their school is going to improve. Even though the resources at the moment are not as good as the teachers would wish, the teachers still emphasize skills such as media literacy in many classes.

In general, the primary school teachers expressed concerns about the resources that their schools had. When asked about how teachers are expected to use ICT in their work (Appendix C, question 3), Japanese primary school teachers focused on practical examples of various topics dealt with in the classroom rather than referring to the curriculum. One of the primary school teachers pointed out that with certain topics it is easier for the pupils to understand things that they can see instead of relying on the same information being conveyed by using only words.

5.2.3 Japanese exchange students' view on ICT and curriculum

When inquired about the definition of ICT (Appendix E, question 1), one of the Japanese students knew exactly what the letters stand for and explained that the term encapsulates devices, software and communicating for example online. When asked what comes to mind about its use in education (Appendix E, question 2), she admitted that she had recently taken the pedagogical ICT course at the university, and readily listed educational uses that she had run into in her studies, including using Office applications, sending email, making a website, conducting a survey online, using a mobile app in educational context, programming and dealing with copyright issues.

Another Japanese student was not quite so sure about the definition (Appendix E, question 1), but contemplated that using ICT in Finland is more convenient than in Japan. When asked about what she thinks of ICT in education (Appendix E, question 2), she considered ICT to be important for "survival" in society and education, and useful and convenient for teachers in school. The third student interviewed knew what ICT was (Appendix E, question 1) and mentioned laptops, iPads, iPhones and Powerpoint. When it came to ICT in education

(Appendix E, question 2) she mentioned using Powerpoint in the class and basically using any device available for searching information concerning the tasks in class.

When asked about the attitudes their peers have towards ICT (Appendix E, question 12), two of the students seemed slightly conflicted. One contemplated that the younger generation is more open to using ICT in pedagogy, but others might believe in traditional, paper-based teaching methods. Another felt that some like it and some do not, and that some students might be afraid to use it if they do not possess sufficient skills. She felt that in general, based on her experiences, Japanese university students might not possess enough information or skills in the use of ICT, and that they do not get enough opportunities to practice. The third student, on the other hand, said the attitudes of her peers were positive. As a teacher trainee, she pointed out that teachers are overworked, but the use of ICT will make their work both more effective and easier because it decreases the time that the teachers need to spend working. She also mentioned that it would be important to have knowledge of ICT because in the future, people who know how to use ICT are needed all over the world, and that is why we should have a positive attitude about it.

When posed the question about whether ICT in education is useful (Appendix E, question 13), all three students agreed. Some of the reasons included "to work more efficiently, to attract more students, and sometimes it works well, it enhance like collaboration among the students, and probably and hopefully among the teachers as well" (Yanagawa-san), and that by using ICT, it would make it easier for teachers to make materials.

5.3 Similarities and differences in the views on ICT

Primary school teachers from both countries viewed ICT mainly as a tool to be used in the classroom, having a more practical approach to the definition of ICT and its use in education. Teacher trainers in both countries, on the other hand, seemed to have a wider perspective on the topic, and the role of ICT in the future work life of today's children was mentioned in both Finland and Japan. The teacher trainers in both countries also especially emphasized the roles of learning and communication in the use of ICT, and in Finland also the concept of influencing others was mentioned.

In Japan, the attitudes and capabilities were seen to have some kind of connection with age, as younger teachers were seen as more interested and skilled in the use of ICT. This was different from Finland, where teacher trainers and teachers reported varying attitudes among both students as well as experienced teachers, depending mainly on the teachers' personal preferences as well as their ICT skills in general. Negative attitudes were mostly seen to stem from a lack of ICT skills, which was likely to make the use of ICT seem off-putting or overwhelming.

The teachers, teacher trainers and exchange students in both countries were unanimous about the usefulness of ICT in education - all of them agreed that it is useful. Many Finnish interviewees also felt that ICT was not only useful, but necessary. Interviewees from both countries also pointed out that ICT makes the work of teachers easier by decreasing the time spent on manual or repetitive tasks. Japanese primary school teachers saw that ICT is useful in fetching information, and Finnish teachers expanded upon this, also emphasizing its role in creating things. The answers have been summarized in Figure 1.

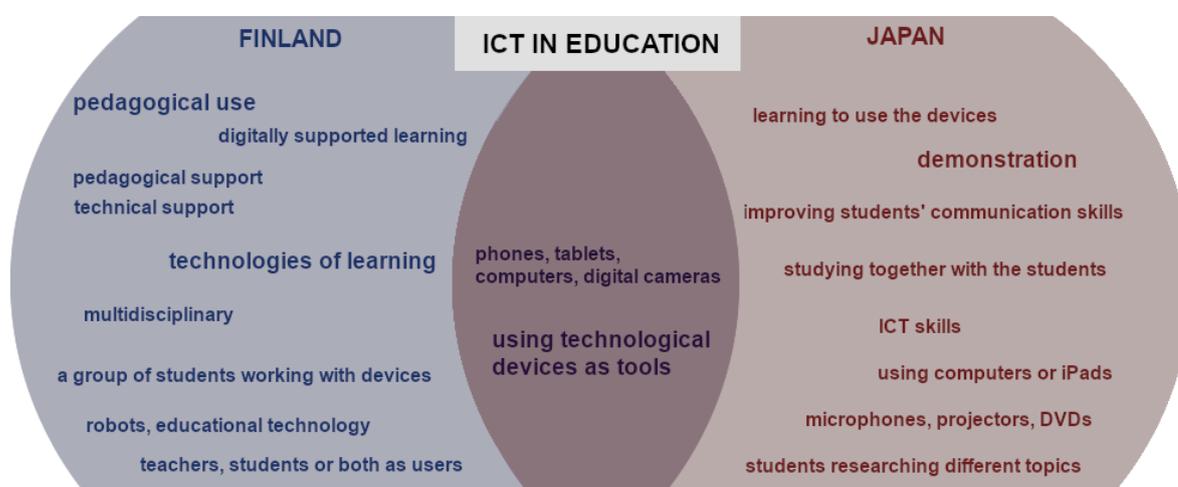


Figure 1. How Finnish and Japanese teachers described ICT in education. Center represents both countries.

6 The interviewees' views on teacher training and supplementary training

In this chapter we will summarize the interviewees' statements considering teacher training and supplementary training, and then include comments from the interviewed exchange students regarding the subject. We will first go over the statements of the Finnish interviewees, before moving onto those of the Japanese interviewees. Finally, we will analyze the similarities and differences between the statements of the interviewees of both countries.

6.1 Finland

In this chapter, we will go over the interviewees' views about ICT in teacher training and supplementary training in Finland, especially whether they find it to be sufficient. After the teachers and teacher trainers' views, we will also take a look at the Finnish exchange students' ICT background, as it might provide valuable insight on what kind of role ICT has had in education in the past, before the new curriculum came to be.

6.1.1 Teachers and teacher trainers' views on ICT in teacher training

As mentioned in chapter 3.1.4, the University of Jyväskylä curriculum includes two separate ICT courses. The first one covers the ICT basics required to get through university studies, and the second concerns the pedagogical use of ICT (Katja). But the interviewees from the university (Anna, Katja) pointed out that ICT is also integrated into other courses of the degree program, especially into subject studies, where the teacher students learn about the subjects that they will be teaching to their pupils (Appendices D and G, question 4). For example, music subject studies might include utilizing GarageBand software to compose musical pieces with technology, or art subject studies might include editing images or videos or drawing on iPads. In addition, one of the classroom teacher study groups is centered around ICT more than the others, providing the students with a chance to specifically focus on the use of ICT during their classroom teacher studies (Emma).

When inquired whether they found the amount of ICT in the degree program sufficient (Appendices D and G, question 5), the majority of the university interviewees answered negatively. One was on the fence and felt like the necessary skills can also be picked up in work life. However, all of them felt that no extra courses in addition to the existing two were necessary, but that ICT should instead be even more strongly integrated into the entire program as a whole. One of them also pointed out that the use of ICT in the program should be defined in a more detailed manner, so that all of the classroom teacher study groups would consist of similar content, and all of the teacher trainees would learn the same skills. In fact, interviewees Katja and Emma explained that they were in the process of redefining and updating the degree program from these points of view. Maija also expressed her wishes of including a practical internship into the program, where teacher students would cooperate with teachers in a real classroom environment to implement a phenomenon-based project together, utilizing ICT.

6.1.2 Teachers and teacher trainers' views on ICT in supplementary training of teachers

Interviewee Katja explained (Appendices D and G, question 8) that annually, funding for organizing supplementary training for teachers can be applied for from Finnish National Agency of Education. Supplementary training can be organized for example by municipalities, volunteer networks or private companies. Teachers may participate in training either outside of classroom hours, or during classroom hours if a substitute teacher can be hired. There are no official requirements for teachers to participate in supplementary training in Finland, although the employer might expect it.

According to interviewee Maija, a large part of the supplementary training for teachers is provided by the municipalities in which they work (Appendices D and G, question 8). Maija also spoke of a Central Finland region-wide Digital tutor network, which she described to be one of the most organized and efficient networks in the country. Many of the Finnish interviewees, both teacher trainers as well as teachers, had been actively involved in organizing supplementary training. Those working at the university teacher training facility

provided training mainly through the university, whereas several of the teachers were involved in volunteer networks or requested to train colleagues by the employing school.

One of the teacher trainers, Emma, has been organizing long-term supplementary training in Finnish language and literature, and has included themes such as multimedia learning environments, multiliteracy and collaborative writing in the training. Communication and social interaction are also heavily based on the internet in the modern age. She has aimed for integrating ICT into the training in a subtle way, making it a natural - even hidden - part of the course instead of placing it in a central role. Subject matter and the pedagogical point of view are always in the center of her course. She felt that this approach was beneficial especially to teachers, who felt negatively about the use of ICT, and were not interested in using it at the beginning of the course. She reported that it seems to work, as teachers get to dabble in technology without noticing its presence as the course progresses through subject matter, before finally challenging the teachers to use new ICT tools at the end of the course, where they generally feel more comfortable with it.

When asked what kind of ICT training the teachers had received (Appendices C and F, question 4), some of the teachers answered that they have not taken part in much or any training in recent years. Pekka explained that during his second year as a teacher he had a longer 10-day training, but since then ninety percent of his ICT skills have been learned independently. He did add, however, that when training others, he usually also learns something himself. Heikki also concluded that although he has not received barely any official training at all, he has learned from discussions with other teachers. Most of his skills however have also been learned independently. Matti estimated that he participates in training once a year, and the rest of the time he studies independently, "mainly through trial and error". Seija mentioned independent study as her main source of training as well, but in addition she had been taking courses at the university and participating in staff training whenever a new technology was adopted at the school.

When those of the teachers that had received ICT training were inquired whether they found it to be adequate, the answers were diverse. Seija found her ICT training to be sufficient and considered that she can easily find more information by herself if there is for example a

program that she needs. Pekka stated that since he had not received any ICT training during his teacher studies and was - as a young male teacher - expected to know about ICT, he very quickly had to start learning about it by himself. Matti answered with a "yes and no", stating that the training leaves much up for the consideration for the teachers themselves, and teachers tend to forget the content of the training unless the topic is close to their interests or applicable to a current project in the classroom.

When asked whether their peers had received similar training, Seija responded that some of the training provided by the school is mandatory, or training that is organized to all teachers, whereas some of the training is voluntary. It is up for the teachers, however, what they do in their free time. Pekka described a similar arrangement in his school, where everybody takes part in certain training, but for most of the training the participation is up for the teachers' own interests. Heikki suspected that all the teachers who use ICT very actively have learned of its use independently, even though he did feel that the amount of training has increased in the past few years.

