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PRE-SERVICE KINDERGARTEN TEACHERS' PERCEPTIONS AND ATTITUDES TO-  
WARDS ICT IN THE CLASSROOM

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Abstract:

The aim of this study is, first, to analyse how pre-service teachers perceive ICT as a tool that supports learning and their attitudes towards ICT. Analysing how pre-service kindergarten teachers see technology in the classroom. I seek to find challenges when pre-service kindergarten teachers believe technology might impede their teaching, problems that can cause the use of it and limitations. Discover what their negative and positive perceptions towards ICT are and their general impression about ICT.

I explore and detect the differences between students' attitudes from first year and after the first year of their studies. In this point, I analyse students from first year and the rest of the year at the same time, not before and after a course.

The study was conducted using a sample collected from the Early Childhood Education Faculty from University of Oulu, Finland. The number of participants was 46 and the instrument, which was carried out, was a questionnaire with 19 questions in a likert-scale type from 1 (Disagree) to 5 (Agree) and 4 open-ended questions where participants could answer in a short paragraph. The questionnaire was created based on previous studies, which were focused on the same research topic as this one.

The results show that pre-service kindergarten teachers have, in general, a positive perception and attitude towards ICT, excluding some specific aspects. However, there was a big amount of participants who could not position themselves in one extreme of the opinion. There are not big differences in perceptions and attitudes towards ICT between first year students and students who are not in first year.

The conclusions of this study highlight that pre-service kindergarten teachers do not have a strict opinion towards ICT but they find technology beneficial in kindergarten classrooms. They are optimistic and positive towards the use of ICT and at the same time, willing to learn about the implementation and use of ICT in kindergarten classrooms. On the other hand, most of the participants fear the lack of resources or skills as a factor that will impede or challenge them on the use of ICT in the classroom.

This research might help future researches on the area of kindergarten teacher training and how to model ICT or Media Education courses in future curricula. Another suggestion for future researchers is to focus on the main issues that teachers do not use ICT in the classroom or taking parents and children's perceptions and attitudes into consideration.

Keywords: early childhood education, technology, ICT, pre-service teacher, kindergarten, beliefs, opinion.

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## 1. INTRODUCTION

Technology is a complex term in the research field; there are many factors to take into consideration when it is time to measure it in a study case or research. Technology has become a tool that it is present in people's everyday life and for that reason, the variety of information and content that people have access nowadays have been increasing and growing. In schools, the question, which it is raising at the moment in primary and secondary education, is not anymore if technology should be used in classrooms, it is about what kind of technology teachers and students should use and how it should be use effectively (Kalogiannakis, 2010). However, in kindergarten classrooms, the situation is still controversial, there are many unresolved issues regarding the use of technologies, health issues or bad effects on the use of them in children (Siraj-Blatchford and Siraj-Blatchford, 2003) and not many countries consider the support for the development of ICT in the curricula of early childhood education. In Finland, with the new implementation of the curricula, ICT takes part of it and it is mention in several parts of the curricula. Therefore, it is important to analyze, examine and research this environment in terms of how kindergarten teachers behave towards ICT, what it is their perception and attitudes when it is time to use ICT (Zaranis, 2015).

Literature indicates the importance of teachers, educators and adults that participate in the educational settings and are part of children's environments, of having an appropriate training that provides guidance and understanding of the use of ICT, also being informed of the educational purposes and potential of ICT in early childhood education environments (Bolstad, 2004). Many studies have suggested the importance and effectiveness of ICT in early childhood environments, supporting collaboration, cooperation and positive learning experiences for children and for strengthening their relationships with adults. Also in the area of literacy, mathematical thinking or supporting special needs children.

Some factors, that influence the use of technologies, is the effective ICT professional development for early childhood teachers and educators. Their own level of confidence, beliefs about learning and teaching through ICT, will affect on their decision about what they will use and how they will use ICT in kindergarten classrooms. Effective training develops understandings and supports teachers connecting their previous knowledge with the new

philosophies and pedagogical views about ICT in early childhood education environments. It is important for teachers to explore new methodologies and ways of working, and through ICT training, it is possible (Bolstad, 2004). For a good and effective use of ICT, it is important for practitioners to understand the purpose, goals, practices and context of early childhood education (O'Hara, 2004)

There is a general positive attitude towards ICT in the current situation of kindergarten teachers and pre-service teachers, however, several studies discovered some factors that discourage teachers on the use of ICT, like the lack of knowledge on this area and time for preparing the lessons (Shirvani, 2014). But, one aspect is their intention of using ICT and another thing is if they really use ICT in their classroom and why they do or do not use it. Some researchers, from different countries (Kankaanranta & Kangalasso, 2003; O'Hara, 2004; Bain, 2000), described the lack of training in many early childhood education practitioners, who have studied early childhood education at the university, and how they feel uncertain about the value of ICT and how it will support their teaching and learning on children. Suoninen (2008) mentions that just a small group of early childhood practitioners have studied media education.

It had happened in many countries, that the classrooms were completely modified for new technologies and devices for teachers to use them in their methodologies or for children's learning. According to Higgins (2003), the fact of providing new and updated equipment to schools will not change the experience on the use of technologies. However, the differences appear when teachers are able to discern and understand which resources are better used in certain moments and which technologies are beneficial in other situations.

In Finland, kindergarten teacher's training provides courses related to ICT or media education, however, from Pääjärvi's (2016) study, Universities in Finland offer a little basic knowledge on ICT or not at all, since the majority of courses are introductory or they are part of their orientation studies, many of them are optional and not mandatory. This means, new graduated students are not enough competent in media education.

The aim of this study is to discover the perceptions and attitudes of pre-service kindergarten teachers towards ICT in Oulu, Finland. Analyze how pre-service kindergarten teachers



perceive ICT as a tool that supports learning and their attitudes towards ICT. Find challenges when pre-service kindergarten teachers believe technology might impede their teaching and discover what their negative and positive perceptions towards ICT are. It is important to research on this area because pre-service kindergarten teachers are the future teachers of early childhood education and their perceptions and attitudes will define what and how the use ICT in the classroom. In the analysis, it is possible to find if pre-service kindergarten teachers have positive ideas towards ICT or they are not so familiar. A negative attitude and perception will lead to a non-use of technologies in the future or a wrong use of them.

In this study, it is mention on the theoretical framework, the positives and negative effects of ICT in kindergarten classroom and other important aspects to take into consideration regarding this topic. In that section, it is explained how the author of this paper seek for information related to technology in early childhood education and previous studies related to pre-service kindergarten teachers' perceptions, beliefs and attitudes towards ICT. The study focused on early childhood education, since it is a controversial area and still not enough researched.

In the empirical part, the study explores the general perception and attitudes of pre-service kindergarten teachers and later it describes in more details in this sections. The data collection was carried out in the Early Childhood Education department in Oulu University with a sample of 46 pre-service kindergarten teachers. For the quantitative data collection method was used a likert scale questionnaire and for the qualitative data, four open-ended questions. During the data analysis, SPSS and NVivo was used to conduct the analysis of each data and T-test in SPSS for the comparison between first year students and non-first year students as quantitative data.

In the last section, the study describes the relation between the theoretical framework and the empirical part of this study. The study shows the results in a descriptive method and uses charts and tables to explain the findings in a more clear way. It also gives the conclusions of this study and a better understanding of the results. This study sets out the positive perceptions towards ICT from pre-service kindergarten teachers and the negative factors

that impede them on applying in the classroom. Also it gives a descriptive analysis of the answers that participants wrote in the open-ended questionnaire and results in a meaningful way and gives a clear explanation about the similarities and differences in the perceptions and attitudes towards ICT between first year students and participants who are not in the first year of their early childhood education training. This research suggests different approaches for future researches that want to investigate the same area in the future.

## **2. THEORETICAL FRAMEWORK**

In the next section, different aspects are going to be described in the application of technologies in early childhood education. Based on different researches, this chapter concentrates on the general aspects of the implementation of ICT in kindergarten classrooms and specifically, about positive and negative aspects when kindergarten teachers use technologies in the classroom. Besides, this chapter includes pre-service kindergarten teacher's perceptions and attitudes towards ICT from different studies and how teachers use ICT in the classroom. At the end, since this study was conducted in Finland, there is information about teacher training at the university and the implication of ICT and Media Education in their curricula and courses.

### **2.1. General idea of ICT and its role in early childhood education.**

Information and communication technology (ICT) is defined as “*anything that allows us to get information, to communicate with each other, or to have an effect on the environment using electronic or digital equipment*” (Siraj-Blatchford & Siraj-Blatchford, 2003, p.4)

It is a fact that in most of the countries around the world, children are growing up with information and communication technologies (ICT) as part of their daily lives. The environment where they live around, including the youngest children are able to manipulate electronic toys, devices such as tablets or smartphones, and learning tools that twenty years ago didn't exist at all (Vandeveld, 1999)

Since ICT is becoming more embedded and omnipresent in young children's environment, through an important part of parent's lives, family members, caregivers and early childhood educators. Literature mentions that early childhood children's education experiences should reflect and connect with their experiences in their lives and the early educational sector should be investigated more and guided for further development in the area (Bollstad, 2004). Learning ICT skills are basic knowledge as reading or writing for 21st century students (Pedersen et al., 2006).

However, the support and interest around the whole education sector for a better development and integration of ICT in early childhood education environment has been increasing into education policy, curricula and practice for the last years. With this desire of implementing ICT in classrooms, some school sectors got more technology and technological infrastructure without a proper plan and consideration about the pedagogical purposes for introducing the technology in the school (Bolstad, 2004) or appropriate training for teachers for a good use of them.

It is well known by many researches that ICT facilitates collaboration, cooperation and positive learning experiences between children. Also, as in many case studies is mentioned, ICT can enhance the relationship between children and adults, parents, educators, caregivers... (Lee, Hatherly, & Ramsey, 2002; Whalley & the Pen Green Centre Team, 2001), however, all this positive effects of ICT will not happen on its own. According to Siraj-Blatchford & Whitebread's book, the new technologies can be used well or badly, and this is where teachers intervene in the ICT implementation.

The use of ICT in early childhood education should be connected in a clear explanation and acceptance of the purposes, practices and social context of early childhood education. ICT should support children's education, teacher's methodologies and structure children's early childhood education experiences (Bolstad, 2004). These experiences or lack of experience with ICT at home, affects into children's education. Educators should study a plan for the use of ICT in early childhood settings (Brooker & Siraj-Blatchford, 2002).

ICT is seen in the area of teaching and learning as a strategy to improve, implement and facilitate the new pedagogy of the information society (Cuban, Kirkpatrick & Peck, 2001; Voogt & Pelgrum, 2005), besides that, researches showed that literating children on the different communication modes of their culture, teaching about how to organize and analyze information and let them produce and create information, will give them an effective skill as lifelong learners, nonetheless, those are still few studies about long-term and deep-going effects of ICT (Kozma, 2003a; Venetzky & Davies, 2001).

