How The Use Of Technology Can Be Integrated Into Early Childhood Education, With An Emphasis On Children Aged 3-5 Years Old

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Degree Programme in Social Services

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This thesis was an activity based project. The objectives were to explore how the latest curriculum legislation regarding technology in early childhood education could be put into practice, and to demonstrate to children that there is more to technological devices than games and other forms of entertainment. In order to meet these objectives it was important to explore the European and Finnish legislation regarding the use of technology within early childhood education, the implications of using technology with young children, and the practicalities of incorporating the use of technology within early childhood education.

As the overall topic for the thesis was very wide, the thesis was unable to consider every aspect of the topic. Therefore instead of trying to tackle the whole topic, the thesis main focused was on using digital cameras and how their use could be incorporated into the existing learning experiences of children. Due to the nature of the children involved in the thesis, the use of interactive stories and multi-sensory spaces were also explored.

The data and findings for this thesis were collected from the practical application of the legislation in the form of a case study which involved children aged 3-5 years, and many years of experience working in the field of early childhood education.

The main findings of the thesis were that incorporating technology is far easier than many practitioners expect, the activities involving technology and children need to be flexible, fun and relevant to the children, and that the children need to have a sense of control over their learning experiences e.g. the type of photograph they want to take.

Keywords: Early childhood education, ICT, technology and children

1 Introduction

This thesis intends to explore the concept of technology, with an emphasis on how it's use can be incorporated into the learning experiences of children within early childhood education settings. As this is a relatively short piece of writing, it is only possible to scratch the surface of this topic, and therefore, this thesis aims to provide some interesting thoughts or ideas for research in the future. Due to the nature of the topic and it's elements being so wide, it is important to establish the aims and objectives of the thesis at an early stage in the writing process, but before getting into the aims and objectives of the thesis, the reasons why this topic was chosen must be explained.

The topic for this thesis was chosen because it is something that has been discussed and written about many times over a number of years, especially in relation to the amount of time that children spend being entertained by technological devices such as game consoles, mobile phones and tablets. As the latest legislation in Europe and Finland concerning early childhood education curriculums highlights the inclusion of technology, and I have several years experience of using technology within early childhood education, it seemed to be a natural choice for a thesis topic because it would combine practical experience with theory and new legislation. In addition to this, the use of technology is an ever increasing part of daily life in today's society, and therefore children need to learn how to use it and experience using it other than for entertainment purposes from an ever increasingly young age in order to become a completely integrated member of the community in which they live.

The main aim of this thesis is to demonstrate how technology can be included into the early childhood education curriculum inline with the European and Finnish legislation. In order to achieve this overall aim, the thesis has some smaller, but equally important objectives to achieve along the way. There are three objectives that refer to the way in which the technology will be incorporated into the early childhood education learning experiences. These objectives are, to show the children that there is more to technology than playing games, to demonstrate how the use of technology can be incorporated into the existing learning experiences of the children, and to provide different opportunities for the children to acquire the same skills because children are motivated by different things and learn in different ways.

As a result of the topic and the goals set for the thesis, it only seems natural, that this thesis takes an activity based approach in the way that data is collected and the overall process is evaluated. This in turn means that there has to be cooperation with an early childhood education centre, and this will come in the form of a case study with children aged three to five years old, who are attending an English speaking kindergarten in Finland. This case study will focus mainly on the aspect of digital photography, with the children having the opportunity to use both a digital camera and a camera application on a mobile device to record their learning experiences and aspects of the kindergarten day that are important to them. In addition to this the children will experience using a tablet as source of information e.g. using google earth to find out more about places, google image search to find pictures of things that interest them or interactive stories as a fun way to begin learning English because several of the children in the groups are experiencing the English language for the first time.

This thesis will take the format of establishing what the two main aspects of the topic are, (technology and early childhood education), and how they can be integrated with each other, then consider all the relevant European and Finnish legislation. Once the theoretical background has been established, the thesis will take a more practical approach in order to achieve the aims and objectives, taking into account possible problems that can be encountered along the way, and the benefits that can achieved by overcoming those problems.

1.1 What is technology?

Technology, media education or ICT (information communication technology), as it is often referred to in relation to education, relates to devices and equipment are encountered regularly through out our daily life that rely on some kind of circuit board or processor in order to work. The range of technological devices that children encounter on a daily basis around their home or in an early childhood education setting are rapidly increasing. With this ever increasing exposure to technology, naturally there has been many concerns and media publicity about those concerns regarding how much children should be using technology, and what are the long term effects of children using such devices?