When the teachers were asked what kind of ICT training they thought would be useful for teachers in the future (Appendices C and F, question 13), the answers revolved around the words "practical" and "pedagogical". Seija described an approach where ICT acts as a support for learning, and the focus is in other content. She gave an example of teaching programming by tying it together with other content, such as reading comprehension or storytelling. She also emphasized practical training that is easy to integrate into one's work, preferably organized at the school. Heikki focused on pedagogical training, where the devices support pedagogy rather than take the center stage. He would also discuss technology's meaning in modern society and aid the teachers in ruling out some ICT content, since he felt that it is simply not possible to focus on everything. Pekka suggested training that would mix two methods, combining a traditional lecture and practical project. Teachers would first learn theory, and then implement it in practice with the help of ICT tutors. Matti stepped out of the context of training in a traditional sense, and vouched for having one pedagogically skilled ICT support person at the school, without their own class to teach, to focus only on implementing the use of ICT in the classroom, together with the teacher. That way, the everyday support of the teachers would be secured.

6.1.3 Finnish exchange students' views on ICT in studies

One of the exchange students, Elli, is a student in early childhood education. She had taken part in a compulsory course for all the students at her home university where basic skills such as Word, Powerpoint and Excel were covered (Appendices E and H, question 3). She was happy with the training she had received both at the university and at her earlier education in Finnish primary school and high school. She felt confident in her skills (Appendices E and H, question 4) and said that she feels that she has adequate skills in basic computer skills and good skills in media literacy. She also did not mention which other type of training she would have needed.

Even though one of the Finnish exchange students, Keijo, was majoring in ICT, he felt that he had not had enough training when it came to ICT (Appendices E and H, question 4). In fact, his ICT training must have been more extensive than other interviewees', but his criticism of the training he had received was focused on theoretical aspects of the topics that he had learned, and he felt he would have benefitted more of the kind of training that would have had a more practical orientation. Thus even he did not feel confident about his ICT skills, naturally in relation to things he needs to accomplish in his future work.

6.2 Japan

In this chapter, we will go over the interviewees' views about ICT in teacher training and supplementary training in Japan, especially whether they find it to be sufficient. After the teachers and teacher trainers' views, we will also take a look at the Japanese exchange students' ICT background, as it might provide valuable insight on what kind of role ICT has had in education in the past, before the new curriculum came to be.

6.2.1 Teachers and teacher trainers' views on ICT in teacher training in and supplementary training

Based on the interviews of teacher trainers Kobayashi-sensei (specialized in educational technology) and Miyauchi-sensei (specialized in English), ICT training is not in a prominent

role in teacher training in Japan (Appendices D and G, question 4). Kobayashi-sensei teaches one course for the students that deals with ICT in education, but that course is not compulsory for teacher trainees. In the course students are introduced to e.g. digital textbooks and working with the interactive whiteboard. Some of the themes covered in the course also include using media in class and programming education, and the course content includes making ICT lesson plans for affiliated primary schools.

There is also a basic course for students where they learn how to use e.g. Word and Excel, but in general both of these teacher trainers were of the opinion that more training in ICT would be useful for students. One of the teacher trainers working in the school mentioned the observation of classes where ICT is used and talking about them with the teachers as an important way to learn.

Japanese primary school teachers mentioned that in their schools, training is organized by the Board of Education in the form of a workshop (Appendices C and F, question 4). This kind of workshop is organized at least once a month and all teachers are supposed to attend it. Primary school teachers receive additional help and support also in their schools from other teachers who have experience and knowledge, and they get help from other teachers in the form of peer teaching. The number of workshops arranged and additional support in the form of visiting teachers depends on the resources allocated for this by the local Board of Education. However, observing classes taught by skilled teachers was also mentioned as one method of training. The training available is on offer to everybody in the local school but one primary school teacher pointed out that not everybody benefits from the training in the same way, as that was dependent on the kind of skills the teachers possess before the training.

All but one primary school teacher would like to receive more training and they would like it to be practically oriented so they could apply their new skills instantly “on the spot”. When asked what kind of training would be useful in future (Appendices C and F, question 13), the teachers gave practical answers that concerned everyday tasks in the classroom, such as showing one pupil’s work to other pupils and also kept in mind the upcoming changes in the national curriculum and the ability to teach programming. Only one of the primary school

teachers felt confident about his skills and pointed out that he did not need training in terms of skills but it would be in his interests to learn more about what kind of useful software is available. The other interviewed primary school teachers, however, were of the opinion that their pupils have better ICT skills than they themselves do.

6.2.2 Japanese exchange students' views on ICT training

Yanagawa-san, who graduated as a classroom teacher from a Japanese university within the last 5 years, explained that they had one ICT course in the university, in which they learned how to use the university account, to open Moodle and to use Microsoft Word and Excel (Appendix E, question 3). The course was mandatory to all of the university students, not only education students, and mainly aided the students to utilize the ICT tools that were necessary for getting through their program. She estimated the course to be around 4 ECTS. Yanagawa-san concluded that the course did not really develop her ICT skills further than they already were, since the same tools such as Excel had already been covered in the ICT classes in junior high school and high school.

Yanagawa-san did, however, also take a voluntary 3-day intensive course called "Introduction to programming education" in her last year of bachelor's degree. During the first day, the students learned how to use Scratch and also delved a bit into PHP. By the end of the day, they also had to make a teaching plan as to how to teach Scratch and programming basics to pupils. During the second day, the students had to conduct a class in front of real pupils in a real classroom environment. At the end of the day, the students had reflection on how the day had gone. The third day also included teaching programming in a real classroom. This course was also around 4 ECTS, since despite its short length it was rather intensive. Yanagawa-san felt that the course offered some great insight to using Scratch in education, but at the same time that the course was too intensive and fast-paced to truly feel confident in her skills.

Hanzawa-san had also had a class on Microsoft Word, Excel and PowerPoint in high school (Appendix E, question 3). She also felt the course to be insufficient in teaching her ICT skills, since when she entered university, she ran into problems with ICT and had to ask for

assistance from older students. Nonetheless, she had felt like she had had many opportunities to use ICT in her Japanese university, but when she came to Finland as an exchange student she found herself learning more about ICT and having even more opportunities to use it. Hanzawa-san majored in music education and explained that in Japan her music classes mainly consisted of classical instruments, and ICT was not present in the practice room. She described that she was very surprised to discover a PC and recording system in the school's music practice room in Finland, and that ICT tools such as music applications on smart devices were heavily used in education. Although she had initially felt somewhat skeptical about their presence, she now felt that they were important for the pupils in music education.

Ozaki-san, who was studying to be a teacher, had taken one compulsory course in ICT which effectively dealt with “how to write a report” (Appendix E, question 3). She did not find this course particularly useful for her. She also mentioned that there was a course available which focused on educational technology but which was optional. When she came to Finland as an exchange student, she was surprised to see how much ICT was in use in every classroom, and she was particularly impressed by the Finnish teachers’ interest in students’ opinions and how by using technology these were made visible to other students (Appendix E, question 5). In this connection she mentioned the concept ‘active learning’ which is used in Japan and felt that perhaps this had not been correctly understood in Japan, since active learning there did not really include answering open questions. She saw this as a difference in the pedagogy between the two countries and preferred the open questions since that provided students a chance to develop their thinking and to come up with their own opinions. When it comes to her own skills, she did not clearly mention whether she felt confident about her own skills or not (Appendix E, question 4).

6.3 Similarities and differences in teacher training and supplementary training

Both countries included a general ICT course in the bachelor’s degree program of the teacher students that was mandatory for all university students. The content of this course in both countries was also similar, mainly dealing with practicing to use Office software such as

Word or Excel and familiarizing oneself with the school's ICT environment. Both countries also had a pedagogical ICT course for students with similar content, but whereas in Finland the course was mandatory for the students, in Japan it was not. One major difference in teacher training between Finland and Japan is the level of qualification required for a teacher position in a primary school. In Finland, generally a master's degree in education is required (with some exceptions in accepting degrees from nearby countries), whereas in Japan a bachelor's degree is sufficient.

The teachers in both countries yearned for a practical approach in supplementary training - one that could be easily adapted into the classroom. Another big difference, however, was to be found in the role of supplementary training in the teachers' careers. In Finland, teachers are not required by law to participate in supplementary training throughout their careers. The employer might organize training at the school and expect their teacher employees to participate in it, much like in any other job, but should the school not organize their own training, the teachers are not required to seek or participate in training elsewhere. In Japan, on the other hand, teachers are required to prove every 10 years that their skills are up to date, requiring a minimum of 30 hours of training, as stated in chapter 3.2.4.

Another interesting difference between the two countries lies in the acquisition of a teacher post in a school. In Finland, an open vacancy in a school is advertised in public similarly to other jobs, and qualified teachers are able to apply for open teacher positions in any school freely. The school will then review the applications, and generally hold job interviews for the most prominent candidates, selecting the candidate of their choice freely, but fairly; the Finnish legislation expects an employer to select the most qualified person without any bias regarding for example age or gender. In Japan, as explained in chapter 3.2.3, graduated teachers take a hiring exam organized by the prefectural board of education, and the teachers with good scores will be hired first. A newly hired teacher spends the first year with reduced responsibilities, being mentored by a more experienced teacher. After that, they become a full-time teacher. A new teacher's assignments change every three years. This leaves Finnish teachers with a lot more freedom towards where they want to apply for work, even though the hiring process might be less transparent to all candidates than a standardized exam.

As explained in chapter 3.2.5, mentoring is an important part of a teacher's work in Japan, especially in the early stages of his/her career. New teachers are expected to observe and imitate more experienced teachers and model their own teaching accordingly. Observing classes taught by skilled teachers was mentioned as one of the methods of ICT training by the interviewed teachers in chapter 6.2.1. Although in Finland ICT tutors were mentioned as having an active part in the ICT training of teachers in chapter 6.1.2, their role is fundamentally different, as they provide assistance to teachers in implementing the teachers' own goals in the classroom as equals, rather than from a higher point in hierarchy. The answers have been summarized in Figure 2.

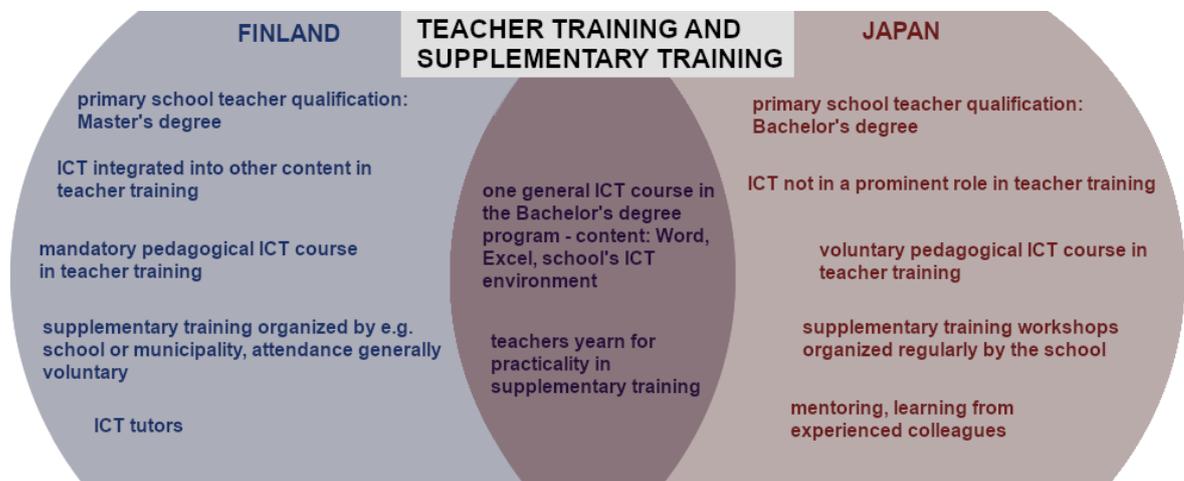


Figure 2. Features of teacher training and supplementary training in Finland and Japan. Center represents both countries.

7 Devices and supporting processes for ICT in primary education

Utilizing ICT in education requires, first and foremost, devices. In this chapter we will cover what the teachers reported the available ICT equipment to be at their respective schools. After covering the devices, we will move onwards to summarize what kind of technical and pedagogical support the teachers have received in the use of ICT in the classroom. It is an important topic, since according to a survey conducted in 2001 (Pelgrum 2001, 173), the lack of supervisory and technical staff is a frequent obstacle for utilizing ICT in education. After presenting a summary of both countries' answers in turn, we will analyze the similarities and differences between the answers of the two countries.