In Finland, the use of ICT in early childhood education and pre-primary education is often questioned and it has been invisible in the curricula (Finnish National Board of Education; Kangassalo, 1998) since the last change in August 2016, it is mentioned in the pre-primary education curricula that is called “*competence in information and communication technology*”. It describes the importance of the development on ICT skills as part of the society and for their future life. It says, “*The mission of pre-primary education is to promote children’s ICT-competence alongside the children’s homes*”. It should be used to support children’s interactive skills, learning skills, and the gradually developing writing and reading skills. Promote creative thinking and teamwork skills through them at the same time, children should be taught to adopt safe and ergonomic ICT use. In “*operational culture that supports growth and learning*” category, it describes that communication technology devices and other tools may be used in ways agreed upon with guardians (National Curricula for pre-primary education). Furthermore, enough ICT resources are necessary for a good early childhood environment during their education, however, there isn’t sufficient access to computers and information networks (Kankaanranta and Kangassalo, 2003) and it have not been widely applied in practice (Pääjärvi and Mertala, 2016). According to Hujala et al. 2012, there are frequently no ICT devices as part of kindergarten classrooms.

## **2.2. Negative effects of ICT in early childhood education.**

Technology has appeared in many researchers for the last decades. Its appropriate use, the benefits, disadvantages and challenges were some of the topics related to it and health issues associated with ICT is one of them. In this section, it is explained in detail what other researchers have considered or found in their studies, facts or situations when technology could not be beneficial for children and the reasons behind those negative effects. If there are disadvantages or unfavorable moments that ICT produce or influence during the learning or teaching process, what it makes it like that and what it could be improved.

There are many studies that mention the appropriate use of ICT and how its bad use can affect young children’s cognitive, physical, social and emotional development. A bad use of technologies can cause some symptoms like eye fatigue and postural effects of a prolonged use of computers, this symptoms are most commonly on adults (Bolstad, 2004). Some authors consider that the use of ICT is incompatible with open-ended, creative play

and learning (The Royal Society of Canada, 1999). Besides, there is a big discussion related to video games; in Griffiths' literature review about video games and aggression, he concluded that there is not empirical evidence or literature that could claim that violent games promote aggressiveness (Griffiths, 1998) at the same time, there is no clear evidence that declare that ICT is not a useful tool for supporting young children's learning and development. However, other studies show that interactive environment of video games can contribute to children's learning, which comprise the development of reasoning and problem solving abilities, skills in decision-making and dealing with multiple sets and layers of information (Bolstad, 2004). Furthermore, connected with the health issues, many authors suggest a proper training and good information about the security and appropriate ways to work and use computers to practitioners and children, since computers can play a role in young children's early childhood education experiences, besides other kind of activities children have, like contributing to raise children's creative play and expression using a huge range of different forms of ICT, for example, cameras, digital toys, tablets, mobile devices for communication... that can be use outdoor and indoors and let practitioners use them for different learning purposes and playing activities (Bolstad, 2004).

The general health awareness related to ICT and computers use should be part of children's learning and teachers, educators, practitioners, caretakers' education, compiling health and safety policy (Siraj-Blatchford and Siraj-Blatchford, 2003, p. 21). According to AAP (American Academy of Pediatrics) recommendations, children younger than 18 months should avoid the use of screen media except for video-chat. For children between 2 and 5 years old, the recommendation goes to 1 hours of screenplay per day with a supervision of parents and choosing a good software according to their age. Children older than 6 years should use screen media as long as it doesn't interrupt their sleep, physical activities or other essential behaviors. However, limits should be set on the use of ICT and a proper software and technology that it is suitable for their age.

Another concern about the negative sides of using ICT in learning environments is isolation. Medvin et al. (2003) advise that classroom environment design can encourage isolation or integration. On one side, some researches point out that computer should not be part of children's education in an early childhood stage since it impedes natural intellectual

growth of preschool children (Lynch & Warner, 2004) and that computers support social isolation and loneliness. It mentions that with ICT, children develop dependency as well as health issues (Raptis and Rapti 1997, Kubey, Lavin & Barrows 2001). On the other side, other studies have showed that young children prefer to play computer games with other friends than alone on their own (Linderoth et al., 2002) and they show more interest when there is an adult supporting and guiding the computer activity.(Graham & Banks, 2000, Medvin, Reed, Behr, and Spargo (2003)

### **2.2.1. Other factors that makes ICT fail in kindergarten classrooms**

In the previous sections, general negative effects were mentioned. However, there are other factors as ethnicity, culture, language, gender and economic or social status that affect on the knowledge, skills, disposition and feelings children present around computers in their early childhood settings (Bolstad, 2004). Therefore, it affects on the performance and situation in the use of ICT in the classroom.

From practitioners' side, lack of awareness and information about general issues that concern ICT and passive attitudes at the time of using the role of supervisor. Kindergartens didn't have enough ICT training and how to use different tools in creative ways in order to integrate teaching and learning to stimulate and engage children (Tsitouridou and Vryzas 2004). Also, insufficient equipment/software or budget to buy new equipment and the absence of technical support impede on teachers the use of ICT in the classroom (O'Hara, 2004). It is important to research on the area of training and the conditions where teachers perform, so in the future, the circumstances are going to be more favorable for teachers and students.

With the implementations of new technologies in schools and classrooms, professional teachers are going through several challenges on developing their knowledge and change different ways of implementing new information. It is complicated for certain practitioners to learn the new knowledge independently of the situation in which it will be used. Some teachers did not have a proper training in ICT or because of their age, at that time, it was not common to implement anything related to technologies in kindergarten classrooms. Actually, the implementation of technologies in kindergarten is quite recent so it is normal

to expect non-prepared teachers in this area. However, it is important as a teacher to keep updated on the new learning theories and methodologies. Learning new technologies has to be meaningful for teachers and at the same time, keeping good environment in their classroom. It is happening that the pressure among the culture is too strong and it is hard to remove the learning structures that day by day are been used to a new different concept (Karagiorgi & Charalambous, 2006). That is why is essential to give opportunities to teachers who are already performing and at the same time, train in an appropriate way, future kindergarten teachers.

At last, there are some discussions about software developers and the new era of games and marketing. Educative community must be alert to new technologies, applications and different software that are more influenced by the lucrative markets than for the educational values and purposes that they might promise. The market target both children and parents or even early childhood education settings, when at the end, the educational benefits are completely different (Bolstad, 2004). Here it comes again, the importance of training and teachers being able to choose what to use, how and for which purpose.

### **2.3. Positive effects of ICT in early childhood education.**

Positive effect had been mentioned in this study previously, but in this section it is going to describe more specifically and from literature what the benefits of ICT in early childhood education are. There are many different ways to apply technologies in the classroom and for many different purposes. ICT is a wide term with large amount of possibilities in the classroom, for learning or teaching. Technologies could be implemented in many diverse areas and gives hundreds of opportunities to teachers and children.

ICT use can provide a valuable context for collaboration, cooperation, and positive learning experiences as well as to support children's cognitive and emotional development and the development of social skills, encouraging discussion or enhancing the relationships between adults and children. Good software can allow children to engage in self-exploration and structure in a certain sense that covers individual needs (Bolstad, 2004). Useful and adequate devices could fit to individual task or group work, as it was mentioned before. For group work, ICT could be used for communication, shared tasks, evaluation



and assessment or presenting are some of the examples. Teachers could use them to keep track of children's learning and at the same time, document the progress and deficits of the children.

ICT can be used to improve areas such as literacy or multi-literacies (Hill & Broadhurst, 2001; Pastor & Kerns, 1997), expressing themselves, verbally, visually or emotionally. It is a useful tool in areas such as mathematical thinking, special needs, language development and writing abilities (Cochram-Smith et al, 1998, Bolstad, 2004). Researchers found positive and beneficial the use of technologies to improve children's abilities. Certain software and devices give chances for children to practice, not just in a traditional way with a device, also with audition and visualizing. This improve other capabilities in children such as reading, listening or memory (Ilmeideh, 2010).

Other transversal knowledge, like creativity, problem solving, risk taking and flexible thinking can be supported with the use of technology in a group or individual task, outdoors or indoor. It helps children to process better their own thoughts and being able to express themselves in a concrete way as well as project abstract thoughts (Fischer and Gillespie 2003, Eunsook & Genevieve, 2005).

For teachers, it helps to enhance children's learning and play experiences, to strength practitioners' professional learning and development, reinforce communication between parents, children, or the early childhood center. ICT offers additional resources to teachers to plan and find new ways of teaching, explore new methodologies and creative ways to integrate it into the curriculum. ICT is always adding to, rather than replace, it is a tool that complements teacher's activities.

It is considered that at the age of three years old, computers can be introduced at kindergartens, on condition that good and appropriate software is used and correct supervision for children (McCraw and Meyer 1995, Plowman and Stephen, 2005). Lately, there has been many reforms, in teacher education and the training of pre-service teachers that include ICT as a top priority in kindergarten education (Zaranis, 2015).

In the 21<sup>st</sup> century skills, the use of computers and technology are considered such important tools as in the past, pencil and paper was considered for learning in previous generations. (Ntoliopoulou, 1998). Being able to perform, teach or learn is an indispensable expertise for teachers and children in the future, for their working situation or life condition. It presents multiple facilities at the moment and that is why it is considered important in the area of education.

### **2.3.1. Appropriate use of ICT in kindergarten classrooms.**

Many studies center their attention into teacher training and how this is the basement of a good understanding of ICT and for teachers to connect their pedagogical knowledge with ICT skills. Educational centers should demand an effective and appropriate professional training in the use of ICT with young children (Siraj-Blatchford & Whitebread, 2003, p.6) with guidance and help for practitioners.

The understanding teachers get from their training about the use of ICT and the skills they get will affect on their decision in the classroom and the appropriate use of ICT in it. It is important, for an effective training, how pre-service teachers perceive technologies and what are their attitudes towards them. With this information, educators could be aware of the direct needs that students have and will let them design new courses according to the results of these kind of studies.

Downes & Fatouros (1995) points that technology won't improve the learning on its own, the teacher is the intermediate between technology and the classroom and the teacher is the one supporting and facilitating the students to acquire knowledge (Livingstone 2012).

The way ICT and other resources are used are part of teacher's' role (Higgins, 2003), they are the key for the success of student's learning.

Computers are learning tools rather than machines that deliver instructions (Lowther et al., 2003; Ruthven et al., 2005), they are here to support the teaching of content.

Then, it is part of practitioners' role to take decisions and select which ICT tool would be more adequate to the learning environment, that encourage students rather than limits. Choose how and when to use it, because with their understanding of ICT, practitioners will support children's learning (Bolstad, 2004).

The use of ICT should be for teachers to learn and explore new ways of teaching, they should connect the use of it with their practices and social context of early childhood education (O'Hara, 2004; O'Rourke & Harrison, 2004; Sheridan & Pramling Samuelsson, 2003), at the same time, planning the use of ICT to make sure that technology appears in the curricula with a meaningful and developmentally purpose. Learning goals, identify devices, analyze devices and how to integrate into the curriculum are some of the ways that show how practices with ICT are potentially effective in the area of educational technology.