By taking in to account this interpretation of what technology is, it is easy to see just how wide the topic of technology can become, for example consider the devices we are familiar with today and what purpose they serve, then compare these devices with previous ones that were used for the same purpose. When we start considering this aspect of technology, the scope for learning becomes even wider and starts to encompass more than one area of the early childhood education curriculum for Finland. An example of this could be the idea of a mobile, there are smart phones, mobile phones with out touch screens, mobile phones without cameras or the internet, cordless phones with a limited usable range and landline phones that are always connected to the wall just to name a few (Plowman et al. 2010; Price 2009). For ideas about comparing today's technological devices with those they replaced refer to the appendices, page 47.

1.2 What is early childhood education?

In it's simplest form, early childhood education refers to a child's education, learning experiences and development before they start compulsory schooling. Usually these educational activities, experiences and resulting development takes place in a setting other than the child's own home. In some cases however, the parents may decide to educate their children themselves, in which case the educational activities, experiences and resulting development are likely to be at the child's home or familiar places close by.

According to the european commission, early childhood education is considered to be public, private or voluntary activities and learning experiences that are planned for children under primary school age. In order to be classed as early childhood education, these activities and learning experiences must be planned inline with national legislation about early childhood education (European Commission/EACEA/ Eurydice, 2016, 7.)

The Finnish national core curriculum for early childhood education and care is more specific about early childhood education. This legislation specifies that early childhood education should encourage children to explore and interact with a wider environment than their homes, it should allow children to add new ideas and experiences about the world around them to their existing experiences as a means of developing

the children's ability to understand better the divers community which they are part of (Finnish National Agency for Education 2016, 83.)

1.3 Child development

Child development is a wide and very varied topic that almost everyone has some form of opinion about. For the purposes of this thesis, this section will give a brief introduction to the theories and approaches to child development that are the most relevant to the approach taken to learning new skills in the case study. The projects in the case study were created with a combination of these theories in mind because no one theory or approach to child development has all the answers, but by combing elements from different theories and approaches to learning, it is possible to find a best fit solution for any group of children.   Through my experience, by adopting this approach to teaching and learning within early childhood education, it has become apparent that this approach yields the best results in the end.

Piaget's research into child development was mainly focused around observations he made as his own children were growing up. He recognised the importance of children being allowed to find things out for themselves through exploring and being given the opportunity to make decisions, including decisions about what and how they learn. (Penn 2008, 41-42.) This lead to the development of a theory of development based on four stages of development through which all children move as they grow and develop. These stages of development can be seen in table 1.

Stage of Development	Explanation	Age
Sensorimotor	Learning through physically interacting with objects and the environment.	0-2 years
Preoperational	Children still rely on appearances of what things look like, but start to convey meaning through language, both orally and using their bodies.	2-7 years
Concrete operational	Children combine, organise and reorganise knowledge and experiences.	7-11 years
Formal operation	An ability to think logically and understand abstract concepts or ideas.	11+ years

Table 1 (Penn 2008, 41-42; Piaget's Theory of Cognitive Development by psychology notes hq. 2015.)

Vygotsky believed that a child's learning should start from what the child is already familiar with, and that the adults are equally important in the process of children building on the knowledge and skill they already have.   This can involve adults or other children who have already mastered the next step demonstrating what to do, encouraging children to try new things or providing a scaffolding for the children as they grow and develop. The idea is that the level of an activity just be pitched just above the level at which a child is competent to do a task unaided. This level of learning where a child is able to achieve a given task with some support is known as the zone of proximal development and forms the backbone to Vygotsky's theory of development. This need for more able or knowledgeable people to support a child's learning highlights a need for children to learn in a social environment, e.g. through

socialising with others in a role play situation children are able to develop an understanding of different roles within society. (Penn 2008, 43-44.)

Bruner was inspired by both Vygotsky and Piaget, and spent time exploring different aspects of their theories. He was particularly interested in the idea of scaffolding the children's learning and the zone of proximal development of Vygotsky's. Through this exploration, Bruner came to the conclusion that anything can be taught and learnt by children of all ages if the idea is approached in an appropriate manner for the child's ability and understanding of skills and concepts leading up to the new information or skill to be acquired (Penn 2008, 45.)

Maslow created a hierarchy of needs that need to be satisfied in order for any kind of . Each level of the pyramid needs to be achieved and fulfilled in order that a child's development can proceed to the next level. If at any point in time an aspect of one level is missing or not completely fulfilled, there will be implications for all areas of development and needs that appear further up the pyramid. This in turn has the effect that development can not continue as effectively until that missing aspect lower down the pyramid has been rectified. Refer to figure 1 for Maslow's pyramid of the hierarchy of needs that underpins child development.

Figure 1: Maslow's hierarchy of needs (fisher 2013, 3.)