7.1 Finland

In this chapter we will first go over what kind of devices were available in the Finnish teachers' schools. Then, we will take a look at ICT tutors and pedagogical support in general, as well as technical support - and discover the close-knit relationship between them.

7.1.1 Teachers and teacher trainers' views on devices

The teachers were inquired what kind of ICT equipment is available at their school (Appendices C and F, question 8). Heikki's school had one computer room, where there were devices for about half of the pupils of one class. In recent years, however, the school had also acquired enough iPads to cover a full classroom of pupils. In Pekka's school, there were 1-to-1 Chromebooks for every 4th and 5th grader as well as for every teacher, and a computer classroom of 25 computers, as well as 25 iPads. The devices were rotated between classrooms according to booked reservations. In Matti and Seija's school each classroom was equipped with an interactive display (ie. interactive whiteboard), a computer for the teacher and a document camera. In addition, all classes had, at the minimum, a cart of iPads that was shared between three classrooms and could be reserved by booking, and some classes had their own 1-to-1 iPads for the pupils that they could take home. Other available devices

included Chromebooks and VR glasses. The answers were in line with the 2016 Keski-Suomi ICT survey (Kenttälä et al 2017, 12), according to which 92% of the schools have a video projector and 82% of the schools have tablets.

The teachers were also asked whether they found the equipment sufficient (Appendices C and F, question 9). Despite residing in the school with the smallest amount of devices out of the interviewees, Heikki was satisfied with the amount, even if a few other teachers at his school had longed for more devices, and felt that the training of teachers is far more important than the sheer amount of devices available. Pekka found his school's amount of devices to be fairly good, since now there was one device per two students, but considered that there could be more of them. Seija found the school's devices to be plentiful, and she described that they were able to acquire more if there was a justified need. Matti also agreed that the devices and software were sufficient at the school.

The device budget is decided by the municipality (Appendices C and F, question 9), generally per amount of pupils in the school, and the amount of devices is dependent on the school itself, where it is decided which devices to spend the budget on (Heikki). Seija described that her school has an ICT board that makes decisions about ICT acquisitions and upgrades.

7.1.2 Teachers and teacher trainers' views on ICT tutors and pedagogical support

ICT tutors (Appendices C and F, question 11) are, in general, teachers who have taken on ICT tutoring responsibilities in their work environment on top of their usual teacher duties, often out of personal interest in the use of ICT, gathering experience and expertise by delving into ICT during their free time (Heikki). One of the ways to provide support is to attend other teachers' lectures and help out with ICT during the lesson - interviewee Pekka explained that he has a couple of hours per week allocated for this purpose. Interviewee Matti described his previous school, where the school had generally used the funding to enable teachers to take a break from teaching for a limited time to focus on ICT-related tasks such as creating guides.

Interviewee Heikki talked about the local ICT tutor activity, elaborating that ICT tutors from different schools have meet-ups together to go through ICT topics and learn from each other. He also explained that besides the group activities and meetings, the ICT tutor network

enables forming direct contact with other ICT tutors, to whom they can then turn to when facing challenges with using ICT in education.

Besides the more common case of teachers with additional ICT responsibilities, also dedicated ICT tutors exist, especially in bigger schools or municipalities. In the upcoming year in the school that interviewee Matti was describing in the first paragraph of this chapter, the funding was to be used to enable one teacher to become a full-time ICT pedagogical support, allowing them to help other teachers with the use of ICT in practice by assisting the teachers during their lessons. For example, the ICT tutor and a teacher would re-invent a classroom project to use ICT and plan it together, and then implement it in the classroom so that the ICT tutor also attends the lessons and ensures that the use of ICT proceeds smoothly by assisting whenever needed. Matti himself had also given similar support in several schools for longer periods of time, and found this approach very efficient, as it eases the teacher into the use of ICT gradually.

In some instances, the pupils have been part of ICT tutor activities. Interviewee Seija explained that every now and then, ICT-related club activities are available for pupils, and a few years ago, one of the club activities was receiving training and acting out as for example iPad support. She also described a practice that is still prevalent today - a sort of mentorship, where older pupils act as mentors or guides to younger pupils, and one of the activities consists of older pupils teaching ICT to the younger pupils, as a sort of peer learning exercise.

7.1.3 Teachers and teacher trainers' views on technical support

Aside from pedagogical support, technical support is also needed with the use of ICT. After all, devices need to be maintained and updated, and they may occasionally malfunction. The teachers were inquired what kind of technical support is available in their school environment (Appendices C and F, question 10). At Pekka's school the ICT responsibilities are split among three people, one of whom maintains AV devices, and Pekka himself focuses on computer maintenance, besides the pedagogical support. In addition, helpdesk is available via phone. Seija described that her school has a group of ICT representatives; teachers, who have received training, and are able to provide technical support in most cases. When devices

malfunction or the teaching staff do not have rights to attempt to fix a software-related problem, PC support is contacted.

Unfortunately, as Matti who works at the same school commented, there is only one dedicated support person for the whole school in the centralized PC support, which he felt to be insufficient, considering the large amount of devices at the school. He also elaborated that in smaller schools ICT tutors are the sole source of technical support. This was confirmed by interviewee Heikki, who described that when he was given the title of ICT tutor at his school, to his surprise he was abruptly bombarded with a variety of ICT questions the following day, expected to automatically know the answers and solutions to everything ICT-related because of his title. After getting used to his new position and building enough expertise, he does feel like the arrangement works better than before. He explained that before ICT tutors became technical support, technical support could only be reached by a phone number, and it was difficult to receive support quickly and easily. In his point of view, the best way to receive support is to get it from the people who are located at the school.

7.2 Japan

In this chapter we will first go over what kind of devices were available in the Japanese teachers' schools. Then, we will take a look at ICT tutors and pedagogical support in general, as well as technical support.

7.2.1 Teachers and teacher trainers' views on devices

The teacher training school's situation and the other schools' situations seemed to be quite similar when it comes to devices that the schools have access to (Appendices C and F, question 8). The teacher training school seemed to be quite similarly equipped in comparison to other schools in the sense that the teacher training school had e.g. two screens for six classes in one floor to use. These screens are moved from one place to another, meaning that all classes do not have access to a screen at all times. Not having enough access to devices was mentioned as one reason for ICT not being used so much in classes. However, it was also pointed out that with the change in the national curriculum in 2020 the resources would have

to be increased. The goal is to improve the situation gradually so that by 2025 all pupils would have their own tablet to use.

Japanese primary school teachers had access to the same devices in both schools: they had pcs, tablets, digital cameras and screens. In these schools, pupils either had a tablet they could use (but not all the time), or they shared the tablet with another pupil. They could also spend time in the computer classroom. The number of devices varied in different schools, but the general opinion of the primary school teachers was that there were not enough devices in relation to the number of pupils in their schools (Appendices C and F, question 9). In one school there was no Wi-Fi so even though they had tablets, they could effectively only use them as digital cameras and recorders. The school principal and the person responsible for ICT made the decisions concerning equipment in primary schools (Appendices C and F, question 9).

7.2.2 Teachers and teacher trainers' views on ICT tutors and pedagogical support

For teacher trainers in the teacher training school, the concept of an ICT tutor sounded familiar and it was mentioned that there are two of them in their school (Appendices C and F, question 11). In the teacher training school there are 30 teachers altogether and 600 pupils. From the Japanese perspective, the two teachers who could be considered ICT tutors are more experienced teachers who are familiar with the use of technology. However, one of the teacher trainers also pointed out that this was not a common system in Japan, because ICT was not considered a school subject. Although ICT tutors were not yet common in Japanese schools overall, according to Kobayashi-sensei, "Ministry of education are now trying to put one ICT assistant to, for every four schools". Thus, the goal was to not have one ICT tutor per school, but one per four schools.

The concept of an ICT tutor was not familiar to primary school teachers (Appendices C and F, question 11), but they grasped the concept quickly because there were similarities in the Japanese system in comparison to the Finnish system. The biggest element of surprise for the primary school teachers was that also pupils could be ICT tutors. They said that they don't have any particular ICT tutors in school, but that besides the training arranged by the

Board of Education, teachers who have more experience help others. Whilst they were initially surprised to hear that pupils could be ICT tutors, one of the primary school teachers also mentioned that in her school the more skillful students teach the students who are not so skillful.

7.2.3 Teachers and teacher trainers' views on technical support

Japanese primary school teachers said that there were two ways to get technical support (Appendices C and F, question 10). One of them was a visiting computer support person. In some schools this support person came at least once a month, but in another school this person's visits had been halted because of the economical situation. The decisions about the visits are made by the local Board of Education. The second form of technical support available in primary schools is consulting the teachers who are experts within the school itself.

7.3 Similarities and differences in supporting processes

Although all of the Japanese teachers were not familiar with the concept of ICT tutors, the practice seemed to nonetheless be similar in both countries - a teacher that was more experienced in the use of ICT or possessed good ICT skills would provide assistance to other teachers. Another similarity between the countries in this area was the difficulty in reaching technical support. In both countries, teachers had taken up the role of technical support, providing assistance to their peers when needed.

The differences between the countries accumulated in the availability of ICT equipment in the schools of the interviewees. In Finland, each classroom was equipped with basic ICT equipment, such as a teacher's PC and screen or smartboard and a document camera, and in addition some schools had 1-to-1 devices for the pupils, consisting of either tablets or Chromebooks. Many schools had tablet carts that could be booked to get tablets for the classroom (either 1-to-1 or one tablet per two pupils), and every school seemed to have a PC room that could be booked for lessons. In Japan, the amount of ICT equipment varied from school to school. In general it can be said that there were less possibilities to use ICT equipment than what the teachers would have wanted to do. Unlike in Finland, each classroom

did not have e.g. a screen to use but in some situations the screen was movable and had to be shared with other classes. Also, the number of tablets was not sufficient in all schools for the pupils to have their own tablet to use. Even if the school had tablets, their use could be limited if the school e.g. did not have Wi-Fi at all. To sum up, our impression based on the interviews was that the Japanese schools did not have as much equipment as the Finnish schools.

Considering the major difference in the availability of devices, it seems logical that the Finnish teachers found their ICT equipment to be sufficient, whereas the Japanese teachers did not, and considered that their use of ICT greatly suffered due to lacking ICT equipment. These findings have been summarized in Figure 3.

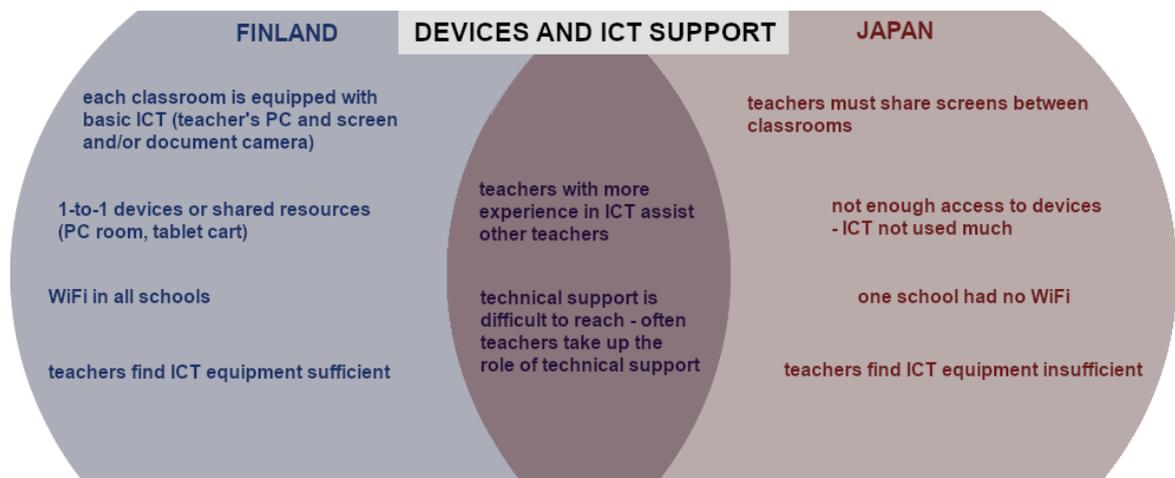


Figure 3. Interviewees' statements about the ICT equipment and ICT support in their schools. Center represents both countries.