Educators must plan and think about children's educational goals, social and emotional needs when they want to promote collaborative learning opportunities for them working with technology and enhance learning experiences (Quesenberry, 2016; Bolstad, 2004), so ICT resources become a necessary and an integrated part of the learning process, not just a technical tool to ask for help (Zaranis, 2015).

There should be a connection between the pedagogical approach, the values and the ICT resources in order to offer a proper teaching for young children that it is related to goals and have a specific focus (Bolstad, 2004). A relation between pedagogical theories related to ICT and the curricula will provide more effective teaching and freedom to professionals.

Practitioners shouldn't forget to keep the balance between technology activities and outdoor activities. Technology activities need to support children's self-directed learning experiences where they are able to formulate their own concern, passion and interest. Part of the role of an early childhood educator is to provide young children different ways to develop their skills. Scaffolding children's use of ICT is one way to regulate activities and assessment is an essential part for their learning (Bolstad, 2004; Quesenberry, 2016).

Children should begin to learn the first steps of technology, what it is, how to use it, appropriate use of it, correct position and the role of technology in our lives as well as learning through technology, how to apply concepts, how technology supports learning and teaching or the benefits of using ICT. From educators' side, the use of ICT can reflect on children's and educator's interactions likewise to strengthen and guide family involvement in children's learning, considering ICT not just a tool, otherwise, a mind tool (Zaranis, 2015; Bolstad, 2004).

The class climate changes with the introduction of ICT in the classroom, it also modifies the relationship between teacher and students in a more open and free communication. Students are motivated to work with computers, activities are more engaging and challenging than the traditional ones, and in general, the learning environment is more meaningful (Ilomäki, 2008)

All these actions and decisions from educators related to ICT are influenced by some factors like teacher's own level of confidence with computers, self-esteem and beliefs about learning and teaching ICT in early childhood years. That is why guidance, examples and support in their training and professional development will influence those decision making about how and when to use ICT during children's learning (Dockett, Perry, & Nanlohy, 1999).

Finally, one of the relevant points for an educator is to integrate ICT into practice and keep updated, being familiar with contemporary theories about learning and development and new technology material that could be useful in teaching or learning as well. Connect both concepts and being able to link them and find when it is the appropriate time that learning or teaching requires this tools. That means time and effort from educator's side (Baron and Harrari 2005; Selwyn 2000; Bolstad, 2004).

#### **2.4. Pre-service kindergarten teacher's approach towards ICT**

The training period is an essential part of teachers' education to become a skillful practitioner in the area of technology. Researches have showed that the beginning of their training is very influential for a teacher to understand different educational tools in the future and during their training (Hermans et al. 2008; Mumtaz 2000). Also, Kalogiannakis (2010) mentions in his research that there is an existing gap between what pre-service kindergarten teachers are taught about ICT and their expectations in a live classroom setting.

Many studies discuss about the uncertainty, bad confidence and lack of skills in ICT, how to implement and combine different ICT tools with the teaching methods and lack of attention towards ICT. The answer to this effects on teachers are generally provoked from the

training period and preparation for the working life (Bolstad, 2014), describing teachers' situation as a critical issue for the field of teacher education and technology and referring to ICT courses as fundamental part of pre-service teachers' training to determine the future role of ICT in education (Kalogiannakis 2010; Wedman and Diggs 2001; Wheeler 2001). The consequence of this pre-service teachers' non-preparation on ICT skills derive to a negative general attitude and perception about ICT in educative settings (Angeli 2004; Chen and Chang 2006; Kumar and Kumar 2003; Yildirim 2000), therefore, it affects on the way teachers improve their teaching environment (Selinger 2001; Wetzel et al. 2004).

According to Chen and Chang's research (2006), teachers who attended computer training from college or university showed more positive attitude than those teachers who had received only in-service training or were self-taught. It creates attitude that question ICT's ability to produce a quality education and learning outcomes (Kalogiannakis 2010; Shade and Davis 1997; Tsitouridou and Vryzas 2004; Zaranis and Oikonomidis 2009). Through computer courses, teacher's attitudes and computer use will be affected and improved, besides, it will keep an adequate technological competence and motivation about how to use ICT in the instruction of young children (Kankaanranta, 2003) and support the integration of ICT into teaching methodologies (Zaranis, 2015). For instance, in Ilomäki's research (2008) it shows that ICT wasn't a challenge for teachers but there were in scaffolding students in open learning environments, hence, there were missing competencies in didactic methods and in managing learning and teaching process. A positive attitude towards ICT affects adequately when teachers use technology in the classroom, promoting student thinking, expression and knowledge building (Loveless & Dore 2002). Teachers who have used ICT or had been trained in the use of ICT are more likely to implement their knowledge in an adequate pedagogical setting and practices with meaningful purposes in a classroom (Hakkarainen et al., 2001).

In previous studies, it could be seen differences between a group of teachers or pre-service teachers who have more experience in the use of ICT or have a previous training in this field and another group of teachers or pre-service teachers who are not familiar with technologies and do not have experience with them. The group who are familiar with the use of

ICT succeed more in the use of digital devices and applications than those who are not using them or have never had training related to it (Ilomäki, 2008)

## **2.5. The role of teachers with ICT**

As it is mentioned before, ICT is a good tool to enhance children in their learning process and for teachers, ICT is a powerful tool that can be implemented in the classroom, but these practitioners need guidance and opportunities to feel capable, competent and informed about the educational purposes and potential use of ICT. It is important that teachers learn new ways of communication, of seeking and handling information and interact through ICT, along with how ICT impacts on children's learning, playing, development and strengthening relationships (Bolstad, 2004).

It is important to provide teachers with spaces and time, where they can explore, understand and expand their capabilities and literacy about ICT and how they could use ICT to support and broad practice in their own early childhood settings (Downes & Fatouros, 1995). Analyze the content of different software, the purposes of them and examine which ones are more suitable for certain methodologies, are part of teachers' role as educators. They should investigate new possibilities and educational centers must provide teachers with courses, resources and support for their professional development in their working environment.

In spite of this, educators need guidance and support to find as many opportunities and ways to use and squeeze the potential that ICT presents, so educators can strengthen all aspects of early childhood education practice and at the same time, educators need to be aware and updated of the new projects and ideas related to ICT that are made for young children and be updated with the new resources that the technological market is offering.

Finally, another important point is the consciousness that educators need to have related to health and development issues that are relevant to ICT in early childhood environment (Stephen & Plowman, 2003). As it was described in a previous section, negative issues related to health can provoke serious problems and teachers must be aware of all of these

dilemmas. It is their responsibilities to get informed and know how technologies work in a kindergarten environment and what it is beneficial and what it is not.

According to Lakkala et al. 2005 research, it is mentioned seven ICT competences that teachers should need to integrate into their teaching and early childhood education. These competences are: basic ICT, technological ICT, ICT policy, ICT use in ethics area, ICT integrated into teaching subject, didactical methodology based on the use of ICT and working with ICT for managing teaching and learning process.

In Lakkala's research is mentioned that it is not just about skills and technicalities while we are talking about ICT, there are transversal competencies and knowledge that improves teacher's practices when these concepts are applied in the early childhood environment. It is crucial for practitioners to gain experience on integrating ICT competences with their pedagogical knowledge and skills (Owston, 2003).

## **2.6. Finnish pre-service kindergarten teacher training in ICT**

In the early childhood education teacher training curricula, media education appears like a minor subject (Pääjärvi et al, 2016). From Pääjärvi's research, between all the kindergarten teacher training programmes that Finnish universities provide, 23 courses included media education or ICT themes. From those courses, 9 of them include media education specifically in their goals, content or literature, although, 14 of the 23 focused on ICT. Lastly, just one course included, in its goals and content, both concepts, media education and ICT.

These subjects are more focused on general skills and technical skills but it does not project the professionalism in the early childhood education area. It includes known-how techniques and focused more in performing and the superficial use of technologies. Apart from technical skills, teachers should learn how to implement all those skills into the current curricula and be multidisciplinary in the area. The mere fact of learning how to use a computer will not change the situation in Finland, there is a need of more deep implementation of the ICT and Media Education. In the early childhood education curricula, the aims are focused in general concepts about ICT, whether or not the teacher imparts it in a more specific way and professional, it can't be known. Early childhood education is not well

recognized in the field of technologies, that is why it is not well known by many of the professional educators.

Regarding Pääjärvi et al. (2016), it is common for pre-service early childhood teachers to learn quickly outdated ICT skills and not suitable for pedagogical situations. Suoninen (2008) mentions in his research that there is a small minority of ECE teachers that have studied media education. In Karila et al. (2013) research it estimates that in universities, early childhood education training in ICT skills is not at an appropriate level.

Low technical self-efficacy builds barriers to media education (Kupiainen, Niinistö, Pohjola & Kotilainen 2006). Also, lack of training and knowledge in the area gives low self-confidence hence, an absence of the use of technologies. Therefore, continuous development, adding reflective competencies and knowledge management promotes professional competence in relation to media education in ICT.

It is essential to include and rise visibility in the early childhood curricula which is full of traditional and newer forms of content, to find place for the new competences in the 21st century education such as media education, ICT, multiculturalism or sustainable development (Korhonen & Rantala 2007). These competences are competing for a position in the new early childhood education, addressing the needs that new educators demand for a successful future in the early childhood environment, for the support in their subjects and working life.



### **3. METHODS**

In the next pages of this study, there is going to be an explanation of the main objectives of this research and the research questions that were thought to answer at the end of this paper. The description includes the target of this study and which kind of participants was chosen to engage this study and the instrument that was used to resolve the aims previously mentioned. Moreover, there is a detailed explanation about how the data was collected and the analysis of it step by step, for both sides, qualitative and quantitative data.

#### **3.1. Aims and research questions**

The purpose of this study is to analyse how pre-service teachers perceive ICT as a tool that supports learning and their attitudes towards ICT. Analysing how pre-service kindergarten teachers see technology in the classroom, like if it affects on the classroom's atmosphere, supports children's learning, how hard it is to evaluate children's learning through technology or if they feel comfortable and confident including ICT in their future teaching methods. I seek to find challenges when pre-service kindergarten teachers believe technology might impede their teaching, problems that can cause the use of it and limitations. Discover what their negative and positive perceptions towards ICT are, their general impression about ICT and their predisposition about learning ICT during their training in the future. I explore and detect the differences between students' attitudes from first year and after the first year of their studies, with this I find how their attitudes change during their training time and it help understand more when students apply for their studies and how their way of thinking towards ICT changes during the years. In this point, I analyse students from first year and the rest of the year at the same time, not before and after a course, this study will give a general overview of how pre-service kindergarten teachers think about ICT.

In order to achieve the aims of this study, a questionnaire was made to analyse all these points and for the purpose of this research, research questions were formulated:

- How pre-service kindergarten teachers perceive the advantages and challenges in using ICT in kindergarten?

- What are pre-service kindergarten teachers' attitudes towards ICT in the classroom?
- What are the differences between first year students' attitudes and non-first year of pre-service kindergarten teacher training?

### **3.2. Methodology**

The main focus of this study is descriptive, the results of this research will help the education community to understand more about the perceptions and attitudes towards ICT of university students in the area of early childhood education.