Gardner divides development into several different intelligences as he believes that people can be intelligent in different ways, and not just the stereotypical way of being academically successful at school. Gardner accepts that a person can be particularly gifted in one or more areas of intelligence, while finding other areas of intelligence to be more challenging (Penn 2008, 56.) These areas of intelligence are briefly explained in table 2

Area of Intelligence	Explanation
Linguistic	Able to play around with words, quick to understand and internalise new words or phrases, able to express own viewpoint or feelings clearly.
Musical	Sensitive to pitch and rhythm, finds it relatively easy to sing or learn to play musical instruments.
Logico-mathematical	An ability to understand abstract ideas and mathematical concepts.
Spatial	A good sense of space around including distances, proportions and the ability to create visual images.
Bodily-kinesthetic	The ability to control the way you use and move your body e.g. dance.
Personal	An understanding of yourself, your feelings and reasons for your actions.
Social	An understanding of other's e.g. their feelings, emotions and reasons behind their actions.

Table 2 (Penn 2008, 57.)

2 Early childhood education legislation

During this section of the thesis the relevant early childhood education legislation will be explored with an emphasis on how it relates to the use of technology. In addition to the technology legislation, two other important aspects must be considered, multiculturalism and the subject of copyrights and licenses. Multiculturalism in early childhood education needs to be considered because the case study took place in a multicultural kindergarten, where many of the children are from different cultural and religious backgrounds, and often speak a different language at home to that which is used in the kindergarten. The subject of copyrights and licenses is important because in the digital age that we are living in, it is very easy to access music, pictures and movies through internet based sights and applications on mobile devices. Unfortunately many of these are designed for personal use and therefore additional licenses or permission may be needed in order to access such resources when using them in relation to early childhood education.

As the practical aspect of this thesis is taking place in Finland, it is important to take into account both the Finnish and European early childhood education legislation. For the purpose of the thesis, this legislation will be considered with an emphasis being placed on it's relevance to technology and multiculturalism.

2.1 Early childhood education in Europe

Europe is made up of many different countries, each of which has it's own cultural background, traditions, language, history and educational system, the legislation has to cater for all these differences, while trying to establish some kind of uniform baseline of expectations for provision of early childhood education throughout Europe. As a result of this diversity within Europe, there has been several researches carried out in recent years in order to establish how early childhood education is implemented in a number of European countries. This research has been aimed at uncovering the similarities and differences between the various education systems, what can be done to improve the quality of early childhood education, and whether or not it would be feasible to create a Europe wide curriculum where the only difference is the language in which the curriculum is taught. As a result of the research undertaken in various countries around Europe, four similarities came to light that were common to those examples of good practice within early childhood education. The aspects relate to the way in which the curriculum os delivered more so than what subject is being studied e.g. a holistic approach, a child centred environment, treating children as individuals and adopting a policy where all children are included and treated equally (Curriculum Quality Analysis and Impact Review of European Early Childhood Education and Care (ECEC). 2014, 82.) In addition to these four principles of early childhood education, the research also uncovered some pedagogical principles which were common amongst the early childhood education providers that were providing what was considered good quality practice within early childhood education e.g. learning through doing, focussing on pedagogical interactions, stimulating environments and cooperating with other organisations or professionals. Refer to appendices for more information (Curriculum Quality Analysis and Impact Review of European Early Childhood Education and Care (ECEC). 2014. 82.) Based on these characteristics for good practice, the European Union has set high expectations for the provision of quality early childhood education. This includes the specification that by the year 2020 at least 95% of children between the age of four and starting primary school education will be participating in early childhood education that meets their criteria for good practice (Opening up education through new technologies.) In relation to early childhood education and technology across

Europe, research has highlighted that in order for european industries to remain competitive globally future generations will need to be much better equipped with digital and technological skills, and in order for this to become a reality these skills need be part of the education systems at all levels of education (Opening up education through new technologies.)

The main way in which the European Union intends to improve ICT skills is through working closely with national education ministries and other organisations involved with education. The intention is to establish and share good practices in using technology as a means to develop tools, skills and competences with digital equipment and other forms of technology throughout all levels of education. The impact of this decision will be that individual countries within the EU will be expected to incorporate the use of technology when updating their own legislation, policies and curriculums. However, how these policies etc are enforced is up to each individual country to decide. An insight into possible solutions can be seen already in the Greek curriculum outlines based on eight learning areas organised in a cross-thematic kindergarten curriculum for children aged four to six years old (Curriculum Quality Analysis and Impact Review of European Early Childhood Education and Care (ECEC). 2014, 29.), and the English EYFS (early years foundation stage) updated in 2017 (EYFS statutory framework. 2017.)