8 Use of ICT in primary education in practice

The previous chapters covered ICT in curriculum and teacher training, as well as the supporting processes for the use of ICT in classrooms. How, then, do the curriculum, the results of the training and the available devices show up in practice? This chapter goes over the findings of how ICT is used in primary education in practice, based on the interviews of the primary school teachers.

8.1 Use cases of ICT in Finland

The teachers were asked how they use ICT in their work in practice (Appendices C and F, question 5). The use cases of ICT that the Finnish teachers mentioned were numerous. Most often ICT was mentioned as a tool to create; it was used for writing essays and making presentations, videos, websites and e-magazines, but also for programming, animating, and 3D modelling, latter mainly for use in 3D printing. ICT was also viewed as one of the common classroom tools: digital textbooks and cloud platforms were mentioned. More exotic examples of ICT were for example 360° photos, greenscreen technology, and VR, the latter of which many teachers mentioned to be an occasional spice to create a wow effect rather than a standard classroom tool. Some example cases of the use of ICT with the youngest pupils was to learn how to use tablets and using apps such as BookCreator or Scratch Junior on them. For example, Seija had had her first graders create an art portfolio in BookCreator.

Cloud platforms, such as Google Suite or Microsoft Office 365, seemed to be in general the basis for the use of ICT in primary schools that the interviewees had been teaching at. One interviewee (Pekka) pointed out that with cloud platforms, the tools can be used among teachers as well as with the pupils. He brought up the importance of ICT in the teachers' daily lives, since ICT tools can make for example managing teaching materials and grading pupils' work significantly easier. One interviewee (Heikki) highlighted collaborative tools, for which cloud platforms often offer various useful features. Another (Matti) spoke of a similar aspect, the ease of access of digital tools and materials. A paper poster made in class as group work can not be taken home by all of the group members, but a digital presentation or video can be accessed by all of the group members even after the presentation has been

displayed in class. In general, he described his goal of making digital tools as easy to pick up as standard pen-and-paper tools, so that whether the pupil walked over to a box to pick up classroom tools or started up a cloud storage application, it would feel just as natural. Seija brought up a similar point of view, describing how she sometimes lets her pupils choose whether they would rather work on the assignment with a pen or with a tablet.

Aside from teachers who use ICT frequently in their work, there are also teachers who do not actively utilize ICT in practice. Teachers have great liberty to organize their own teaching, and no one supervises their teaching methods. One drawback from this is that the skill development of pupils is very dependent on the skills and level of interest of their teacher. Interviewee Maija described how her three children had all received different sets of ICT skills in school. One of her children had had the same classroom teacher for 4 years. The teacher had been close to retiring and had decided to completely abstain from integrating ICT into their teaching. Interviewee Emma also spoke of teachers, who might have negative feelings towards ICT, and at the most extreme scenarios, decide to only include "traditional methods" in the classroom, since in their view children already use enough ICT outside of the school environment. Even in less extreme scenarios, a teacher might make the first introduction of ICT to their pupils in 4th grade by taking them to the "PC room" to examine computers in wonder, which Emma regarded as a nightmare scenario.

When the teachers were asked whether their colleagues use ICT the same way as they do (Appendices C and F, question 6), Pekka considered that especially programming was mostly his responsibility, elaborating that a few hours of his work time per week was reserved for assisting other teachers. Otherwise, almost all teachers in his school use ICT, some more and some less. The quantity of electronic teaching material was seen to greatly affect its use. Matti felt that the teachers at his school are fairly enthusiastic about the use of ICT and they have received plenty of training in it, and devices are also readily available. Seija commented that all of the teachers have the opportunity to utilize it, even if it does depend on the teacher how the use will be implemented.

When asked what kind of ICT skills the teachers teach to their pupils (Appendices C and F, question 14), Pekka listed cloud-based writing, creation of images, presentations and

animations, latter of which he felt to be good for combining many things. Practicing typing skills in typing software called Näppistaituri was also mentioned. Matti named the device using skills and overall working skills, latter consisting of for example the ability to plan one's work and implement it. Other described content included for example the use of cloud services, the management and sharing of files, programming and typing. Heikki also mentioned text-based and image-based content creation, but also cooperation, and documenting one's skills, for example in the form of a portfolio. Seija also named word processing, content creation, typing and programming as ICT skills she teaches her pupils, but also explained that she makes a point of not teaching everything about a tool to the pupils. She prefers showing the pupils only the necessary basics, after which they can start using it and discover more by themselves and teach each other.

8.2 The use of ICT in Japan

In this chapter we will cover the use of ICT in Japan in practice. We will first cover the common use cases before moving onto programming and robotics, which become relevant once the new curriculum takes place.

8.2.1 Use cases of ICT

Microsoft Office programs such as Word and Powerpoint were commonly used in the schools of the interviewed Japanese teachers (Appendices C and F, question 5). Also the general use of the internet was mentioned as a tool. Example topics mentioned included pupils using computers to research information about their chosen topics in order to be able to give a presentation (e.g. historical details or special subjects in Japan) or using computers to demonstrate e.g. with Google Earth how mountains are shaped, or finding demonstrations about the movements of the stars - as one of the teachers put it, seeing is believing. When it comes to languages, pupils can use the computer for e.g. listening to English. One teacher mentioned that due to the lacking Wi-Fi in his school, they could mainly only use the iPads as cameras and recording devices.

In addition to Microsoft Office and general internet usage, some Japanese educational programs and applications were in use in the Japanese schools. The Japanese software or applications mentioned in the interviews were Loilo Note (ロイロノート), Just Smile (ジャストスマイル), School Intra Pack (スクールイントラパック) and a fourth application which did not have an English name but was called 学習探検ナビ in Japanese - consisting of the words study or learning (学習, *gakushū*), exploration (探検, *tanken*) and navigator (ナビ, *nabi*).

As we had never encountered these tools before, we proceeded to search for information about them. We discovered that Loilo Note is a virtual workspace tool where users can save information as multimedia cards. Just Smile enables practising the use of the keyboard and the mouse. School Intra Pack is a web-based collaborative learning software, where the pupils can e.g. write their notes or reports and the output is in HTML format. 学習探検ナビ is a software that enables independent learning, and includes content from the subjects of Japanese, social studies, mathematics, science and English.

All Japanese primary school teachers interviewed mentioned that pupils' ICT skills were not evaluated as such. If the outcome of the pupils' work was e.g. a Powerpoint presentation, it would get evaluated, but the focus of the evaluation would be more in the content rather than in the production of the work.

8.2.2 Robotics and programming in education

Since programming was going to be introduced in Japanese schools in 2020, we also managed to get insight into what kind of equipment will be used in teaching Japanese children programming when teaching will be carried out according to the new curriculum. One of the teacher trainers, Kobayashi-sensei, had profound experience with educational technology and also had a clear vision of what could be used in teaching programming to pupils. He had been training teachers in different schools in the Ishikawa prefecture, and had a practical approach to the topic.

Kobayashi-sensei explained that smaller children learn how to control a simple robot and learn to draw figures in Scratch. Inspiration had been drawn from European and other Asian countries. He also elaborated that wealthy schools use Lego Mindstorm robots for programming practice, while other schools use different robots, such as Cam-Program Robot (カムプログラムロボット). Cam Robot uses the British Micro:bit as its base. Another similar technology mentioned was Ichigo Jam software, which can be combined with the Raspberry Pi to create a programming environment. Also Sphero was mentioned, and Kobayashi-sensei presented pictures of several other robots, saying that these materials were plentiful in Japan.

8.3 Similarities and differences in the use of ICT

Office programs such as Word, PowerPoint and Excel were used in the schools of both countries. In Japan, the platform was generally always Microsoft Office, whereas in Finland the platform varied between two cloud-based platforms, Google Suite and Microsoft Office 365. Writing essays in Word or similar applications and making presentations in PowerPoint were common practice in both countries. Also general use of the internet in for example searching for information was mentioned in the interviews of both countries, as well as overall device using skills. ICT was not a subject of its own in either of the countries, and was not evaluated as such.

Other than that, the ICT use cases differed greatly. Each country seemed to have their own common applications. In Finland the programming tool Scratch got mentioned numerous times, but the Japanese teachers did not name any programming applications or tools in their interviews. Of course, programming was not yet included in the curriculum at the time of the interviews, and one of the teacher trainers was able to provide examples on what kind of programming tools could be used in the future. Novelty ICT tools that were mentioned in the Finnish interviews, such as 360° photos, greenscreen technology and VR, were missing from the Japanese interviewees' schools entirely.

Although the pupils did research, wrote essays and made presentations in both countries, based on the interviews it seemed that in Finland, creation on different platforms (eg. images, videos, animation) had a central role in the use of ICT, whereas in Japan, demonstration was

emphasized more (Google Earth, star movement, English listening exercises). These findings have been summarized in Figure 4.

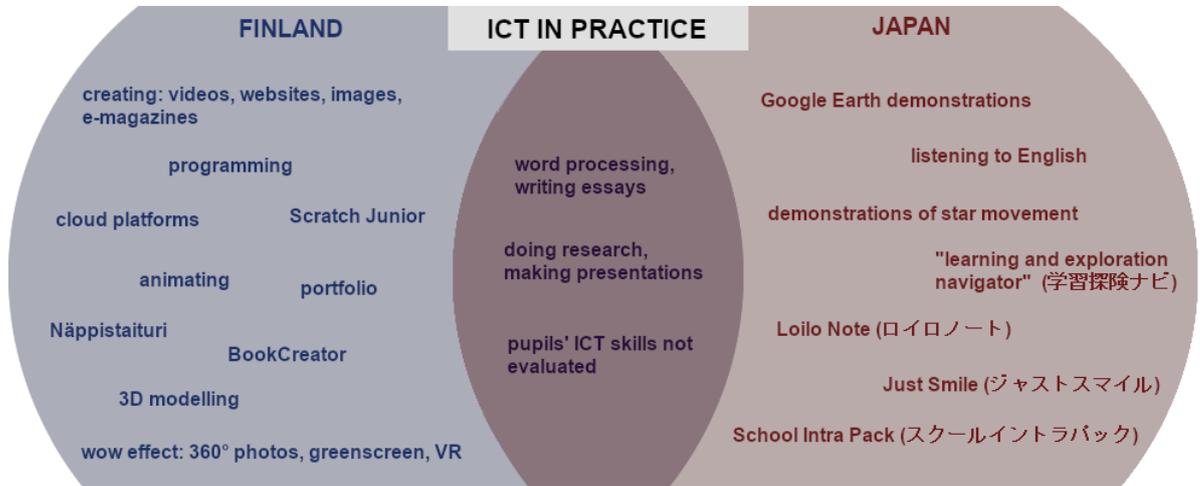


Figure 4. How interviewees described their use of ICT in practice in Finland and Japan.

Center represents both countries.

9 Conclusion

In this chapter we will further analyze and discuss the findings of this research by answering the research questions posed in chapter 1. After the questions have been answered, we also want to highlight some best practices and good ideas that were mentioned by the interviewees throughout the interviews. We will then proceed onto reflection, after which we will cover the reliability of the research, and finally move onto the limitations of the research and suggestions for future research.

9.1 Answers to research questions

In this chapter, we will answer the research questions stated in chapter 1 based on our findings.

9.1.1 How do the teachers of the two countries perceive ICT and its use in education?

As covered in chapters 5.1.1 and 5.2.1, primary school teachers in both countries saw ICT mainly as a tool to be used in the classroom. In Finland, use cases such as pedagogy, work and every day scenarios came up in the answers. ICT was compared to other classroom tools, such as notebooks and pencils, and its main purpose was seen as support for teaching and learning goals. In Japan, collaboration was mentioned, and the teachers were keen on focusing which available tools can be included in ICT.