I conducted this study following both approaches; quantitative research and qualitative research. Quantitative methods refer to approaches to empirical analysis that collect, analyze, and present data in numerical rather than narrative form (Given, 2008). The data will explain the basis of a phenomenon, in this case, the perceptions and attitudes towards ICT in pre-service teachers. For this part, my research strategy is a likert scale questionnaire where it shows pre-service kindergarten teachers' attitude towards ICT in the classroom and how the participants rate their answers according to negative and positive questions related to the topic. The quantitative research predicts students' attitudes based on the likert scale questionnaire where the range was from 1 (Disagree) to 5 (Agree), it helped to understand students' attitude and their perception in a numerical order.

However, qualitative research refers to social approaches that collect data in a narrative form that describes a phenomenon (University of SC, 2015). Compared to the quantitative part, for the qualitative part of my study I used four open ended questions where I explained how pre-service kindergarten teachers perceive ICT in kindergarten, it tries to understand the area of technology in early childhood education and kindergarten training environment. Understanding the participants' meaning and attitudes towards ICT, qualitative research explains in more details the quantitative part of this research, it describes more in deep the results and explains in detail what it is exactly that challenge pre-service kindergarten teachers about ICT in kindergarten. The aim is to interpret the answers of the questionnaire, categorize, interpret and describe them, being supported by the quantitative data.

For the last research question of this study, quantitative data was used from the likert scale

questionnaire and I compared the results from first year pre-service kindergarten teachers and the rest of the students from kindergarten training.

The approach of this study is deductive, on the basis of the theory technology enhance learning in early childhood education, I explored and found similar researches that are measuring comparable data. This study will relate to previous studies and link similar and different results from them to show how it is the theory in the area of Northern Finland. This study will help in the area of teacher training and ICT since, as it was mentioned before, it will relate to previous studies but in the Finnish context. Specifically, the results will benefit and guide more in the Finnish educational environment, hopefully, it will present new ideas for a future curricula or modifications in the current one in pre-service kindergarten teacher training.

### **3.3. Participants**

The participants of this study were 46 students from the Early Childhood Department at Oulu University, Finland. The participants, pre-service kindergarten teachers, are from first year to fourth year of their training, 63% of the participants are studying first year, 21,7% second year, 10,9% third year and 4,3% fourth year. Some of the participants had taken courses related to ICT or media education and some others not, but this study didn't take that into consideration for the analysis of the results.

### **3.4. Instrument**

In order to successfully meet the aims of this study, the instrument being used was a likert scale questionnaire with 19 questions where the range was from 1 (Disagree) to 5 (Agree), 4 open-ended questions where they had to write short answers explaining their opinion towards each question and 2 questions related to the participant's background. For the likert scale, there are three categories: perception, negative attitude and positive attitude. The questionnaire has been developed from other researches in the same topic and the guidance of my supervisor.

### **3.5. Procedure - Data collection**

I decided to use both methods to supplement and support each other's answers. With a quantitative questionnaire I was able to reach more students than a normal interview and with this data I could give an overview of my topic. With the open questions, I was able to obtain more descriptive and broader answers for my study. Also it gives more examples, ideas, thoughts and perceptions about the topic and this material can support the quantitative answers with more detail and accurate.

The main data of my analysis is the qualitative part since it gives a more descriptive information of my data, offering measurable results and concrete for future discussions. The quantitative part provides a general idea of the main data.

To select the participants, the questionnaire was sent by email to the whole Early Childhood Department that comprises all the students in it. After reaching some of them, I made use of my personal contacts to reach more students after one of their lessons with iPads as the tool to collect the rest of the answers and Google Docs for the software of the likert scale questionnaire. In total, 32% of the participants filled the questionnaire from the email I sent and 68% of the participants answered the questionnaire after one of their lesson. The ages of the participants varies from 19 years old to 36 years old and the average age is 23,21 years. The data was collected during the spring semester in 2017 and every participant had filled the questionnaire anonymously and individually.

From the quantitative questionnaire, 46 participants answered all the questions, however, from the qualitative questionnaire, not all the participants answered the four questions in a proper way, some of them did not answer or wrote "I don't know" so it is not possible to categorize or obtain meaning from those answers and they were classified as non-answered questions. The average number of answers per question is the 36 participants.

### 3.6. Data analysis

The research methods used for this study are divided into two: quantitative data and analysis and qualitative data. In this section, there are explanations, step by step, of all the movements that were done in this research study.

For the quantitative data, Microsoft Excel was used to transfer all the data from the likert scale questionnaire and find the mode, mean of each question and all the mathematical procedure to combine questions and find results of this research. Also it was used to create charts to show the results of this study and have a better visualization and explanation of each question. Descriptive analysis provides a summary of the data content and the information that was collected during the questionnaires creating a description about what the data shows. This summary makes the results and conclusions more manageable since it reduce the 46 answers times the questions from the likert scale questionnaire into a summary.

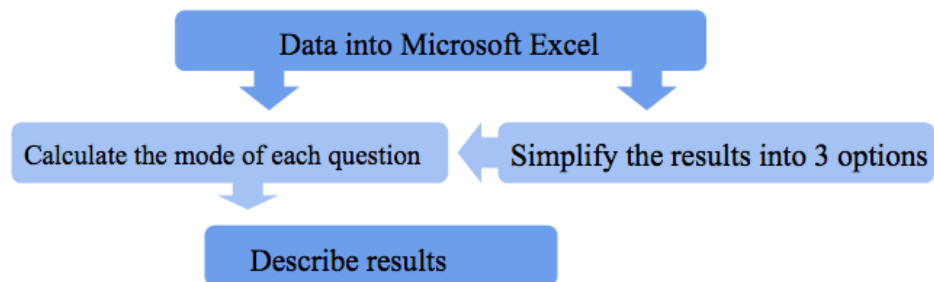


Figure 1

For the third research question, SPSS version 23 was used to compare pre-service kindergarten teachers' results from first year and from those who are not in the first year. The quantitative data was exported to SPSS and T-test was used for the comparison of the third research question. T-test is used in statistics to assess and evaluate if two groups are statistically different from each other, in this case, I compared the answers between students from first year and students who are not in first year from Early Childhood Department. After that, factor analysis was used on the quantitative data as an exploratory statistical method to observe the correlations between variables (questions), it was used to understand what constructs unobserved data.

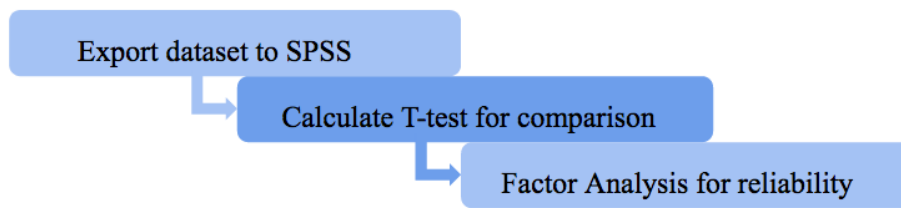


Figure 2

After the quantitative questionnaire, participants were asked to fill four open-ended questions voluntarily. For the analysis of this part of the study, the questions that weren't answered or the answer was "I don't know" or similar were not counted for the analysis, since it did not give any information related to the questions. The final number of questions that were answered are in table. It is a smaller number compared to the quantitative questionnaire but it was still relevant for the study. The questions, from the qualitative questionnaire, that were formulated are the following ones:

- Q1: In which situations ICT can be beneficial in kindergarten?
- Q2: How do you see the challenges of applying ICT in kindergarten?
- Q3: What would impede you from implementing ICT in your teaching methods?
- Q4: When do you think ICT is needed in kindergarten classroom?

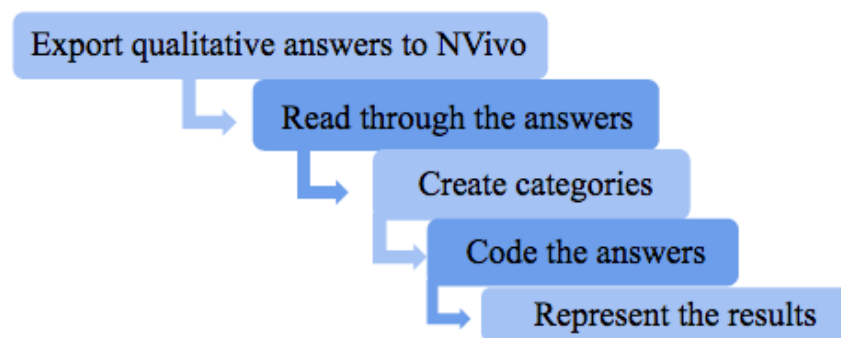
Question	Total answers
Q1	30
Q2	34
Q3	42
Q4	37

Table 1

NVivo was used to categorize all the data from the open-ended questionnaire. First step was to export the qualitative answers to NVivo and read through all the answers. The second step was to find categories for each question and start coding each answer according to the categories that were created previously. During the coding part, some categories were modified or include into another category because the number of categories per question were high or the meaning of the categories were similar. For a better description and un-

derstanding of the results, it was beneficial to simplify this step. At the end, there were four categories per question, except one of them that ended with five categories.

When all the answers were coded, the information of the numbers of times that the results were coded into one category were transferred manually to Microsoft Excel. With the data in Excel sheet, it was possible to describe and create charts that represented the amount of answers per each category, using percentages and the mode of each category. Finally, from the charts, the categories and results of the mode were described carefully and finding conclusions from the obtained data.



*Figure 3*

## 4. RESULTS

The aim of this study is to analyse how pre-service teachers perceive ICT as a tool that supports learning and their attitudes towards ICT, discover which complications pre-service teachers find when they apply technologies in their teaching environment and identify positive and negative approaches towards technology.

The results would be presented in different sections that correspond to different methodologies that has been used in the research. In each section, I am going to explain the results in detail of each analysis and at the end of these sections, there is a summary with all the results.

### 4.1. First descriptive quantitative results

A descriptive statistical analysis was chosen to represent the likert scale questionnaire as the quantitative data of this research. Previously, the mode of each question was founded for a better understanding of the data.

The general average of the answers from the participants is 3 (Moderate) in most of the questions (Q1, Q2, Q4, Q6, Q8, Q10, Q11, Q12, Q13, Q14, Q15, Q16 and Q17) (See Figure 4)

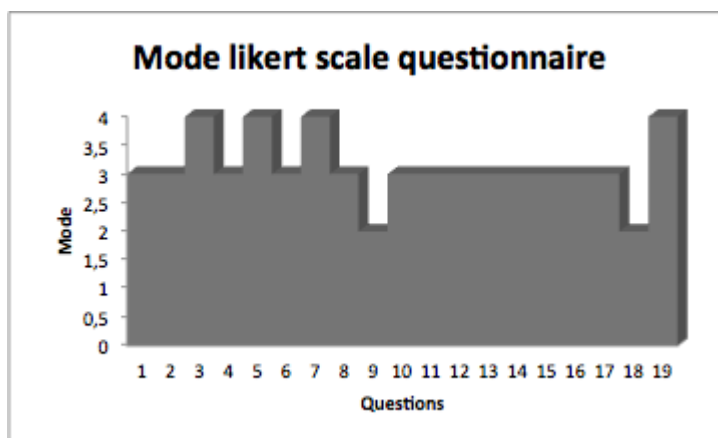


Figure 4

In questions related to “perception of the challenges and advantages in using ICT in kindergarten classroom” (Q1, Q3, Q4, Q7, Q10 and Q11) there is a positive reaction from practitioners. In Q3 and Q7, the mode is 4, this means that pre-service kindergarten teach-



ers agree that ICT use in teaching and learning is essential to prepare students to live and work in the 21st century and ICT can be a good supplement to support teaching and learning. For the rest, the mode is 3 but in two of them the answers tend to agree.