Early childhood education will have an important role to play in the development of European education in the future, even when considering the later stages of education and later the employability of young people e.g do the skills learnt in early childhood education enable young adults to access vocational education or training schemes? These schemes could play a key role in increasing the employability of european youngsters, but if the people they are aimed at have the necessary skills to access them (Early Childhood Education and Care.) In order for European education to achieve such targets in later stages of education, research has shown that all prior stages need to be reviewed, developed and delivered in an appropriate manner, and early childhood education has been highlighted as being the most important stage of all. The reasons for this statement are that early childhood education creates the foundation on which all the other stages of education are built on, it is the early childhood years where education has the greatest influence on children and therefore early childhood education needs to cater for the full range of needs that the children have, and to do that skills in using technology need to be included within the early years (Early Childhood Education and Care.)

2.2 Early childhood education in Finland

In Finland there is a new national curriculum for early childhood education that came into force in August 2017. This legislation is based on the "Act on Early Childhood Education and Care," with more detailed guidelines and information being provided by the Finnish board of education (opetushallitus). In 2014, and again in 2016 the early childhood education and pre-primary education guidelines were reviewed in preparation for this national core curriculum. This national core curriculum will be regulated by the Finnish board of education (opetushallitus) (Finnish National Agency for Education 2016, 8.)

Early childhood education in Finland is seen as an important stage in a child's education, learning and development, and therefore it is viewed as being important to include what children have already learnt, experienced and are interested in when planning the many activities and learning experiences that are provided throughout the years in early childhood education. The children are expected to be part of the planning process and the themes or topics that are explored each year should come from the interests and wishes of the children.   By doing this the children are more closely connected to the learning

experiences , and will learn more effectively because of that connection (Finnish National Agency for Education 2016, 36.)

One area in particular that has been highlighted is the development of transversal skills, knowledge and attitudes. These are skills, knowledge and attitudes that can be transferred from one subject area or learning experience to another during the early years, later in life the same skills could allow an adult to move between different career paths. The underlying theory behind this is that the only thing that is constant in today's world and society is the element of change, and therefore people need to be much more adaptable than ever before is businesses are to remain competitive. Early childhood education is seen as the starting point for this and the foundation on which future knowledge, skills, understanding and attitudes will be built on. As with anything, if the foundations are not solid, then there is a limit to what can be built on top before problems occur and you have to deconstruct layers until reaching the foundations and are able to fix the underlying problem (Finnish National Agency for Education 2016, 41.)

There are five transversal skills that are highlighted as being the most important for children to develop during early childhood education. These refer to the use of technology, how children think and learn, how the children participate in activities, how the children interact with each other and are able to express themselves to others, and the children's ability to take care of themselves e.g. daily routines, and hygiene (Finnish National Agency for Education 2016, 42.)

An ability to use information and communication technology (ICT) is viewed as an important part of daily life, for both children and adults, individuals and groups of people as it is the medium through which members of society communicate with each other and are able to become active and productive members of the community in which they live. Early childhood education needs to promote the development of these skills as a means of providing all members of society and individual communities with equal opportunities throughout their education and later life. Within ICT, the aspect of multi literacy is highlighted as being an important aspect. Multi literacy refers to the way in which an individual interacts with and understands different types of text and messages that are encountered in everyday life. In terms of early childhood education, this includes texts or messages presented as written, spoken, audiovisual or any other digital means, and these multi literacy skills are closely linked to how a child's thinks, processes information and learns. In relation to children within early childhood education, this can simply be naming things, exploring their environment or being exposed to a variety of different experiences (Finnish National Agency for Education 2016, 45-46.)

The use of ICT should not take over from other "more traditional" styles of learning, but instead become part of a varied learning experience where children can interact with different devices or apps in order to develop a variety of skills. ICT should be a versatile tool for teaching and learning, and used in a manner that is inline with the legislation and acceptable to both the early childhood education provider and the families using their services e.g. are children able to bring their own devices, programmable or remote controlled toys or how devices are used to support learning (Finnish National Agency for Education 2014, 37, 60.)

When learning how to use different technological devices, children should be guided and shown how a device or function works before being allowed to explore independently, and be taught how to use the devices in a responsible manner. Children don't only need to have their own wishes and interest taken

into consideration when using technology, but also need to develop an understanding about the needs and wishes of others around them e.g. when using a camera, who and what can they take pictures of (Finnish National Agency for Education 2016, 86.)

The Finnish National Core Curriculum for Early Childhood Education and Care emphasises the importance of integrating technology in a holistic manner so that it becomes an integral part of the children's learning experiences and not a separate aspect of learning that appears to have no relevance to anything else in the learning environment e.g. by using different materials and tools to create a picture (Finnish National Agency for Education 2016, 82.)