The attitudes of teachers in both countries were seen to vary. In both countries the teachers felt that those who have a positive attitude or personal interest towards ICT will use it in great amounts, whereas the teachers who have a negative attitude or little interest in ICT will use it as little as possible. One Finnish primary school teacher elaborated that they had witnessed both extremes in their school environment, and one Japanese primary school teacher contemplated that the gap between the two extremes can be considerable. Another Japanese primary school teacher pondered that if the teacher's ICT skills are not sufficient, it is not possible to show the children an example. Despite these mixed views on the ICT attitudes of teachers in general, all of the interviewed teachers found ICT in education to be useful.

When inquired why, the Finnish primary school teachers gave examples of being able to fetch, mold, edit and create both information and creative structures. Japanese primary school teachers pointed out that ICT can function as a visual aid that can give instant feedback to the pupils. Both Finnish and Japanese teachers mentioned involving and activating students as one useful part of ICT, as the pupils can find information by themselves, and how it can make things easier for teachers by shortening the time spent on handling evaluation data or teaching certain topics.

Overall, the teachers in both countries shared the majority of their views: perceiving ICT as a classroom tool, witnessing split attitudes towards ICT from both extremes and finding ICT in education to be useful, both from the initiative of the pupils as well as the workload of the teachers. Visual aid to learning was something that was only mentioned in Japan, where overall demonstration had a stronger emphasis in the use of ICT, while ICT as a tool for creation received a central role in Finland.

9.1.2 What kind of supporting processes have been set up to support the use of ICT in education in Finland and Japan?

As discussed in chapter 6.1.2, in Finland some of the supplementary training of teachers is organized by the schools, and occurs about once or twice a year. Some of the training organized at the schools was mandatory, while some of it was voluntary. A large part of supplementary training for teachers is provided by the municipalities. The interviewed teachers, however, had not taken part in a lot of training, although some of them had been organizing supplementary training for other teachers. All of them concluded that most of their ICT skills had been learned during their free time.

In Japan, mandatory training is organized at the schools at least once a month by the Board of Education, as outlined in chapter 6.2.1. The training takes place in the form of a workshop. Another important source of training is mentoring, which takes form as receiving support from experienced teachers, peer teaching, support from visiting teachers and observing classes of skilled teachers.

Finnish schools seemed to have sufficient devices and infrastructure, as discussed in chapter 7.1.1. In some classes, there were either 1-to-1 devices for the pupils permanently in the classrooms (tablets or Chromebooks), but even the rest had a possibility to book a tablet cart and a PC room to use. In one school, a tablet cart was shared by three classrooms, but the cart had enough devices for the whole class. In another, the PC room had enough computers for two pupils per computer. In addition, each classroom was equipped with basic utilities for the teacher, such as a PC for the teacher and a projector or document camera.

In Japan, the schools had similar tools - computers, tablets, digital cameras and screens (chapter 7.2.1). Tablets were not available at all times, but when they were, in general there were either 1-to-1 devices or one tablet per two pupils. Computer classrooms could also be booked for lessons. Overall, there were few devices per pupil, and for example a screen was shared between three classrooms. One school was lacking Wi-Fi entirely. Lack of devices was seen as a contributing factor to not actively using ICT in the classroom. This seems to align with the observations of Lander (2019, 35), who considered the abundance of technology in the classroom in Finland "to be in contrast to that of Japan".

The majority of pedagogical support in Finland centered around ICT tutors, as described in chapter 7.1.2. Teachers who were interested in the use of ICT could volunteer to become ICT tutors, giving assistance to other teachers. At some schools ICT tutors had specific hours per week dedicated to ICT tutoring activities, and in one school funding had been procured to fund a full-time ICT tutor for a year. The "New Primary School" project described in chapter 3.1.5 further elaborates the current situation with increasing the amount of ICT tutors in Finland. The teachers also spoke of an ICT tutor network, and one of them described their network contacts as an important source of assistance in chapter 7.1.2. In some instances, pupils have been trained and acted as ICT tutors in classrooms.

In Japan, as described in chapter 7.2.2, ICT tutors were not necessarily named with a title, but the function was the same. Teachers who were more experienced with ICT gave support to other teachers. This was not considered to be common, however, since ICT was not yet in a prominent role. The situation is likely to change, since as quoted from Kobayashi-sensei

in chapter 7.2.1, the ministry of education is going to ensure that there is one ICT assistant per four schools.

In Finland, some schools had specified ICT staff that also handled technical issues, and some had a helpdesk or PC support that was available via phone, as stated in chapter 7.1.3. Contacting and reaching support was not considered easy, however - the technical support might have too many devices to look after, and considering that they were not on-site, it was not quick or easy for them to visit. In Japan, technical support was provided by a visiting technical support person, as mentioned in chapter 7.2.3. The visits were sparse, however - in one school, the technical support person visited once a month, and in another, the visits had been halted due to the economical situation. In general, in both countries teachers who were more experienced with ICT provided technical support to their colleagues to their best abilities, when possible.

9.1.3 How is ICT used in education in Finland and Japan in practice?

As stated in chapter 8.3, in both countries, ICT was used to have the pupils write essays, search for information on the internet and make presentations. Generally different Office applications were used for these tasks - in Finland cloud-based Google Suite or Microsoft Office 365, and in Japan Microsoft Office. Cloud-based office applications were especially mentioned to aid the teacher in organizing their work.

In Finland, as covered in chapter 8.1, ICT was emphasized as a tool for creation for the pupils. Teachers mentioned for example the creation of images, videos, websites, e-magazines, animations and 3D models, and it was not uncommon to have the pupils assemble a portfolio of sorts. Programming and typing skills were also taught, as well as file management and sharing. Some of the applications mentioned were BookCreator and Scratch Jr for lower grades, and Scratch and Näppistaituri for higher grades. Some less common ICT tools such as 360° photos, greenscreen technology and VR were also mentioned, but not used regularly.

In Japan, ICT was especially highlighted as a tool for demonstration for the teachers, and use cases such as looking at geographical structures in Google Earth and looking up visual

models of the movements of the stars were mentioned, as mentioned in chapter 8.2.1. In addition, some applications specific to Japan were used, including Loilo Note (ロイロノート), Just Smile (ジャストスマイル), School Intra Pack (スクールイントラパック) and "study and exploration navigator" 学習探険ナビ. These applications enable saving information as multimedia cards, practicing the use of keyboard and mouse, writing reports and learning independently, respectively.

9.1.4 What kind of challenges can there be in the use of ICT in education in Finland and Japan?

As stated in chapter 5.1.2, the Finnish national curriculum presents some obstacles in the use of ICT. The use of ICT is defined so vaguely that it is up for interpretation (Katja). Although this enables municipalities and schools to create their own ICT curriculums based on the national one, the side effect is that many teachers feel like they're not obliged to personally utilize it. Interviewee Matti admitted that utilizing ICT in the classroom is largely dependent on the interest and enthusiasm of the teacher. This also results in some teachers teaching ICT heavily, others not at all, as illuminated by the stories of Maija and Emma in chapter 8.1. This sets pupils on unequal grounds and can lead to non-standard results in the ICT skills of the pupils. This line of thought aligns with the discussion in the information education and media education study of Ohashi et al (2014, 116) where it was presumed that "allowing teachers to use their own discretion in implementing IE and ME may lead to differences in the contents as well as the degree of attainment of IE or ME in each classroom".

The amount of funding in Finnish schools is dependent on whether the municipality or headmaster applies for funding - a school can not receive funding for its projects if it is not applied for, and many schools never apply, sometimes because they are not sure of what they need (Anna). This can result in resources being split unequally between schools. This is reflected on both the acquisition of devices, as well as the training of the teachers. Most of the training is organized during weekday work hours, and if the budget is tight, teachers can not always get substitutes in order to participate in training sessions. This results in teachers having to participate in training in the evenings or weekends, in which case the training becomes

completely voluntary and requires quite a bit of motivation (Katja). As an example of this, all of the interviewed Finnish teachers had been developing their ICT skills independently in their own time.

Especially in smaller schools, ICT tutor teachers end up becoming technical support for other teachers, instead of being able to focus on providing pedagogical support for the utilization of ICT (Matti, Heikki). This can result in a lot of unexpected work and cause a lot of strain on the teachers that have taken up the post of the ICT tutor. The end result was not entirely negative, since this also meant that technical support was easier to reach than before, since it was now stationed at the school (Heikki).

Teachers, like all the other workers in Japan, are very busy. As commented by Hanzawa-san, whose mother was a kindergarten teacher, even kindergarten teachers can have 12-hour workdays. She felt that there is simply no time for Japanese teachers to learn to use ICT in their own time. This seems to align with the OECD Teaching and Learning International Survey mentioned in chapter 2.3, where Japanese teachers had the longest working hours, a considerable amount of the work time being used on administrative work and extracurricular activities (OECD 2018).

All of the interviewed Japanese primary school teachers pointed out that the resources in the schools were not sufficient and had an impact on the use of ICT in their classes. The interviewed student Yanagawa-san's thoughts reflected the same thing, as she commented that some schools, depending on the municipality, can have very lacking ICT equipment. However, as stated in chapter 7.2.1, the amount of resources was likely to change with the change in the national curriculum.

Some university processes in Japan can be partially digital, creating further problems. Interviewee Hanzawa-san described the process at her home university where they had to write essays on the PC, but print them out in order to turn them in, and once the teacher had checked the assignment and returned it to the student, the student had to then scan it in order to save it to their PC or the university cloud. She felt that regulatory stamps were part of the problem, as printed papers are usually stamped to show approval or official status.

Hierarchy is something that came up in several interviews, but the results were not conclusive. For example Hanzawa-san brought up the fact that since hierarchy has an important role in Japan, younger teachers - who might be more capable with ICT - can not simply teach it to older teachers, who are higher in the hierarchy and supposed to be more experienced. This is in line with Asada's (2012a and 2012b) views on the role of hierarchy in a Japanese school. Then again, many teachers considered that in their schools, the teachers who are more skilled with ICT help the other teachers, and they did not mention age as a contributing factor. Also, Kobayashi-sensei spoke of the ministry's plan to introduce one ICT tutor per four schools in chapter 7.1.2. A more thorough research would be required to gain insight on the role of age- or experience-related hierarchy in ICT mentoring in Japan. The answers to all of the four research questions have been summarized in Figure 5.

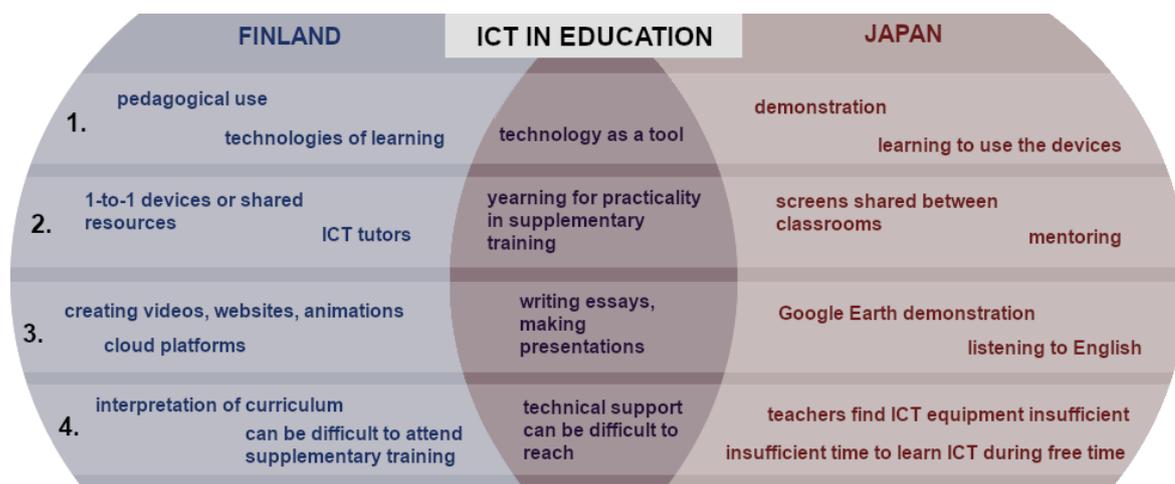


Figure 5. Summary of answers to research questions (1-4) from the interviews. Center represents both countries.