From the questions related to “negative attitudes towards ICT” (Q2, Q6, Q8, Q9, Q12 and Q18) the mode in all of the questions is 3, except for Q9 that it is 2, so pre-service kindergarten teachers don’t see ICT as a difficult tool to use and Q18 where they affirm that ICT is not something that will overwhelm them while working in a kindergarten classroom. From the questions which mode is 3, Q8 and Q12 tend to disagree, however, Q2 tend to agree which means that pre-service kindergarten teachers fear the risk of danger using ICT in the classroom.

From the questions relate to “positive attitudes towards ICT” (Q5, Q13, Q14, Q15, Q16, Q17 and Q19), the mode in most of the questions is 3, except for Q5 and Q19. Pre-service kindergarten teachers see the use of ICT in teaching and learning as a positive impact on children’s motivation and the majority of them are interested on receive training in the use of ICT to work in kindergarten classrooms. From the questions which mode is 3, participants tend to disagree in Q13 and Q15 which means that ICT don’t improve the class climate and ICT is not something that will limit their freedom as a pre-service kindergarten teachers. In Q14, Q16 and Q17, participants tend to agree to the statements on the questionnaire. From a moderate general answer, participants tend to rely on technology, they slightly agree that computer resources encourage them improving the teaching process and they are closer to the statement that says that the use of ICT increases the motivation as a pre-service kindergarten teacher.

## **4.2. Mode**

After the description of the likert scale questionnaire, for a more accurate interpretation, the answers “strongly agree” and “agree” were added to each other, creating just one at the end, like for the answers “strongly disagree” and “disagree” that were added too. At the end, the final result will show three options from the original five: agree, neutral and disagree. For the next table, the results that are showed, present:

- 1: the mode shows that participants agree to the question

- 0: the mode is neutral and participants answered with number 3 (Moderate)
- -1: the mode represents that participants disagree with the claim of the question.

The new synthesis of the answers, after adding the extreme options, created new modes. (See Figure 5)

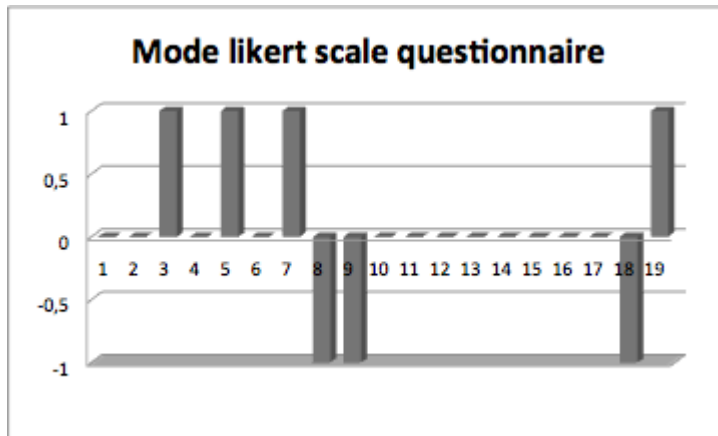


Figure 5

For the questions 3, 5, 7, 9, 18 and 19, the mode keeps being the same what means that the general perceptions or attitudes of pre-service kindergarten teachers are moderated in those questions' claims. However, in Q8 "ICT creates more problems than solution" participants disagree on this statement what it is positive for the conclusions of this research study.

For a more detailed explanation about the likert scale questionnaire, the second mode has been computed and this is the second option that was more answered in the questionnaire. The second mode has been considered from the total responses that are over 25% of the total, this refers to 11 or 12 participants agreeing with the answer. In this situation, as in the descriptive analysis, Q2 and Q13 are important to point out since participants see the use of ICT dangerous and ICT doesn't improve the class climate. However it is important to mention that in Q4, Q7, Q10, Q11, Q14, Q15, Q16 and Q17 the participants have a positive perception and attitude towards ICT. Participants think that the use of ICT is important in kindergartens, they consider ICT as a good tool that supplements their teaching and facilitates collaborative work in kindergarten. They think children are more auto-

mous while learning with ICT and it is not hard to keep track of their learning while using ICT. ICT is reliable for them and they don't see ICT as a limitation for teaching and using it in the classroom increase their motivation and encourage them using it more.

Summarizing, we could say that participants have more positive attitude towards ICT, in general, than negative. However, it would be more correct to say a moderate attitude that tends to a positive approach about the use of ICT in kindergarten classrooms. The reasons why they won't have a positive attitude towards ICT is related to the possible danger of using ICT in the classroom and some participants don't see ICT as a tool to improve the class climate.

### 4.3. T-test

First year students and students who are not in first year were compared. For the findings of this comparison, the t-test, for independent variables, was practiced in SPSS version 23, trying to find if there are differences or similarities between the two groups, in relation to their perceptions and attitudes towards ICT.

First of all, the mean of each group (perception, attitude and negative attitude) from the questionnaire was found to see the similarities or differences between both groups. After that, an independent samples t-test was conducted to compare perceptions and attitudes towards ICT in first year (1) and no first year students (2). The results of the t-test are the following ones:

Group Statistics					
	VAR00021	N	Mean	Std. Deviation	Std. Error Mean
Perception	1,00	29	3,4138	,41457	,07698
	2,00	17	3,3627	,35957	,08721
Attitude	1,00	29	3,2217	,29224	,05427
	2,00	17	3,0756	,50030	,12134
Negative	1,00	29	2,6724	,41900	,07781
	2,00	17	2,6961	,40498	,09822

Table 2

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Perception	Equal variances assumed	1,184	,283	,423	44	,675	,05105	,12080	-,19240	,29450
	Equal variances not assumed			,439	37,604	,663	,05105	,11633	-,18452	,28662
Attitude	Equal variances assumed	4,414	,041	1,254	44	,216	,14604	,11646	-,08867	,38076
	Equal variances not assumed			1,099	22,526	,283	,14604	,13292	-,12925	,42134
Negative	Equal variances assumed	,002	,965	-,187	44	,852	-,02366	,12645	-,27850	,23117
	Equal variances not assumed			-,189	34,596	,851	-,02366	,12531	-,27816	,23083

Table 3

The results show that:

There was not a significant difference in the scores for perception in first year students (1) (M=3,41; SD=0,41) and the rest of the students (2) (M=3,36; SD=0,36) conditions;  $t(44)=0,42$ ,  $p=0,283$  [95% CI=-0,19;0,29]

There was not a significant difference in the scores for negative attitude in first year students (1) (M=2,67; SD=0,42) and the rest of the students (2) (M=2,70; SD=0,40) conditions;  $t(44)=-0,187$ ,  $p=0,852$  [95% CI=-0,28;0,23]

There was a significant difference in the scores for attitude in first year students (1) (M=3,22; SD=0,29) and the rest of the students (2) (M=3,08; SD=0,50) conditions;  $t(44)=1,25$ ;  $p=0,04$  [95% CI=-0,09;0,38]

This information suggests that the perception and negative attitudes towards ICT in pre-service kindergarten teachers, are the similar, however, this test suggests also that the attitudes (positive) towards ICT in pre-service kindergarten teachers are different between students from first year and the students who are in another academic year.

#### 4.4. NVivo

Furthermore, for the qualitative data, open questionnaire, NVivo 23 was used to load the data, categorize and code all the answers from the participants.

The purpose of question 1 (In which situations ICT can be beneficial in kindergarten?) is related to perception about ICT from pre-service kindergarten teachers. With this question, participants will show in which areas they think it is more convenient to use technology and where technologies could give a positive experience to children in kindergarten classrooms.

The aim for question 2 (How do you see the challenges of applying ICT in kindergarten?) is also related to perception about ICT from pre-service kindergarten teachers. In this question, participants will explain what provokes a conflict in terms of using ICT in kindergarten classrooms. The answer could be a factor or a person, an ideology or an institution, it is the fact or external factor that challenges them and therefore, pre-service kindergarten teacher are not able to apply technologies in the classroom.

For question 3 (What would impede you from implementing ICT in your teaching methods?) is categorized into attitude. Pre-service kindergarten teachers have to describe what or who is making them not to apply or implement ICT in their methodologies, what it is interfering on their attitude of using ICT in their teaching or what they think are the main problems of implementing technology.

Finally, in question 4 (When do you think ICT is needed in kindergarten classroom?), the answers are related to attitudes towards ICT. Participants have to define when the use of technology is demanded in kindergarten classrooms, when ICT has a room in kindergarten classroom to promote effective learning or teaching, when it is effective or produce a positive experience in learning environments around kindergarten classrooms.

After transferring all the data to NVivo and analyse the content, these are the final categories that were created for the coding part:

Question 1	Filling time
	Learning
	Motivation
	Teaching

Question 2	Children
	External negative attitude
	Resources
	Skills
Question 3	Children's use
	External negative attitude
	Not for kids
	Resources
	Skills
Question 4	Learning
	Opportunities
	Right situation
	Teaching

*Table 4*

**Question 1:** “In which situations ICT can be beneficial in kindergarten?” was categorized into 4 different sections: filling time, learning, motivation and teaching.

The total number of answers is 30. In table 4, there is a representative chart that shows the number of answers. The category with more answers is teaching (13), but learning (11) was chosen a considerable number of times too. Teaching is defined as a category that relates to teacher's role and the action of teaching. It refers to the answers that mention a specific subject where technology could be beneficially applied, supporting the curriculum or other projects/activities. Some examples of the answers from this category are:

*“When it supports the actual aims and goals of the activities instead of being used just for the sake of using ICT”*. - Student n°7

*“When child is learning numbers or letters for example”*. - Student n°43

Learning category indicates when the answer includes the word and meaning of learning. It refers to a person who is learning, children’s role, teacher’s role, training time etc... For example:

*“ICT could be integrated to many different things”*. - Student n°25

*“When it is used to support and integrated with other curriculum and is interesting to children”*. - Student n°8

And finally, filling time category refers to the moments where there isn’t any activity or subject going on, like waiting time or free time and they find beneficial to use technologies in that situation. The answers that were coded into motivation category indicate that the action of using ICT is a tool to motivate children and participants find beneficial the use of ICT to apply in moments when it needed to arise motivation in the children.