2.3 Multiculturalism in early childhood education

Multiculturalism refers to the presence of more than one culture within any given society or place, regardless of the number of people involved, the size of the place where they are gathering or the reason for them being in the same place at the same time. When considering multiculturalism in relation to early childhood education it is important to keep this definition in mind, especially when there may only be one child in the group from any particular cultural or religious background, but there may be many different cultures within the group of children. A multicultural approach demands that all the cultures represented are treated equally, and that all children receive the same learning experiences and opportunities to develop skills, knowledge and understanding. This includes the children making choices and having a say in what activities or topics are planned (Finnish National Agency for Education 2016, 34.)

According to the new curriculum in Finland, early childhood education facilities are required to employ staff that are able to create a learning environment that both reflects a positive attitude towards different cultures, and demonstrates how to interact positively with people of all ages who come from different cultural backgrounds. It is seen as being important that the workers in these facilities set a good example and responsible for creating a positive feeling in the environment (Finnish National Agency for Education 2016, 34.) The creation of this welcoming environment is important to young children because often starting early childhood education is the first place where young children spend time away from familiar adults and places. The way a child is received and treated affects the way that the child feels and the child's ability to learn, so naturally, a child who is welcomed and feels safe will find it easier to settle and learn (Penn 2008, 109.) As a result of this, early childhood education centres have an important role to play in today's world as communities are made up from an increasing number of nationalities, cultures etc (Finnish National Agency for Education 2016, 55).

The new national core curriculum for early childhood education in Finland highlights what services should be provided, and the approaches that should be adopted in order to maintain high standards of early childhood education in relation to multiculturalism. It recognises that preconceived ideas and stereotypes can be easily passed onto children, the need for practitioners to be aware of this and to support children in developing the necessary social skills to deal with others who are somehow different to themselves in a non stereotypical or prejudice manner. In addition to this, by creating a positive attitude towards others and encouraging young children to interact with each other equally regardless of their differences, the staff are better able to help the children develop a positive view of themselves and have a higher level of self esteem. This in turn enables the children to learn more effectively (Finnish National Agency for Education 2016, 55.)

Multiculturalism should be seen as a positive addition to any learning environment and a useful resource for the children to learn about the world around them, similarities and differences between different cultural backgrounds, and developing a positive attitude towards different cultures living alongside each other. (Finnish National Agency for Education 2016, 55).

In summary, multiculturalism within early childhood education at it's best is where every child is treated as an individual, with their cultural and religious background being viewed as a positive addition to the learning environment. This positive attitude needs to be clearly apparent to new families and visitors to the centre, throughout all aspects of the curriculum, environment and overall experience at the early childhood education centre. (Finnish National Agency for Education 2016, 92.)

2.4 Copyright, licences and permission to use media

Copyright and licensing issues cover a wide variety of sources of information and resources that are readily available to the anyone who has access to the internet, which is more or less everyone in society today. As the use of technology increases and access to digital information, music, the internet and apps e.g. Spotify or Netflix accounts become increasingly more accessible without more careful planning or consideration being given to what is actually involved. Whether or not you need to obtain a license to access these digital resources for use within early childhood education is mainly to do with the issue of copyrights, and there are two main categories for resources covered by copyrights that need to be considered. The first of these categories refers to the use of fictional or descriptive representation in writing or speech, a musical or dramatic work, a cinematographic work, a photographic work or other work of fine art, a product of architecture, artistic handicraft, industrial art, or expressed in some other manner, and the second of these categories relates to Maps and other descriptive drawings or graphically or three-dimensionally executed works and computer programs shall also be considered literary works. (Copyright Act (Finland 2015.)

When an individual purchases something that somebody else owns the copyright for, e.g. a cd or downloads a digital recording of music by their favourite artist, they also buy limited rights to the use of that purchase. These limited right are intended for personal use and doesn't cover the use of that material in any other way unless otherwise stated. Personal use usually means listening to the music on your own device at home, on the move, or in the case of musical notation one personal copy can be made e.g. to enable an individual to practise away from the rehearsal venue if they share the original copy with other musicians. (Finnish standards association 2017.)

If an individual, company or organisation requires more copies to be made or the use of the material in a situation other than personal use e.g a party, concert or other form of entertainment, permission needs to be obtained prior to the event taking place or an alternative solution must be used. The most common way of gaining this permissions is to apply for a license that covers the intended use of the material. The licence needed depends on what media will be used, and the purpose it will be used for, see table 3 for more information.

Where to apply for a license	The purpose for which the license can be granted
Kopiostos	grant licences for the copying of and digital use of publications in addition to audiovisual material.
Kuorolaulut	have a service where virtually any Finnish song lyrics can by ordered.
Teosto	provides licences for listening to recorded music
Tuotos	provides licences for Finnish films to be shown publicly

Table 3 (Licences and limitations related to copyright in Finland 2017.)