9.2 Best practices and other good findings

In this chapter, we will go through some of the most valuable findings in the interviews in terms of best practices in ICT training as well as in the general use of ICT. Although we had not intended to collect best practices beforehand, they turned up throughout the interviews, as the interviewees shared their own methods that seemed to work well. We wanted to share

these findings since we considered them to be important in increasing understanding on what the interviewees found beneficial.

Throughout the interviews, it became clear that both Finnish teachers and teacher trainees appreciate when the content of the ICT training is closely tied to practical matters and can easily be implemented in the everyday activities in the classroom. Pekka, one of the Finnish teacher interviewees, spoke of a sort of middle ground in chapter 6.1.2, where ICT skills would first be taught to teachers in a lesson environment, and then implemented in practice in the classroom in the presence of ICT tutors, who could help when needed. This way, he felt, the threshold for using ICT in the classroom with real pupils would be lowered, since the teachers would have had sufficient time to absorb the theory behind it first - and on the other hand, it would be easier to take the learned knowledge and skills into practice, since a practical opportunity with assistance was provided.

Interviewee Emma spoke of her best practices in organizing supplementary training in chapter 6.1.2. As a supplementary training organizer for the Finnish language and literature, she kept the subject content in the center, but integrated themes such as multimedia learning environments, multiliteracy and collaborative writing into the training. She felt that an approach where ICT is slowly integrated into the training bit by bit, so that teachers do not necessarily pay attention to its presence, is the most beneficial for teachers who do not view ICT positively. At the end of the training, where the teachers generally feel more comfortable with ICT than they would have at the beginning, she might challenge them to try new ICT tools.

Interviewee Maija spoke of cooperation between teacher degree students and primary school teachers, as described in chapter 6.1.1. She had witnessed projects, where the students and teachers were trained together, and would implement a project utilizing ICT together, and the results had been excellent. She hoped that similar projects would become a part of the degree students' program, so that the students could have a sort of internship where they would implement a project about a phenomenon or some other topic in the classroom with real pupils, together with teachers, and ICT would be present in the implementation.

In Japan, many methods not widely used in Finland were used in teacher training and supplementary training. ICT skills could be trained by observing the lessons of a teacher who is experienced in the use of ICT, as described in chapter 6.2.1. Mentoring was also in an important role, especially in the beginning of a teacher's career. We found the mentoring process to be welcoming, especially for new teachers. Cooperative strategies for teachers such as lesson study, as mentioned in chapter 3.2.4, were also great practices to promote cooperation among teachers and share knowledge.

Aside from best practices in teacher training and supplementary training, one best practice in teaching pupils was mentioned by Seija, as outlined in chapter 8.1. She mentioned that she intentionally starts with only teaching the very basics of an ICT tool to the pupils, and then lets them discover the rest and teach their findings to each other. This gives the pupils an opportunity to practice collaborative learning, which was mentioned in chapter 2.3.5.

9.3 Reflection

In this research, although we could not reliably compare the two countries based on our methods, we noticed many similarities and differences in the views of the participants from both countries. One of the similarities was that teachers in both countries value a practical approach to supplementary training. As a result, we were delighted to hear the suggestions of teachers and teacher trainers concerning the training and supplementary training of teachers as outlined in chapter 9.2, and this in our point of view was one of the most valuable results yielded by the research. For example, cooperative projects between teacher students and teachers in classrooms with real pupils could be a valuable method for all three parties. Aside from providing ideas for organizing teaching, these suggestions could be the basis for more research in the subject.

Another similarity in the views between the participants of this research was how ICT seems to be observed with both enthusiasm as well as dread in both countries. The interviewees observed a division of opinions in their colleagues, and saw how it affected how the colleagues use ICT in their work. In Japan, younger teachers were in general seen to be more capable in the use of ICT, whereas in Finland, the use of ICT was seen as tied to the interests

of the teacher - a teacher who is more interested in ICT is likely to seek further training or learn it during his/her free time. This also affects the pupils, as a considerable part of their ICT skills might be formed in the classroom, guided and inspired by the teacher. If the teacher does not use any ICT in their work, the pupils will not receive any formal instruction in the use of ICT, and will fall behind compared to the pupils of other classes and schools. The question is, now that the divide has been observed, how could we increase or balance the interest towards ICT among teachers? This would ensure equal opportunities for the pupils as well.

In general, we found that acknowledging the challenges in the use of ICT was important in order to come up with answers to problems. One of the challenges spotted in both countries was the division of funding toward ICT acquisitions. In Finland it was seen as an issue that some schools might apply for funding constantly if the headmaster is active, whereas some schools might have problems in wording what they need and thus never end up sending any applications for funding. This results in limited funding towards both the acquisition of devices as well as the supplementary training of teachers. We were wondering if the funding could be more balanced if it was possible to receive assistance for making applications, or even whether a certain amount of funding could be divided among schools without an application process. In Japan, the teachers found the available ICT equipment to be insufficient, and felt that because of it, they could not use ICT as often as they wanted to. The division of funds was not so much dependent on the school, but different areas had different amounts of funding available.

Another notable challenge that plagued the schools of both countries was the limited access to technical support. In Japan, in one example, the technical support was only available once a month, and in another had been halted completely due to economic pressures. In Finland, the centralized technical support was traditionally often available by phone, and was not necessarily located in the vicinity of the school. In both countries, the teachers who were more experienced with the use of ICT had become unofficial tech support, sometimes to the surprise of the teachers themselves. Some of the teachers felt, however, that it was practical to have the technical support residing in the school. Perhaps the solution could then be to provide more technical training to the teachers whose responsibility ICT has become, and

allocate some of their weekly work time to the maintenance of devices, as one of the schools in Finland had done.

9.4 Reliability and validity of the research

In this chapter we will focus on how we were able to use the qualitative criteria set by Tuomi and Sarajärvi (2018, 122-144) previously mentioned in chapter 4.6. We will examine how our research succeeded in terms of reliability and validity when it comes to the aim and meaning of the research, our commitments as researchers, data collection, participants and their relationship to the researchers, the duration of the research, data analysis, reliability and reporting.

As stated in chapter 1, the aim of this research was to discover how Finnish and Japanese primary school teachers perceive and use ICT, what kind of training and support they have received and what kind of challenges they face. The role of ICT in the primary schools of both countries has increased with the latest curricula, and teachers are expected to use ICT in the classroom at ease. We found it important to find out how these recent changes were supported in schools - whether the teachers have received training, and whether they have enough devices at their disposal, not to mention pedagogical and technical support. We also felt that in identifying challenges, it becomes easier to find solutions and to remove bottlenecks in the use of ICT. Perhaps teachers in countries which are also in the process of implementing ICT in education could benefit from the identified pitfalls and plan to avoid them and adopt ideas from the discovered best practices.

As stated in chapter 4.2, interviews were used as the only data collection method in this research. In both countries, there are factors to consider in the interpretation of the interviews. In Finland, the interviews ended up being focused on teachers that utilize ICT heavily and often provide pedagogical support for their peers, having an active role in the use of ICT in their respective school environments. Thus, they were most likely more interested in the use of ICT than the average teacher, and their enthusiasm for learning ICT during their free time might not be shared by the entire population. In Japan on the other hand, due to insufficient language skills of the interviewers, the interviews were not held in the participants'

native language, but in English. Translation was provided by a third party when it was necessary. Regardless, complications in the translation process meant that the communication took more time, and the length and complexity of the participants' translated answers may have been affected. A Japanese language specialist was consulted in the interpretation of some of the answers to ensure that no misunderstanding would occur. The interview as a research method can also include faulty information (Hirsjärvi & Hurme 2008, 35). We took this into account to our best ability by cross-checking information that the interviewees provided whenever it was possible, such as application names, course descriptions, amounts of credits, curriculum content and legislation.

When considering objectivity in a research, the role of the researcher should be considered. The researcher's own interests and points of view affect the collection of material as well as the nature of the collected material - while assembling qualitative material, the researcher restricts the field of research with his or her interpretative perspective (Kiviniemi 2015, 77). In addition, as stated by Tuomi & Sarajärvi (2018, 119), the question of objectivity comes up in whether the researcher aims to understand and hear the participants as themselves, or whether his or her observations are affected by for example the researcher's age, political attitude or nationality. We have made an effort to not let our roles as interviewers affect the responses of the interviewees, and attempted to not let our own opinions or views affect the collection of data.

As stated in chapter 4.3, our focus was in the primary schools of Central Finland and Kanazawa in Ishikawa, Japan. Our aim was to find participants from both areas, and as mentioned in chapter 4.3, we aimed for triangulation of sources by including participants from three different groups. Since the answers of two participants can contradict each other, and we did not want the range of views and experiences to be narrowed to only 2-3 participants, we wanted to find a minimum of four teachers and four teacher trainers (or similar roles) from both areas. The views of exchange students were hoped to bring additional insight to the similarities and differences between the two countries, but were not specific to the area, so we accepted candidates from anywhere in the two countries - but hoped to find exchange students with educational background. Since the exchange students' views were not in a

central role in the research, we concluded that two participants from each country would be sufficient.

The participants were acquired through university connections and the connections among the participants in both countries. We succeeded in reaching slightly more than the desired amount of participants - four teachers and teacher trainers from Central Finland, four teachers and teacher trainers from Kanazawa, three exchange students from Japan, and two exchange students from Finland. Participants did not receive any results or their parts before the publication, and they did not change their answers after the interviews. Since the amount of participants was fairly small and limited to only one region in each country, the research results can not be generalized to represent the countries as a whole. Also, the focus of this thesis was on the views and experiences of the interviewees, rather than readily generalizable facts. The experiences and perceptions of the interviewees should not be generalized to represent their respective populations as a whole.

The research was carried out throughout the time span of 1.5 years. The research process started in early 2019 by searching for information, and the interview questions were prepared throughout spring 2019. As stated in chapter 4.4, the Finnish teacher trainers and project research as well as the Finnish primary school teachers were interviewed in May 2019. The Japanese teacher trainers and primary school teachers were interviewed in July 2019. The exchange students were interviewed in May and August 2019. The interviews were transcribed by early 2020, and the analysis and reporting were carried out throughout spring 2020. When searching for source material, we attempted to find reliable sources that were current and up to date. It is still possible, however, that some of the information presented in this thesis is either inaccurate or out of date due to the long duration of the research.

As described in chapter 4.5, we started by meaning coding the transcribed interviews. We then proceeded to perform meaning condensation on the answers. The meaning condensations were then divided under four suitable themes for reporting - how the interviewees view ICT and the curriculum (chapter 5), the interviewees' views on teacher training and supplementary training (chapter 6), devices and supporting processes for ICT in primary education (chapter 7) and use of ICT in primary education in practice (chapter 8). The meaning

condensations were then compared between the two countries, and the answers under each theme were summarized in Venn diagrams to highlight similarities and differences. The results of the research were then summarized (chapter 9), answering each of the research questions separately.

The different participant groups were asked the same group-specific questions in each country, treating all participants equally. However, if the answers lead to interesting directions from the interviewer's point of view, additional questions were asked to clarify the issues in question. The identities of the participants have been protected with pseudonyms as well as anonymous summaries. The answers have been interpreted to our best ability to catch the original intent of the participants, and we have attempted to report the answers comprehensively while also avoiding overinterpreting the answers. Based on these factors, we feel that the research is reliably carried out and reported, following the common principles of scientific research.

9.5 Limitations of the research and suggestions for future research

The scope of this research was fairly small, consisting of 20 participants and only interviews as the selected research method. Further research on the topic could be implemented by repeating the study by combining quantitative and qualitative research methods to enlarge the scope of the study and thus to add reliability to the research. Coming up with a questionnaire including questions about e.g. the equipment and the training available in both countries would yield a better understanding about what is available nationwide. Based on the answers of the questionnaire, it would then be possible to carry out interviews in selected groups. Observation would also be a valuable method, as it would give a detailed view to how ICT is used in classrooms in practice. It was considered as a method for this research, but due to limited resources the method was not used.