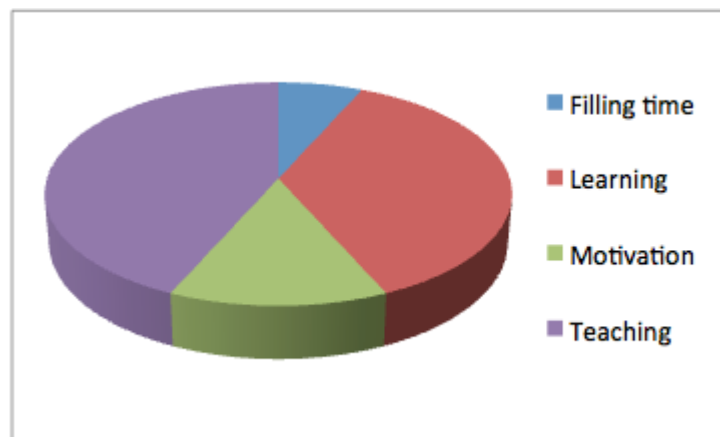


Figure 6

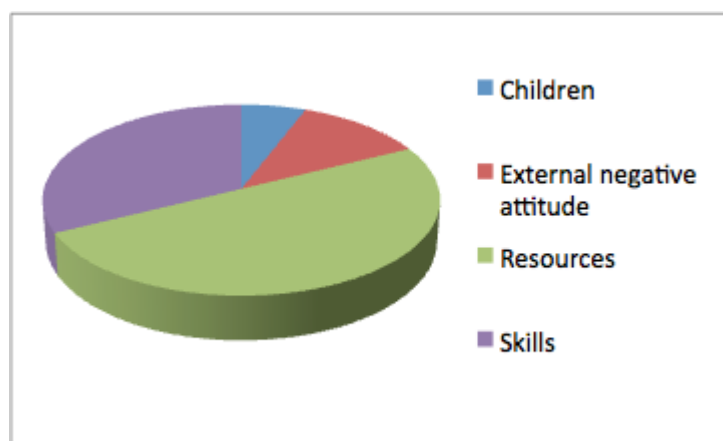
**Question 2:** “How do you see the challenges of applying ICT in kindergarten?” was categorized into 4 different sections: children, external negative attitude, resources and skills. The total number of answers is 34 and there is a significant rate of answers that are more prominent related to resources (17) and skills (11) categories. Resources category means

lack of resources; equipment, money, budget, computers or other ICT material, software or/and time. Skills category refers to lack of skills: knowledge, abilities or training related to ICT, the no application of ICT or integration of ICT in the curriculum or teaching methods. Participants feel the challenge of using ICT when there is a lack of resources or skills. For example:

*“If I don't find any great application for teaching”*. - Student n°15

*“The lack of ICT training”*. - Student n°22

Categories named as “children” describe about those participants whose answers are related to children’s context. The action, behavior or condition of them will impede pre-service kindergarten teachers on using ICT in the classroom. And when an answer was coded into “external negative attitude” it refers to a situation when external people (co-workers, teachers, parents or other adult that is involved on the education of the children) don’t support the use of ICT or their attitude towards it, will impede pre-service kindergarten teachers to use ICT in a kindergarten classroom.



*Figure 7*

**Question 3:** “What would impede you from implementing ICT in your teaching methods?” was categorized into 5 different sections: children’s use, external negative attitude, not for kids, resources and skills.

The total number of respondents is 42 and in resources (15) and skill (12) categories there is a significant number of answers that excel from the rest of categories. Resources catego-



ry refers to the lack of resources; equipment, money, budget, computers or other ICT material, software or/and time. Skills category refers to the lack of skills: knowledge, abilities or training related to ICT, the no application of ICT or integration of ICT in the curriculum or teaching methods in an appropriate way. The answers that were coded into these categories describes that the lack of resources or skills will impede pre-service kindergarten teachers on implementing ICT in their teaching methods. Some examples of it are:

*“Some teachers don’t know how to use it with children”*. - Student n°44

*“There's not enough money and equipment to do that”*. - Student n°4

It is important to accentuate in this question, that some answers express an extreme opinion towards the use of ICT. Some students don’t see ICT beneficial in kids, therefore, they shouldn’t use ICT at all.

*“Many people don't see the benefits of ICT in kindergarten and therefore don't think it's good learning tool for children”*. - Student n°6

*“Kids can't use ICT”*. - Student n°24

Children’s use category refers when children’s bad behavior or use of technology is applied in the answer. The number of answers to this option was very close to skill’s category, hence, it is important to mention that children’s behavior affects on pre-service kindergarten teachers. And external negative attitude express the same feeling as the previous category, it refers to a situation when external people (co-workers, teachers, parents or other adult that is involved on the education of the children) don’t support the use of ICT or their attitude will impede pre-service kindergarten teachers to use ICT in a kindergarten classroom and it becomes a challenge for them.

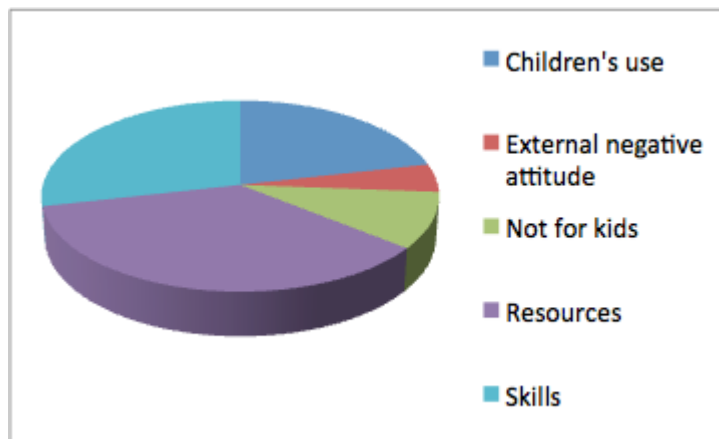


Figure 8

**Question 4** “When do you think ICT is needed in kindergarten classroom?” was categorized into 4 different sections: learning, opportunities, right situation and teaching.

The total number of respondents is 37 and there is a prominent amount of answers in teaching (18) and learning (14) categories that excel from the rest of answers in other categories.

Teaching refers to teacher’s role and the action of teaching. It refers to the answers that mention ICT as a way of teaching a subject/ activity/ other or as a tool for teaching. For example:

*“I think that in these days it's needed because children are used to work with it in home and it's also used in schools so it's important to teach children how to use them also in kindergarten”*.- Student n°4

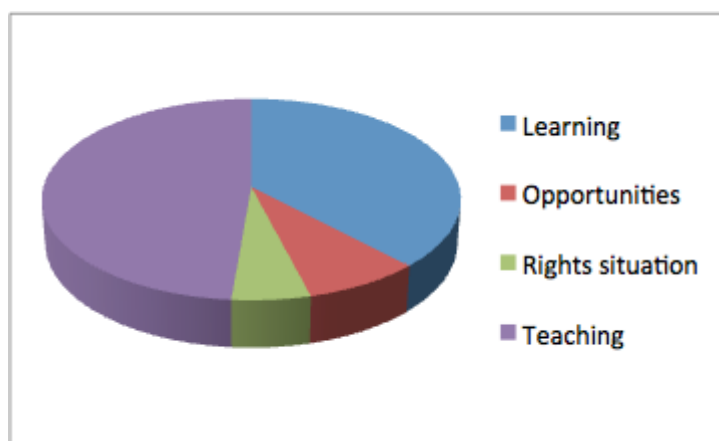
*“It should be used regular as a natural part of everyday practices”*.- Student n°12

Learning category is used when it includes the word and meaning of learning. It refers to a person who is learning, children’s role, teacher’s role or training. For example:

*“It’s important that children learn from the beginning what can you do with ICT and what is forbidden”*.- Student n°4

*“Every child learns differently so ICT brings new learning tools for children”*. - Student n°6

Other categories not so important are “opportunities” that refers to the action of giving chances to studies that do not have the facilities of using ICT at home or are not in a good economic situation and the answers mention that the use of ICT in classroom will give them an opportunity to practice or play with them. And the last category, right situation, not so relevant for this study, are for those answers that were in an abstract form and they refer to general situations without specifying when and what it is right, just telling that it is beneficial when it is a right situation.



*Figure 9*

#### **4.6. Summary of results**

Having a summary of all the results that were described previously will give a general overview of the entire analysis and study.

Qualitative data gives a general analysis of pre-service kindergarten teachers’ perceptions towards ICT. More than half of the modes, 68%, of each question were 3. Six questions have a different mode, therefore, there was a meaning in the results. In the second mode phase where answers were simplified into three options (agree (1), neutral (0) and disagree (-1)) the percentage of questions, which mode is 0, is 63%. Seven questions have a different mode than neutral and there was something to discuss about it.

For the third research question when the study compares the perceptions and attitudes towards ICT between first year students and students who are not first year. The results from T-test for independent variables, showed that in perception and negative attitude, both

groups have similar beliefs, however, in the category of positive attitudes, there is a difference between first year students and students who are not in first year.

And for the qualitative data, the descriptive analysis in NVivo showed that pre-service kindergarten teachers perceive ICT beneficial when it is implemented during the teaching and learning process. Besides, their attitude towards the need of the use of ICT in a kindergarten classroom is focused on teaching and learning too.

Pre-service kindergarten teachers perceive the lack of resources and skills as a challenge for the implementation of the use of ICT in kindergarten classrooms. At the same time, they feel that the lack of resources and skills will impede them on applying ICT in kindergarten environments.

## **5. DISCUSSION**

### **5.1. How pre-service kindergarten teachers perceive the advantages and challenges in using ICT in kindergarten?**

The term of perception is considered in the content of a person's beliefs (Shirvani, 2014; Anderson, 2007). In previous studies, researchers have been using the term "beliefs" to refer a group of concepts that includes perception. Their results showed that pre-service kindergarten teachers are motivated to use technology when there is a previous understanding of the use and they are able to apply technologies in their teaching and student's learning (Albion & Ertmer, 2002). Also it presents that teacher's beliefs are very influential when they have to choose what and how to use ICT and integrate in their classrooms, in their judgment and perceptions (Shirvani, 2014). In general, researchers found that pre-service teacher's perception of the utility of computers was positive (Swain, 2006; Shirvani, 2014; Anderson, 2007), however, improving ICT skills are connected to a proper and effective training, like introductory educational technology course.

To answer this research question about how teachers perceive the advantages and challenges in using ICT in kindergarten, I used the data from six questions (Q1, Q3, Q4, Q7, Q10 and Q11) from the quantitative likert scale and two questions from the open-ended questionnaire (Q1 and Q2). The results from the quantitative data shows that in the majority of the questions, pre-service kindergarten teachers don't have a concrete opinion towards several aspects in the use of ICT in kindergarten classrooms but most of them agreed that ICT use in teaching and learning is essential to prepare students to live and work in the 21st century. They agree that ICT can be a good supplement to support teaching and learning. They consider ICT as a good tool to support learning and teaching environments and they find the need of using ICT for students to be ready in the future for their working lives.