However, in relation to using copyrighted material for educational purposes, the process is not as straight forward or easy to understand whether or not it is necessary to apply for a licence for any given activity.

The Finnish National Agency for Education negotiates and acquires licences to photocopy information and use digital information within educational institutions and state administration. This includes the use of television and radio programmes, but isn't clear about the use of online based sources or music e.g youtube, Netflix or Spotify. (Licences and limitations related to copyright in Finland 2017.) In addition to this parts of literary or musical works may be used after five years from the date of publication according to the copyright act 2015, but in the same act at another point it states that the provisions of the act do not apply to educational activities. (Copyright Act (Finland 2015).)

There are two solutions to this situation in my experience of using technology and media within early childhood education, firstly makes sure you have a licence that covers all possible uses of media and secondly when planning to use photographs or sound, go out and take your own. It is a great learning experience for young children to take their own photographs and record the sound effects themselves. It also makes the exercise more meaningful to the children and gives them a sense of purpose behind their learning experience.

3 Incorporating technology into early childhood education.

Throughout this section of the thesis I will explore the many different kinds of devices and technology that can be used, including the equally varied number of ways in which such devices can be incorporated into early childhood education. In my experience over many years the type of technology and how it is used depends entirely on the resources available at the early childhood education centre e.g. kindergarten, and the group of children you are working with at the time. Even within the same kindergarten I have used the same technological devices in different ways, or completely different devices because the groups of children have been so different e.g. their needs, abilities and interests. When considering possibility of staff other than myself using technology with the same group of children it has always been important to keep a few facts in mind, how familiar is the other staff member with the technology and apps, how confident are they to use the technology flexibly and creatively, and are they motivated to try out something unfamiliar and discover something new with the children? Other aspects of using technology with young children that will affect the use of technology are interests of the children, and their ability to

hold a device and use the app at the same time e.g. taking a photograph might be easier with a mobile phone for some children, but the task is easier using a tablet for other children. To some degree the kind of case a device has will affect the children's abilities to use mobile devices (Saracho & Spodek 2008.) Another aspect of using technology with young children that I have learnt through experience is that many young children are already familiar with mobile devices e.g. phones and tablets, and therefore already have many of the basic skills needed to operate these devices. Due to this I have often found myself working with the skills the children already have in a new way, and then gradually building on those skills e.g. introducing a new app or function. As the children have often been using mobile devices for entertainment only before entering early childhood education, the challenge is how to develop the children's skills in technology while maintaining the levels of interest and motivation to use the devices in other ways.

Mobile phones and digital cameras

A mobile phone is probably the most familiar mobile device to a young child. Many young children will have been passed a mobile phone at some point to watch their favourite cartoon or video clip e.g. travelling on a bus or at home while the parent prepares food. As a result the child is familiar with the device and might have pressed a few things on the screen, thus working out some of the other functions and ways the phone works. The challenge for early childhood education here is two fold, establishing what the children already know, and then developing a fun and meaningful activity through which the children further develop their skills.

As for other kinds of digital cameras, it is much more likely that the children have only experienced using toy cameras. Even so, with this limited exposure, the children might have already learnt many skills that they can transfer to the real thing e.g looking through the camera to see what the picture will be or remembering not to cover the sense with your fingers. Again the challenge is to think about why the children are learning to use the camera and create a fun activity with the children so that the whole learning experience becomes more relevant to them and see a point to learning these skills.

Tablets

When considering using tablets, many early childhood educators automatically start thinking about what apps to download and use with the children, not necessarily how they will incorporate the tablet into the learning experiences in a way that is motivating and relevant to the group of children they are working with. Children can improve many skills, be introduced to new concepts or ideas and discover about the world around them through using a tablet, but of course this learning process is most effective when the staff are already familiar with the technology, what can be achieved through using it, how to use it with the specific group of children and has a willingness to spend time helping the children learn at their own pace and in their own unique way e.g. allowing time to become familiar with the device on their own or interacting with the children while they are using the device. The children should learn skills or knowledge from using tablet at the early childhood education centre that they wouldn't necessarily get from using a tablet at home as a means of entertainment.

Programmable and radio controlled toys

These activities can provide the children with an opportunity to develop problem solving skills, some simple geometric concepts, and how to collaborate or interact with other children who are trying to solve the same problem (Siraj-Blatchford & Siraj-Blatchford 2006,40). e.g. programming a beebot to reach a certain place on the mat or steering a remote controlled car through a course without bumping into objects at the side of the track. This "hands on" approach that requires the children to physically interact with the toy provides them with instant feedback for their actions and an opportunity to learn through trial and error at their own pace, either as an individual or within a small group. According to Piaget, children are active thinkers and learn most effectively through constructing their own understanding (Hayes & Whitebread 2006, 96.)