As mentioned in chapter 9.3, the participants were selected via university contacts, and the interviewees in Finland were mostly teachers and teacher trainers who were enthusiastic users of ICT. This can give a more positive view on the use of ICT in Finland than what would have occurred, if the participants had been chosen at random. If the research is

repeated, a more balanced selection method for participants could prove useful. Also, in order to increase the amount of participants to get a broader view of the issue, it would be useful to do a survey first with a larger number of participants and based on the survey, choose the interviewees. Although we aimed for triangulation of sources as stated in chapter 4.3, the role of exchange students was not equal to that of the role of teachers and teacher trainers, and their statements were not overall as much used in the results. For a more balanced triangulation of sources, it would be more beneficial to use three equally significant sources.

The language situation of the participants was not equal, as Finnish participants could answer the questions in their native tongue, whereas Japanese participants could only provide answers through translation. This might have been reflected in the length and complexity of the translated answers, as translation added to the time requested of the participants. In the follow-up study suggested above, the survey questions could be translated to the native tongues of the participants to provide equal language opportunities for all participants. Interviews could also be organized to take place in the native tongue of the participants.

This research was carried out when Japan was on the verge of adopting a new curriculum that included ICT, and the teachers mentioned that changes in infrastructure were also to be made. As stated in chapter 3.2.1, the previous curriculum was revised in 2008 and fully implemented in 2013. If the adoption of the new curriculum takes an equal amount of time, since the new curriculum starts being implemented in 2020, a follow-up study could be conducted after 2025. At this point, it would be possible to gain valuable insight on how the Japanese primary schools have adapted to the change of the curriculum, what kind of issues require further attention and whether the available training has been adequate. Also, this research focused on the use of ICT as a whole. As the new curriculum that includes programming and robotics in primary school education takes place in Japan, a comparison between the teaching methods and tools used in the teaching of programming and robotics in Finland and Japan could yield interesting results.

In this research, the teacher trainers and primary school teachers mentioned many practices which they have found to be beneficial in teacher training or supplementary training, and

these practices were summarized in chapter 9.2. The different suggested methods for teacher training and supplementary training could be researched further to confirm their usefulness and effectiveness in broader context. On the other hand, many challenges related to the use of ICT were also identified during the research. Further research into how these challenges are being dealt with, and whether they still exist after some time has passed, could also prove useful.

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Interviews

Anna, university teacher. University of Jyväskylä. Interview in person on 9.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Katja, university teacher. University of Jyväskylä. Interview in person on 13.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Pekka, primary school teacher. School FI A. Interview in person on 15.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Heikki, primary school teacher and teacher trainer. School FI B. Interview in person on 16.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Seija, primary school teacher and teacher trainer. School FI A. Interview in person on 16.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Hanzawa-san, Japanese exchange student in University of Jyväskylä. Interview in person 16.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Maija, project researcher at University of Jyväskylä. Interview in person 20.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Yanagawa-san, Japanese degree student in University of Jyväskylä. Interview in person 20.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Emma, university teacher. University of Jyväskylä. Interview in person 21.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Matti, primary school teacher. School FI A. Interview in person 24.5.2019. Interviewed, recorded and transcribed by Veera Hasala.

Miyauchi-sensei, professor of English and a teacher trainer at the Teacher training department, Kanazawa University. Interviewed in person 8.7.2019. Interviewed and recorded by Riitta Kelly.

Kobayashi-sensei, associate professor of educational technology (and teacher trainer) at the Teacher training department, Kanazawa University. Translation provided by Yuichi Takizawa. Interviewed in person 22.7.2019. Interviewed and recorded by Riitta Kelly.

Sato-sensei, primary school teacher (and teacher trainer) at the Teacher training department, Kanazawa University. Translation provided by Satoko Noritomi. Interviewed in person on 24.7.2019. Interviewed and recorded by Riitta Kelly.

Oya-sensei, English teacher (and teacher trainer) at the Teacher training department, Kanazawa University. Interviewed in person 24.7.2019. Interviewed and recorded by Riitta Kelly

Kondo-sensei, primary school teacher. Translation provided by Mitsuru Kokeida. Interviewed in person 25.7.2019. Interviewed and recorded by Riitta Kelly.

Nishizawa-sensei, primary school teacher. Translation provided by Mitsuru Kokeida. Interviewed in person 25.7.2019. Interviewed and recorded by Riitta Kelly.

Ishida-sensei, primary school teacher. Translation provided by Mitsuru Kokeida. Interviewed in person 26.7.2019. Interviewed and recorded by Riitta Kelly.

Tomiura-sensei, primary school teacher. Translation provided by Mitsuru Kokeida. Interviewed in person 26.7.2019. Interviewed and recorded by Riitta Kelly.

Ozaki-san, student at Kanazawa University. Interviewed in person 1.8.2019. Interviewed and recorded by Riitta Kelly.

Elli, former exchange student and current kindergarten teacher in Japan. Interviewed in person 6.8.2019. Interviewed and recorded by Riitta Kelly.

Keijo, a student at Aalto University. Interviewed in person 8.8.2019. Interviewed and recorded by Riitta Kelly.

Appendices

A Finnish interviewees

Pseudo-nym	Role	Age and gender	School (if applicable)
Anna	University teacher	48F	University of Jyväskylä
Katja	University teacher	39F	University of Jyväskylä
Pekka	Primary school teacher + ICT tutor	36M	School FI B
Heikki	Primary school teacher + teacher student trainer	44M	School FI C
Seija	Primary school teacher + teacher student trainer	42F	School FI A
Maija	Project Researcher; previously primary school teacher	42F	University of Jyväskylä
Emma	University teacher	43F	University of Jyväskylä
Matti	Primary school teacher + teacher student trainer	39M	School FI A
Elli	Former exchange student at Kanazawa University	28F	Kanazawa University
Keijo	Exchange student at Kanazawa University	28M	Kanazawa University

B Japanese interviewees

Pseudonym	Role	Age and gender	School (if applicable)
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Hanzawa-san	Exchange student	22F	University of Jyväskylä
Yanagawa-san	Degree student	24F	University of Jyväskylä
Sato-sensei	Primary school teacher/teacher trainer	33M	Kanazawa University
Kobayashi-sensei	Teacher trainer specialized in educational technology	M	Kanazawa University
Oya-sensei	Teacher trainer and primary school English teacher	33F	Kanazawa University
Miyauchi-sensei	Teacher trainer specialized in English	51M	Kanazawa University
Kondo-sensei	Primary school teacher	40F	School JP A
Nishizawa-sensei	Primary school teacher	44F	School JP B
Tomiura-sensei	Primary school teacher	41M	School JP C
Ishida-sensei	Primary school teacher	43M	School JP D
Ozaki-san	Exchange student to Finland	23F	University of Jyväskylä

C Interview questions for teachers (English)

Warm-up:

- A) What is your name, age, and your current position?
- B) Where do you work?
- C) What kind of things does your job include?
- D) How long have you been in this position?
- E) Where did you work before? What did it include?

Main questions:

- 1) What does ICT consist of in your opinion?
- 2) When you hear "ICT in education", what do you think of?

→ What counts as using ICT in education?

The following definitions are shared to ensure that all interviewees are on equal footing for the rest of the interview:

[ICT is a field that includes various technologies, such as desktop computers and laptops, computer programs, computer accessories such as headphones, and the internet which is used for information processing and communication.

ICT as a concept includes all the equipment, tools and methods which are used to search for, control and handle information. These are used in communication. (Tella 1994).

ICT is used to mean all electronic communication channels and ways to deliver messages, that can be used as of help in information processing, i.e. collecting, editing, storing, and sharing information. It is often used to refer to the use in teaching when different ICT solutions are used in teaching. In this sense, ICT is seen as a natural part of classroom usage as well as a form of distance learning and learning using varied methods. (Lipponen & Lallimo 2006, 167.)]

- 3) How do you think you are expected to use ICT in your work? In what ways are you expected to use ICT? Why?

→ Curriculum/National curriculum?

- 4) What kind of training have you received in order to use ICT in your work?

→ Has it been adequate? If not, what kind of training would have been useful for you?

→ Has everyone in your school received similar training?

- 5) How do you use ICT in your work in practise?

- 6) How is ICT being used in your school environment?

- 7) What have the teachers' attitudes towards ICT been like in your school environment?

→ Positive, neutral, negative?

8) What kind of ICT equipment is available in your school?

9) Is the ICT equipment and software of your school environment adequate?

→ Who makes the decisions about ICT equipment and software upgrades?

10) What kind of technical support is provided for the use of ICT in your school environment?

→ If you have problems with using ICT in education, who can you ask for help?

11) ICT tutors are teachers or students who have received ICT training and can help teachers in the use of ICT. Does your school have ICT tutors?

→ If not, do you know of schools that have ICT tutors?

12) If you have ideas for utilizing ICT in your work but don't have the technical know-how to implement it, who can you ask for help?

13) What kind of ICT training do you think would be the most useful for teachers in the future?

14) What kind of ICT skills do you teach to students?

15) Are the students' ICT skills evaluated somehow? If so, how?

16) How do you see students using ICT in their freetime?

17) Do you think ICT in education is useful? Why/why not?

D Interview questions for teacher trainers (English)

Warm-up:

A) What is your name, age, and your current position?

B) What kind of things does your job include?

C) How long have you been in this position?

D) Where did you work before? What did it include?

Main questions:

- 1) What is ICT? What does ICT consist of in your opinion?
- 2) When you hear "ICT in education", what do you think of?

→ What counts as using ICT in education?

The following definitions are shared to ensure that all interviewees are on equal footing for the rest of the interview:

[ICT is a field that includes various technologies, such as desktop computers and laptops, computer programs, computer accessories such as headphones, and the internet which is used for information processing and communication.

ICT as a concept includes all the equipment, tools and methods which are used to search for, control and handle information. These are used in communication. (Tella 1994).

ICT is used to mean all electronic communication channels and ways to deliver messages, that can be used as of help in information processing, i.e. collecting, editing, storing, and sharing information. It is often used to refer to the use in teaching when different ICT solutions are used in teaching. In this sense, ICT is seen as a natural part of classroom usage as well as a form of distance learning and learning using varied methods. (Lipponen & Lallimo 2006, 167.)]

- 3) What kind of qualifications are teachers required to have in general in Japan? What about ICT qualifications?

- 4) What kind of training do teacher trainees receive concerning ICT?

→ What kind of things are included in ICT training? Technologies? Pedagogical support?

- 5) Do you think this training is sufficient?

→ If not, what kind of training should be available?

- 6) What kind of attitude do teacher trainees in general have towards ICT training?

→ Positive, neutral, negative?

- 7) What about teachers?
- 8) What kind of supplementary training do teachers receive concerning ICT?
→ Who gives this training? (Who should be responsible of this kind of training?)
- 9) Do different forms of training include pedagogical advice on how to use ICT in teaching?
- 10) ICT tutors are teachers or students who have received ICT training and can help teachers in the use of ICT. Do many schools have ICT tutors or similar roles to aid in use of ICT?
- 11) What kind of ICT skills are taught to students?
- 12) Are the students' ICT skills evaluated somehow? If so, how?
- 13) Do you think ICT in education is useful? Why/why not?
- 14) In general, how freely can teachers decide what to teach in Japan? Are methods, materials, etc. provided for them, or can the teachers choose them freely?
- 15) Are the students tested at a national level in Japan? Is there a national level, that they should reach?
→ For example, is there an annual national examination for all the schools of the country, that measures how well the students have learned the skills and/or content?

E Interview questions for exchange students (English)

Warm-up questions:

- A) What is your name, age and your major?
- B) What kind of things does your major include?
- C) How long have you been studying?
- D) How did you decide to become an exchange student?

Main questions:

- 1) What is ICT? What does ICT consist of in your opinion?
- 2) When you hear "ICT in education", what do you think of?

→ What counts as using ICT in education?