The qualitative data described that a big amount of the participants find ICT beneficial in teaching and learning context. Many pre-service kindergarten teachers pointed that ICT could support in different areas of teaching, naming different subjects but also mentioning the utility of ICT in activities or projects. Another side of the participants focused more on

the learning aspect while using ICT and how it could be beneficial during their training too. However, the main complications that pre-service students find in the use of ICT in kindergarten classrooms, are the lack of resources and skills. Most of the participants find a challenge the fact that the educational center do not have enough resources, software, equipment or budget for a proper instruments, nonetheless, other of their worries came with the lack of skills and not being able to use different technologies such as computers or other devices and some of them insinuate that the lack of training in the use of ICT will make a challenge for them when they have to implement in kindergarten classrooms.

Summarizing, pre-service kindergarten teachers find beneficial the use of ICT in kindergarten classroom, see them as good tools that support teaching and learning and essential part of a kindergarten classroom for student's future. However, they do not feel confident or have fears and worries when they have to use ICT in kindergarten classrooms and they do not have the appropriate knowledge and skills or the educative center does not provide adequate equipment.

Perception results agree with previous studies, pre-service kindergarten teachers are motivated to use them but a convenient training is essential for a better development of their skills and understanding of the implementation in the educational environments. But, as I mentioned before, most of the modes in the results in the quantitative likert scale questionnaire were 3 (neutral opinion) and this means that students do not have an adequate information about ICT and that might be related to their training.

## **5.2. What are pre-service kindergarten teachers' attitude towards ICT in the classroom?**

From previous studies, several researchers have found that pre-service teachers, who have high knowledge or previous experience with the use of technology, had better attitudes toward it. However, those pre-service teachers with lower knowledge in the use of technology or those who did not use computers in the classroom due to lack of resources or time, support, training or big size of the class, do not feel confident with the use of ICT (Shirvani, 2014; Gibbone, 2009; Watson, 2006)

To answer this research question about pre-service kindergarten teachers' attitudes towards ICT in the classroom, I decided to use from my quantitative Likert scale questionnaire the data that correspond to Q2, Q5, Q6, Q8, Q9, Q12, Q13, Q14, Q15, Q16, Q17, Q18 and Q19. From the qualitative data, Q3 and Q4 were chosen from the open ended questionnaire. In the quantitative data, the questions are organized in two groups: positive and negative attitudes towards ICT.

In general, as it happened with perception's results, pre-service kindergarten teachers do not have a concrete attitude towards ICT and they were not able to position their opinions on one side and most of them answered as a neutral opinion.

In more detail, results from positive attitude showed that pre-service kindergarten teachers see the use of ICT in teaching and learning as a positive impact on children's motivation and the majority of them are interested on receive training in the use of ICT to work in kindergarten classrooms. Furthermore, from negative attitude category, it was found that for pre-service kindergarten teachers, the use of technologies is not difficult and it doesn't overwhelmed them while working with them in a kindergarten classroom.

Qualitative data described that most of pre-service kindergarten teachers would not implement ICT in a kindergarten classroom because of the lack of skills and resources in the educational center. Most of the participants fear that something will impede them on using ICT is the lack of equipment, time, software or other ICT resources but also, many of them showed that their lack of skills and knowledge would interfere on the implementation of technologies in the kindergarten classroom. In relation to their attitudes in a kindergarten classroom and when they think ICT is needed, most of the respondents affirm that ICT is needed in teaching and learning. Several participants described ICT as a tool that supports teaching, during a specific subject, project or activity and another big group of participants mentioned that ICT is a good tool while learning a specific content that suits children but also helps teaching to improve their methodology, seeking information or as an assessment tool, besides some of them pointed out that it would be needed during the training process.

Recapping this data, this study can mention that pre-service kindergarten teachers have a general positive attitude towards ICT, however there are some areas where they do not find confident. In quantitative data, it shows that participants cannot give a specific opinion

about ICT and in qualitative data, pre-service kindergarten teachers describe that the lack of skills and knowledge will impede them on implementing ICT in the kindergarten classroom. Finally, some of them answered that ICT could be used as a tool during the training courses. In conclusion, participants do not have enough information related to ICT, however they have a positive attitude in most of the cases and they are willing to participate in training courses that improve their skills in this area.

### **5.3. What are the differences between first year students' attitudes and non-first year of pre-service kindergarten teacher training?**

From previous studies, they have compared participants by age, having a group of younger people and another who is older than the first one. In my study I decided to compare between first year and the other students who are not in first year because I wanted to compare how the perceptions and attitudes change in students after ICT courses. In Oulu University, the course structure, for an early childhood educator, there is one course in the spring semester for first year students which includes something related to ICT and the rest of courses related to technology enhanced learning, ICT or Media Education are optional. In this situation, I assume that second, third year students might have taken some courses or not and if they have more knowledge, skills or interest related to ICT compared to first year students. In this study it does not mean that non-first year students are older than first year.

To answer this question, I used the quantitative data from the likert scale questionnaire and divided the data between first year students and non-first year students. T-test was used to find the results for the comparison between groups. The results showed that perceptions between first year and non-first year students are not different from each other and the same with negative attitudes towards ICT. However, in the group of data that analyze positive attitudes towards ICT, the results showed that there is a difference between first year students and non-first year students.

The expectations towards these results were different than the current outcome. In Shirvani's study, the older group of pre-service teachers has better attitudes towards ICT than the younger group of participants. In her study, older group of participants had more experi-



ence with the use of technology than the younger group. However, in this study, pre-service kindergarten teachers who are not studying in first year do not mean that they are older than participants from first year or vice versa and it is not known who have taken ICT courses during their training. Also, in this study, results show that there are similar positive attitudes between first year students and participants who are not in first year, on the other hand, regarding perception and negative attitude, results present that there are no similarities between both groups. In this research study, similar results to previous studies, like Shirvani's, were expected but since they are not equal methods, participants or questionnaire, it is possible to say that there can be differences between both studies.

## 6. CONCLUSIONS

ICT is seen in the area of teaching and learning as a strategy to improve, implement and facilitate the new pedagogy of the information society (Cuban, Kirkpatrick & Peck, 2001; Voogt & Pelgrum, 2005). Technology shouldn't be seen as a replacement for teachers since in previous studies is shown that the fact of using technologies, it does not give a beneficial income to the student and teachers are not able to control the use of it, the progress or the learning path of children (Lowther et al., 2003; Ruthven et al., 2005). Different technologies should be used in a way that support teachers' methodologies and give new ideas to improve and be more creative in the classroom.

The analysis of this study was descriptive and the empirical results were able to answer the research questions. A significant part of the results affirm what previous research found and it continues with the existing understanding of the situation of how pre-service teachers perceive and their attitude towards ICT.

To begin, the results suggest that pre-service kindergarten teachers perceive, in a general understanding, positively the use of ICT in kindergarten classrooms and also have a positive attitude towards it. However, the results show that the participants were not able to stand with their opinion in one side of the claim. This suggests that pre-service kindergarten teachers do not have enough information to have a clear opinion about certain claims in the use of ICT.

Also, the descriptive part of the analysis proposes that practitioners find beneficial and needed the use of ICT in teaching and learning. But they think that the lack of resources and skills are reasons for them not to use technologies or it can be a challenge for them when they have to apply them in a kindergarten classroom.

Besides, pre-service kindergarten teachers from first year have the same perception towards the use of ICT in kindergarten classrooms than pre-service kindergarten teachers who are not in first year. This suggests that their perception do not change during their training at the University. Nevertheless, the results suggest that practitioners from first year do not have the same attitude as practitioners who are not in the first year of their training.

Related to my theoretical framework, pre-service kindergarten teachers see the necessity of using technologies in teaching and learning as a supportive tool in a kindergarten classroom and they refer it as an essential for students to be prepared to live and work in the 21st century. In the theoretical section that it has been explained previously, it mentions constantly the role of ICT in a kindergarten classroom and how teachers should use it as a support and not as a substitutive of a teacher. Also, pre-service kindergarten teachers are aware of the negative effects of ICT and, in the results, it shows how pre-service kindergarten teachers see the use of ICT as a danger. In the negative aspects of the use of ICT, it is described health issues related to ICT and other problems like isolation that could be originated by the incorrect use of ICT. Therefore, many researches insist that an appropriate training will originate a good understanding of the negative and positive aspects of the use of technologies.

Based on these findings, the conclusion of this study is that first, pre-service kindergarten teachers do not have a strict opinion towards ICT and they are not able to position themselves in one side of the claim. Based on previous studies, this is because of the lack of knowledge related to the use of ICT and the application of technologies in a kindergarten classroom. It can affect the fact that they have not taken any course about the use of ICT or Media Education yet. Another conclusion that we can get from these findings is that pre-service kindergarten teachers have positive perceptions towards ICT. They believe that technologies are good tools that support teaching and learning in many different ways, like in the area of motivation, support learning or different ways of learning. Most of them agreed that are needed in a kindergarten classroom and children should use them. In general, there is a good attitude about the use of ICT in kindergarten classrooms. They are able to express themselves about the beneficial use of ICT in kindergarten classrooms and what disturbs them for applying technologies in the classroom. Pre-service kindergarten teachers believe that the lack of resources or skills in a classroom will impede them on the use of ICT. Some of the answers relate the lack of training as a challenge when it is time to implement technologies in the classroom and at the same time, the majority of pre-service kindergarten teachers wish being trained in the use of ICT. With this last conclusion, it is possible to see that pre-service kindergarten teachers are optimistic and positive towards the use of ICT and at the same time, willing to learn about the implementation and use of

ICT in kindergarten classrooms.

Regarding the differences between first year students and pre-service kindergarten teachers who are not in the first year of their studies, the conclusion of this study is that generally, there is not a bit difference between these two groups' perception and attitudes towards ICT in kindergarten classroom. Also, because age or previous knowledge related to ICT was not measured, if the results showed a difference, it is not possible to solve the question about what it makes them different.

### **6.1. Findings of the empirical study in the frame of previous research**

The results of this study supports the idea that many pre-service kindergarten teachers feel uncertainty and are bad confident of themselves when applying ICT in a kindergarten classroom. In the same research, it shows the lack of skills or the bad application of technologies in the classroom when they have to combine with their teaching methods. These behaviors towards ICT are related to the lack or wrong teaching of the use of ICT in kindergarten classrooms (Bolstad, 2004).

It can be seen in other researches the importance of ICT training and how they refer to those courses as fundamental part in their training process. (Kalogiannakis 2010; Wedman and Diggs 2001; Wheeler 2000; Chen and Chan, 2006). Through computer courses, teacher's attitudes and computer use will be affected and improved (Kankaanranta, 2003)

Specifically, Shirvani's research (2014) describes in the results sections the positive attitudes of pre-service teachers towards the use of technology and how they think technologies can be a good supplement to support teaching and learning.

Related to pre-service teachers' training in the use of ICT, studies support the idea of enhance ICT courses and teachers' training in the use of ICT since it is an effective way to increase their positive perception and attitudes towards ICT and therefore, good and correct application of technologies in their teaching methodologies (Anderson, 2007; Zaranis, 2013; Ilomäki, 2008; Sivropoulou, 2009; Drexel, 2003). Studies, like Sivropoulou's or Zaranis', describe how teachers who have more knowledge about technologies, perform better than those who do not have previous experience or training in the use of ICT.