Game Consoles

Game consoles are probably another aspect of technology that many children are familiar with from their home environment, and is also the technological device which is the most problematic to incorporate into early childhood education. This is because they tend to be for a set number of players at a time, and require a relatively large space in which to be used, especially nintendo's wii system as it demands the children to be physically active as they interact with the console.   In addition to this many of the developmental goals they can achieve are more effectively mastered through other forms of technology or activities that don't rely on technology at all within the early childhood education environment (McPake, Plowman and Stephen 2010.)

3.1 Technology as part of daily and weekly routines

This section is divided into three parts, activities that include the use of technology on a daily basis, activities where the use of technology is more appropriate on a weekly basis, (allowing for other aspects of the curriculum and developmental areas to be also catered for), and finally examples of apps that have proved to be used successfully during my working life in several different kindergartens. Naturally these activities are not suitable for all age groups within the early childhood education spectrum, or even all groups of children within the same age group. Each and every group of children will be different, and therefore, refer to table 4 for ideas on how to use technology on a daily basis.

Activity	Technology	Explanation
Circle time.	A smart phone or tablet with access to a weather app.	Especially the children who have been in early childhood education for a while benefit from something a little different. Children enjoy being able to compare the weather they have experienced or see outside the window with what the app shows. The older children also enjoy predicting what the temperature is based on how they felt coming to the centre in the morning with the day before, then comparing their predictions with the reality. This could be incorporated with a chart on the wall where the weather is recorded for an agreed length of time.
Story time.	Tablet.	In this digital age many of the children's favourite books have a digital version, and of course some are better than others. The digital stories that have an interactive element to them add another dimension to story times and allow children to interact with their favourite characters. This is especially useful for those children with limited language skills in the language of operation at their centre. IN addition to this children may learn other areas of the curriculum e.g. language if when they touch the screen it tells the word, or maths if when they touch the screen a certain number of times and something happens the same number of times.
Throughout the day.	Tablet, smart phone or other digital camera.	Encourage the children to record their experiences throughout the day. As children become more familiar with the camera they are using, they can explore different aspects of it e.g. the zoom, taking selfies, experimenting with the camera angle or recording sounds using the movie mode.

table 4

All of these ways of incorporating technology within early childhood education on a daily basis can be used with children across the early years spectrum, but of course the youngest children will need more support than the older ones, and possibly even different devices e.g with three year old children a small phone with an easy to grip case, where as the older children might prefer to use a tablet (with an appropriate case) or digital camera for recording their experiences.   The device and activities need to be chosen carefully however so that they cater for the children's needs, abilities and interests. For ideas on how to incorporate technology into activities on a weekly basis refer to table 5

Activity	Technology	Explanation
Phonics and mathematics	Tablet	Using an app that allows the children to practice letter and number formation without the need to sharpen a pencil or find an eraser for mistakes. These apps are useful because children get immediate feedback. The screen clearly shows how the children form their letters or numbers and the children don't have to worry about writing on the lines correctly. The tablet is more versatile than paper and pencil because it can be used either on a table or the floor. The children's work can be saved and printed if necessary.
Other focused activity.	Programmable or remote control toy, or app version of one of these e.g. beebot	An activity chosen by the adult responsible for the group. There is a specific goal or learning experience in mind. The children can work individually, in small groups or as the whole group working together.
Free play option.	Tablet, programmable or remote control toy.	The children are given an agreed amount of time per week when they can choose an appropriate app, programmable or remote control toy that they can use and explore. There are no preset expectations as to what the children will learn from the activity.

table 5

The more focused activities that incorporate technology into the children's learning experiences are valuable learning experiences because they provide an interesting and useful way to introduce new ideas e.g. different scientific and mathematical concepts (mainly with children aged 5 and older), and clearly demonstrate to the children that there is more to technology than entertainment and playing games. Table 6 has more information on using apps that have proved successful in my experience. The age group is intended as a guideline based on the age of children that has been the most successful through my experience.