The following definition is shared to ensure that all interviewees are on equal footing for the rest of the interview:

[ICT is a field that includes various technologies, such as desktop computers and laptops, computer programs, computer accessories such as headphones, and the internet which is used for information processing and communication.

ICT as a concept includes all the equipment, tools and methods which are used to search for, control and handle information. These are used in communication. (Tella 1994).

ICT is used to mean all electronic communication channels and ways to deliver messages, that can be used as of help in information processing, i.e. collecting, editing, storing, and sharing information. It is often used to refer to the use in teaching when different ICT solutions are used in teaching. In this sense, ICT is seen as a natural part of classroom usage as well as a form of distance learning and learning using varied methods. (Lipponen & Lallimo 2006, 167.)]

- 3) What kind of training have you received concerning ICT during your studies in your home country?
- 4) Do you think this training has provided you with good ICT skills? / Are you confident in your ICT skills?

→ If not, what kind of training should have been available?

- 5) Have you noticed any differences in the use of ICT in Finland and in Japan?
- 6) What kind of experiences have you had in using ICT in both countries?
- 7) If you think back to your primary school days, what kind of teaching methods do you remember?
- 8) Do you think those methods were useful? / How do they compare with the methods of today?
- 9) What kind of things do you remember from the use of ICT?
- 10) How was ICT taught in those days?
- 11) What is your impression, how is ICT nowadays taught in primary schools in Japan?

12) What kind of attitudes do you think teacher trainees and teachers have about ICT?

→ Positive, neutral, negative?

13) Do you think ICT in education is useful? Why/why not?

F Interview questions for teachers (Finnish)

Lämmittelykysymykset:

- A) Kerro nimesi, ikäsi ja nykyinen tittelisi?
- B) Minkälaisia asioita työhösi kuuluu?
- C) Kuinka kauan olet ollut tässä työssä?
- D) Missä olit töissä ennen? Mitä siihen kuului?

Varsinaiset kysymykset:

- 1) Mitä on tvt? Mistä tvt mielestäsi koostuu?
- 2) Kun kuulet sanat "tvt opetuksessa", mitä tulee mieleen?

→ Minkä käsität tvt:ksi opetuksessa?

[tässä kohtaa kerrotaan ICT:n määritelmä, jotta loput haastattelusta sama ICT:n määritelmä on haastateltavien tiedossa]

[ICT on ala, joka sisältää teknologioita, kuten pöytäkoneita ja kannettavia, ohjelmistoa, oheislaitteita ja internet-yhteyden, joita käytetään tietojenkäsittelyyn ja kommunikoimiseen"

Tieto- ja viestintätekniikka (TVT, engl. ICT) käsitteenä sisältää kaikki ne laitteet, välineet ja menetelmät, joilla tietoa etsitään, hallitaan ja käsitellään. Niitä käytetään kommunikaatiossa ja viestinnässä (Tella 1994).

TVT:lla tarkoitetaan kaikkia sähköisiä viestintäkanavia ja viestin välittäjiä, joita voidaan käyttää apuna tiedonkäsittelyssä eli keräämisessä, muokkaamisessa, varastoinnissa ja jakamisessa, sillä viitataan nykyään usein myös opetuskäyttöön, kun erilaisia TVT:n ratkaisuja hyödynnetään opetuksessa. TVT nähdään tällöin luonnollisena osana

opetuksen luokkahuonekäytäntöjä sekä etä- ja monimuoto-opetuksen muotoja (Lipponen & Lallimo 2006, 167.)]

3) Millaisia oletuksia on siitä, miten käytät tv:tä työssäsi? Miten sinun odotetaan käyttävän tv:tä? Miksi?

4) Minkälaista koulutusta olet saanut tv:n käyttöön työssäsi?

→ Onko se ollut riittävää? Jos ei, minkälainen koulutus olisi ollut sinulle hyödyllinen?

→ Ovatko kaikki koulussasi saaneet saman koulutuksen?

5) Miten käytät tv:tä työssäsi käytännössä?

6) Miten tv:tä käytetään kouluympäristössäsi?

7) Minkälaisia asenteita opettajilla on ollut tv:n käyttöön kouluympäristössäsi?

→ Positiivinen, neutraali, negatiivinen?

8) Minkälaista tv-laitteistoa on käytettävissä koulullasi?

9) Onko laitteisto ja ohjelmisto riittävää?

→ Kuka tekee päätökset laitteiston ja ohjelmien päivityksestä?

10) Minkälaista teknistä tukea on saatavilla tv:n käyttöön kouluympäristössäsi?

→ Jos sinulla on ongelmia tv:n käytössä opetuksessa, keneltä voit kysyä apua?

11) Tvt-tutorit ovat joko opettajia tai oppilaita, jotka ovat taitavia tai kokeneita tv:n käyttäjiä ja tukevat opettajia ja oppilaita tv:n käytössä. Onko koulussasi tv-tutoreita tai vastaavia?

12) Jos sinulla on ideoita tv:n käyttöön työssäsi mutta ei teknistä tietotaitoa sen toteuttamiseen, keneltä voit pyytää apua?

13) Minkälainen tv-koulutus olisi mielestäsi hyödyllisin opettajille tulevaisuudessa?

14) Minkälaisia tv-taitoja opetat oppilaille?

15) Arvostellaanko oppilaiden tv-taidot jotenkin? Jos arvostellaan, miten?

16) Miten näet oppilaiden käyttävän tv:tä vapaa-ajalla?

17) Koetko että tv opetuksessa on hyödyllistä? Miksi/miksi ei?

G Interview questions for teacher trainers (Finnish)

Lämmittelykysymykset:

- A) Kerro nimesi, ikäsi ja nykyinen tittelisi?
- B) Minkälaisia asioita työhösi kuuluu?
- C) Kuinka kauan olet ollut tässä työssä?
- D) Missä olit töissä ennen? Mitä siihen kuului?

Varsinaiset kysymykset:

- 1) Mitä on ICT tai toisin sanoen tvt? Mistä tvt mielestäsi koostuu?
- 2) Kun kuulet sanat "tvt opetuksessa", mitä tulee mieleen?

→ Minkä käsität tvt:ksi opetuksessa?

[tässä kohtaa kerrotaan ICT:n määritelmä, jotta loput haastattelusta sama ICT:n määritelmä on haastateltavien tiedossa]

[ICT on ala, joka sisältää teknologioita, kuten pöytäkoneita ja kannettavia, ohjelmistoa, oheislaitteita ja internet-yhteyden, joita käytetään tietojenkäsittelyyn ja kommunikoimiseen"

Tieto- ja viestintäteknikka (TVT, engl. ICT) käsitteenä sisältää kaikki ne laitteet, välineet ja menetelmät, joilla tietoa etsitään, hallitaan ja käsitellään. Niitä käytetään kommunikaatiossa ja viestinnässä (Tella 1994).

TVT:lla tarkoitetaan kaikkia sähköisiä viestintäkanavia ja viestin välittäjiä, joita voidaan käyttää apuna tiedonkäsittelyssä eli keräämisessä, muokkaamisessa, varastoinnissa ja jakamisessa, sillä viitataan nykyään usein myös opetuskäyttöön, kun erilaisia TVT:n ratkaisuja hyödynnetään opetuksessa. TVT nähdään tällöin luonnollisena osana opetuksen luokkahuonekäytäntöjä sekä etä- ja monimuoto-opetuksen muotoja (Lipponen & Lallimo 2006, 167.)]

- 3) Minkälaiset pohjatiedot vaaditaan tvt:stä luokanopettajilta?
- 4) Minkälaista tvt-koulutusta opetusharjoittelijat saavat?

→ Minkälaisia asioita tv-t-koulutukseen kuuluu? Teknologioita? Pedagogista tukea?

5) Onko tämä koulutus mielestäsi riittävä?

→ Jos ei, minkälaista koulutusta pitäisi olla tarjolla?

6) Minkälainen asenne opetusharjoittelijoilla on yleisesti ollut tv-t-koulutusta kohtaan?

→ Positiivinen, neutraali, negatiivinen?

7) Entä opettajilla?

8) Minkälaista tv-t-täydennyskoulutusta opettajat saavat?

→ Kuka kouluttaa? Kenen vastuulla?

9) Kuuluuko koulutuksiin pedagogisia neuvoja tv-t:n käyttöön?

10) Tv-t-tutorit ovat joko opettajia tai oppilaita, jotka ovat taitavia tai kokeneita tv-t:n käyttäjiä ja tukevat opettajia ja oppilaita tv-t:n käytössä. Onko monissa kouluissa tv-t-tutoreita tai vastaavia avustamassa tv-t:n käytössä?

11) Minkälaisia tv-t-taitoja opetetaan oppilaille?

12) Arvioidaanko oppilaiden tv-t-taitoja jotenkin? Jos arvioidaan, miten?

13) Onko tv-t opetuksessa mielestäsi hyödyllistä? Miksi/miksi ei?

H Interview questions for exchange students (Finnish)

Lämmittelykysymykset:

- A) Nimi, ikä ja pääaine?
- B) Mitä pääaineeseesi kuuluu?
- C) Monettako vuotta opiskelet?
- D) Miksi halusit/päätit lähteä vaihtoon?

Varsinaiset kysymykset:

- 1) Mitä on tv-t? Mistä tv-t mielestäsi koostuu?
- 2) Kun kuulet sanat "tv-t opetuksessa", mitä tulee mieleen?

→ Minkä käsität tvt:ksi opetuksessa?

[tässä kohtaa kerrotaan ICT:n määritelmä, jotta loput haastattelusta sama ICT:n määritelmä on haastateltavien tiedossa]

[ICT on ala, joka sisältää teknologioita, kuten pöytäkoneita ja kannettavia, ohjelmistoa, oheislaitteita ja internet-yhteyden, joita käytetään tietojenkäsittelyyn ja kommunikointiin"

Tieto- ja viestintätekniikka (TVT, engl. ICT) käsitteenä sisältää kaikki ne laitteet, välineet ja menetelmät, joilla tietoa etsitään, hallitaan ja käsitellään. Niitä käytetään kommunikaatiossa ja viestinnässä (Tella 1994).

TVT:lla tarkoitetaan kaikkia sähköisiä viestintäkanavia ja viestin välittäjiä, joita voidaan käyttää apuna tiedonkäsittelyssä eli keräämisessä, muokkaamisessa, varastoinnissa ja jakamisessa, sillä viitataan nykyään usein myös opetuskäyttöön, kun erilaisia TVT:n ratkaisuja hyödynnetään opetuksessa. TVT nähdään tällöin luonnollisena osana opetuksen luokkahuonekäytäntöjä sekä etä- ja monimuoto-opetuksen muotoja (Lipponen & Lallimo 2006, 167.)]

- 3) Minkälaista tvt-koulutusta olet saanut opinnoissasi kotimaassasi?
- 4) Koetko, että olet saanut hyvät tvt-aidot koulutuksesta?/Oletko luottavainen tvt-taitojesi suhteen?

→ Jos ei, minkälaista koulutusta olisi ollut hyvä olla tarjolla?

- 5) Oletko huomannut eroja tvt:n käytössä Suomessa ja Japanissa?
- 6) Minkälaisia kokemuksia sinulla on ollut tvt:n käytöstä molemmissa maissa?
- 7) Jos mietit alakouluaijojasi, minkälaisia opetusmenetelmiä sieltä muistat?
- 8) Oletko sitä mieltä, että nuo menetelmät olivat hyödyllisiä? Miten ne vertautuvat nykypäivän metodeihin?
- 9) Minkälaisia asioita muistat tvt:n käytöstä?
- 10) Miten tvt:tä opetettiin tuolloin?
- 11) Minkälainen vaikutelma sinulla on siitä, miten tvt:tä opetetaan nykyään alakouluissa?

12) Minkälaisia asenteita ICT:tä kohtaan koet opettajaharjoittelijoilla ja opettajilla olevan?

→ Positiivinen, neutraali, negatiivinen?

13) Onko tvt opetuksessa mielestäsi hyödyllistä? Miksi/miksi ei?