## **6.2. Practical implications**

It is important, for the area of technology in early childhood education, to keep researching and provoke awareness of how pre-service kindergarten teachers' conditions are. Since they are going to become future kindergarten teachers, it is essential to keep track of their correct training. With this research, it is possible to discover how pre-service kindergarten teachers perceive the use of technologies and what it would be their attitude in the moment of applying technology. This kind of research, make us wondering where it could be the obstacle of pre-service kindergarten teachers not perceiving ICT as a good tool for teaching and learning or if they do not behave accordingly to theories related to ICT, why this does happen.

The results of this study show that pre-service kindergarten teachers are willing be trained in the use of ICT and they have positive attitudes and perceptions towards ICT in kindergarten classrooms.

This study might contribute to the future elaborations of early childhood education training curricula and new methodologies in ICT or Media Education courses since this study describes the worries of pre-service kindergarten teachers when to implement ICT in the classroom. But at the same time, it might bring light up to other areas of education, not just in the sector of early childhood education, this topic is relevant both in primary, secondary or university field.

The findings of this study contribute to the current discussion of how it would be the best way to prepare pre-service teachers to integrate technology into their future kindergarten classrooms. The results of this study might be taken into consideration to ICT teachers or training educators.

University teachers should be aware of which kind of perceptions and attitudes pre-service kindergarten teachers have for a better and proper training on the area of ICT and this study could help them understand more their students and implement their courses according to pre-service teacher's perception and attitudes towards the use of ICT. Hence, those courses would be more effective, engaged and motivating for students and as previous studies, the more knowledge related to technologies pre-service kindergarten teachers

have, the better perception and attitudes towards it they have in the application of ICT in the classroom.

The use of ICT does not influence just in education or one area of it. This has relevance in other disciplines, the results of my study might be transferred also to other areas of work than education environment. Nowadays, technology is part of our lives and both adults and children should learn the positive and negative effects of the use of ICT, in addition to a correct, good and appropriate use of it, therefore, people's perception towards ICT are relevant in many other areas of research that are related to the use of technology in the field and what the difficulties are when people are not able to apply or implement them in their working life or daily life.

## 7. EVALUATION

### 7.1. Validity and reliability

In order to present a reliable study, two important factors were carefully considered: reliability and validity. Both terms are used to construct a valid, reliable and objective interpretation of the findings of this study (Lewis, 2009)

Reliability is defined as the need of confidence, accuracy and the demonstration of dependency in the research findings. This means that in case this study would be repeated again, the results will correspond with the findings in this research (Lewis, 2009). The more the study is repeated and the results connect with the findings of this study, the more reliable this research is, its procedure and methodology. However, in qualitative analysis or mixed methods, the reliability methods are different than in quantitative cases since there are external variable that can affect to the study and it is difficult to keep all the parameters and replicate the results even though, the same process and methodology was implemented. Nonetheless, according to qualitative researches, the idea of considering a study reliable becomes when another researcher conduct the study with a similar theoretical framework, data collection, data analysis and conditions, the final findings could be explained theoretically in the same way. In this research study, the author of it, has been describing carefully all the steps from data collection, going through analysis of the results and discussion to make the study as transparent as possible, in a sense to avoid misunderstandings.

In this study, to measure the reliability of the data analysis, analyst triangulation was used with another person who independently coded the data set using the same categories that I have created. The findings from both analysis, the original one and the anonymous person, were compared. For this test, this person coded 20% of the answers from all the qualitative data. The result of this comparison was that 75% of his coding was the same as the coding part of this study. Taking 70% as the limit for a reliable test, this demonstrates the credibility of my analysis and reliability of this research study. The test had to be taken twice for the lack of experience in this area that the person who help to make this possible had. After the first one, the categories and the procedure was explained in more details and this per-

son could understand better the categories and the system of coding as well as the programme NVivo.

Validity is presented as the truthfulness of the research study (Lewis, 2009). First of all, the relation between instrument, data collection procedure, data analysis techniques and research questions or the aim of this study. Apart from measuring the instrument of this study, it is important to analyse the relation with the purpose of the study. In this case, the instrument suits very well in relation to the aim and research questions, as well as the methodology and the analysis of this research. The sample was taken from pre-service kindergarten teachers from University of Oulu and the questionnaire, as it was explained in the methodology section, it was the most suitable method to collect a good amount of participants and a good compilation of clear answers through the likert-scale questionnaire. The results, discussion and conclusions were grounded with previous studies and theoretical knowledge existing and presented in the theoretical framework section of this study. Objectivity was conserved during the entire research process and reasoning through the entire work with the purpose of presenting a reliable work.

## **7.2. Ethical issues**

Ethical concerns were considered in each phase of this study.

During the data collection, participants were explained the topic, aim, purpose of this research study and the research methods to be used and they also gave their consents, face to face during their lessons or online if they filled it at home. For those who filled the questionnaire after their lesson, teachers were contacted beforehand and they approved to go before or after their lesson to collect answers for the research study. The use of a Likert-type response scale was described in Google Docs while they were filling the questionnaire.

There was no deception or lie used during the research, the main aim of the data collection was to gather as many participants as possible with their consents. The data resulted appropriate for the kind of research. To ensure privacy and confidentiality, the questionnaires were collected anonymously; no names or personal information was collected, just their age in case of needed.



Data analysis was conducted carefully and described in detail. Extended argumentation was given to justify the categories of the qualitative analysis and results were reported in detail. In the discussion, the contribution and comparison of previous researches, was considered and the empirical results of each. Conclusion was drawn reporting the evidences of this study accurately. Objectivity was present during the entire process of this study and the logical reasoning for a reliable data collection and analysis of the research.

### **7.3. Limitations**

There are certain limitations in this research. First, the sample size was appropriate for a master thesis but not relevant in a scientific level and the participants are from one university, so this study cannot help to give an overview of the Finnish situation for pre-service kindergarten teachers' perceptions and attitudes towards ICT, as I mentioned, in the implications for future researches, this will be another line of study. The participants of this research study are narrow and specific. The study was conducted with participants in a certain moment of their studies, without taking into consideration if they have previous studies in ICT or Media Education or this research study could have been based on a pre and post ICT course. This limitation affected on the comparison between two groups and that could have been improved.

Another challenge is the language barrier for some of the participants and this issue might have affect on the answers, in a way that it could be more elaborated if the questionnaire was in their mother tongue, Finnish. During the data collection in classrooms, some of them asked for translation of certain words from the questionnaire that were translated at the moment. And finally, in the qualitative questionnaire, not all the 46 participants answered in a proper way the four open ended questions and the number of participants in the qualitative questionnaire decrease that means that the sample went smaller.

This study utilize only quantitative and qualitative questionnaire as a unique source of information from participants. Despite the accuracy of the entire investigation, another source of information about their beliefs and attitudes towards ICT could have been more beneficial for the study and increased the credibility of the results. During the data analy-

sis, some answers were difficult to understand, like the meaning or for a bad spelling or writing, even though it was written in a digital device, therefore, it might have affected on the coding part of the analysis but it was a very small percentage of answers that were difficult to decipher.

Considering these limitations, it is important to mention that the aims of this study were covered and the results were described in an accurate manner, providing objectivity during the entire research.

#### **7.4. Implication for future researches**

This study provides an overview of pre-service kindergarten teachers' perceptions and attitudes towards the use of ICT. In the previous section, I gave some practical implications about how this study could help other areas than education. However, further research is needed to explore in deep, the reasons why pre-service kindergarten teachers perceive or behave positively or negatively towards the use of ICT in kindergarten classrooms and what makes them perform like that. It would be more beneficial to research on the questions about why pre-service kindergarten teachers perceive wrongly the use of ICT or do not apply technologies properly in a kindergarten classroom.

Future studies could include the role of parents in children's education and how they are involved in the media education and their perceptions about it, so as a previous study said (Bolstad, 2004), the more children use technologies at home, the more they are able to use them in the classroom. However, it is essential to describe which kind of use children have at home towards technologies.

Another area to research is sector of teachers' self-regulation towards the use of ICT when there are not appropriate ICT courses in their training and how effective is to develop self-regulated skills into teachers and how effective it is when they apply in real life in a kindergarten classroom. In this approach, it would be interesting to compare the quality and effectiveness of self-regulated knowledge and ICT courses during the training period of kindergarten teachers.

In addition, it could be interesting to repeat a similar research in different universities that provide kindergarten teacher training education and discover the average or pre-service kindergarten teachers' perceptions and attitudes towards ICT in Finland. That will give an overview of future kindergarten teachers beliefs and behaviors about the use of ICT in kindergarten classrooms and it might indicate modifications in the ICT training or courses in Finnish universities.

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## 9. APPENDIX

### Appendix 1.- Likert scale questionnaire

QUESTIONS	1	2	3	4	5
1.- Students learn more easily when using ICT					
2.- There is a danger of using ICT					
3.- ICT use in teaching and learning is essential to prepare students to live and work in the 21st century					
4.- ICT is important in kindergarten classrooms					
5.- ICT use in teaching and learning, positively impacts on children's motivation					
6.- The knowledge children acquire using ICT remains superficial					
7.- ICT can be a good supplement to support teaching and learning					
8.- ICT creates more problems than solution					
9.- The use of technologies is difficult for me					
10.- ICT facilitates collaborative work between children					
11.- Children feel more autonomous in their learning when they use ICT					
12.- It is hard to see what the students have learnt when using ICT					
13.- ICT improves the class climate (students more engaged, less disturbing)					

14.- Technology is reliable for you					
15.- The use of ICT in the lesson limits your freedom as a pre-service kindergarten teacher					
16.- The integration of computing resources in the classroom encourages me improving the teaching process					
17.- The use of ICT increases your motivation as a pre-service kindergarten teacher					
18.- Working with ICT in a kindergarten classroom is something that will overwhelm you					
19.- You are interested to receive training in the use ICT to work in kindergarten classrooms					

Appendix 2.- Detailed results from the likert scale questionnaire

Questions	n	Strongly Agree	Agree	Moderate	Disagree	Strongly disagree	Total
Q1	46	0%	17%	67%	15%	0%	100%
Q2	46	2%	33%	48%	15%	2%	100%
Q3	46	28%	52%	20%	0%	0%	100%
Q4	46	4%	26%	43%	24%	2%	100%
Q5	46	2%	57%	35%	7%	0%	100%
Q6	46	0%	13%	74%	13%	0%	100%
Q7	46	17%	52%	24%	4%	2%	100%
Q8	46	0%	2%	46%	43%	9%	100%
Q9	46	2%	15%	28%	35%	20%	100%
Q10	46	0%	28%	61%	9%	2%	100%
Q11	46	0%	33%	61%	7%	0%	100%
Q12	46	0%	13%	52%	30%	4%	100%
Q13	46	0%	13%	61%	24%	2%	100%
Q14	46	2%	35%	46%	13%	4%	100%
Q15	46	2%	4%	57%	24%	13%	100%
Q16	46	2%	24%	70%	2%	2%	100%
Q17	46	2%	26%	54%	15%	2%	100%
Q18	46	0%	9%	33%	39%	20%	100%
Q19	46	17%	41%	35%	7%	0%	100%
Q20	46	20%	39%	30%	11%	0%	100%