Technology	Age group	Explanation
Bamboo paper, app.	All ages.	This app allows the children to use their finger as a pencil, and clearly shows how they move their finger. The children are able to change the thickness and colour of the line. Develops fine motor skills, but shouldn't replace using pencils, crayons, paintbrushes etc.
Weather app.	4 year olds and older.	An interesting way to learn about the weather. The older children in particular enjoy trying to predict the temperature, comparing the weather they see with what the app shows and recording the weather throughout the year as the seasons change.
Google earth, app.	3 year olds and older.	An interactive way to discover about the world around you.
Interactive stories.	All ages.	When children are a little restless, or are beginning to learn the language being used, this is an interesting way to get them involved at story times.
Bee-bot, app and programmable toy.	5 year olds and older.	A programmable robot that looks like a bee. The idea of the toy is that you program the directions and watch where the bee goes. The aim is to reach a particular place on the mat or screen. The controls are identical on the bebop toy and the bebop app, so it is easy for the children to move between the two versions.
Where's my water app	5 year olds and older.	The basic idea is to fill the crocodile's bath with water. As with many games, it starts simple and increases in difficulty as more levels are completed. As the game progresses it demands that the children plan their actions before starting and it starts to include some scientific concepts e.g. the different states of water and what happens when different substances mix together.
Othello	5-6 year olds and older.	The classic board game with black and white circles. The aim of the game is to get more of your colour than the opponent (either another person or the iPad). Initially this is easy, but quickly the children start to plan ahead and try predicting what their opponent will do next.

Tasty planet app	3-4 year olds and older.	An interactive game that involves moving the tablet in different directions so that your character moves around the screen to find the things it needs to eat.

table 6

Some of these apps require that children think and plan their course of action, possibly modifying their initial plan until they reach the goal e.g. at first there isn't enough water in the crocodile's bath on where's my water. This is further enhanced by a tablet's ability to give instant feedback e.g. the water didn't go where you expected, but you can see where it went instead. This aspect of technology provides children with a feeling of being in control and learning independently, which is important for maintaining a child's interest in learning (Hayes & Whitebread 2006, 99.)

The use of a technology in this way encourages children to take a more active role in their learning and as a result they have the possibility to develop skills and understanding that otherwise would be more difficult for them children. The apps in table 4 create a meaningful situation to the children through which they can discuss solutions to the problems posed and gain instant feedback, which in turn increases the level of interest and commitment to the activity (Hayes & Whitebread 2006, 104.)

3.2 Project work related to topics
As early childhood education is placing an emphasis on a more holistic approach to teaching and learning , the idea of projects related to topics is becoming more commonly used and an important method through which the curriculum is delivered. (Finnish National Agency for Education 2016, 46-50.)

Naturally the way in which technology is used, and the individual activities within a project are likely to vary throughout the year e.g. the way in which the children interact with and use technology will be more simple at the beginning of the year than later in the year. As there are many different ways in which technology can be incorporated into projects and topic related work, this section is further divided into smaller parts, those activities which involve one technological device and those activities which involve the use of more than one device being used simultaneously.

Activities using one device at a time
In my experience there are a few relatively simple ways in which technology can be incorporated in the learning experiences of the children, some of which have been part of the existing learning experiences within early childhood education for many years.

Group mascots, usually a soft toy or character that is connected to a particular group of children. The mascot can go on trips with the children, follow their everyday routines at the kindergarten and spend a weekend visiting each of the children at their homes throughout the year. Throughout the year the mascot has a notebook where photographs and information is written about it's many adventures. Often the children enjoy putting together an overnight bag for the mascot, discussing what their mascot needs, and creating a space in the group's area for the mascot to have it's own home e.g. a hammock in the case

of a monkey.   There is more information and ideas about mascots to be found in section 5.2 under Mona the Monkey.

Investigating shadows and shadow puppets is another fun activity that children enjoy.   Children are naturally curious about shadows, whether they are outside on a bright sun day in summer or standing in front of a bright light inside.   They just can't resist the temptation to play around with the shapes they can create using the different parts of their bodies.   The children can also make their own puppets and use them to create their own puppet shows.   To add to the experience you can use a projector to provide the light needed and play some examples of different way to create shapes, stories etc using shadows e.g traditional shadow puppets or dance shows where the dancers create the story through creating the scenes with the combination of their shadows.   If the children are exploring shadows outside, why not take a digital camera with you and used it to record the shadows of the children or things around them (Finnish National Agency for Education 2016, 71.)

Learning about the world around us is a relatively easy topic through which technology can be included, especially within a multicultural environment.   One of the most obvious ways in which technology can be incorporated within this topic is that of exploring the different countries where the children and staff are from e.g. using google earth to find out where the different countries are, what they look like from a birds eye view, the countries flag etc.   The information can then be recorded on a map of the world somewhere in the kindergarten by adding a picture of the people and flags to the relevant countries on the map, maybe even adding a few interesting facts or places to visit around the map (Finnish National Agency for Education 2016.)   Another way in which technology can be used to explore this topic is by having a teddy bear that travels around the world.   The group of children can meet the bear at the beginning of the year, follow it's adventures throughout the year and have a welcome back celebration at the end of the year.   During the year, the teddy bear sends postcards, stories and photographs handout it's adventures.   In my experience children thoroughly enjoy these adventures, finding out about where the bear has been using google earth on a tablet, and can't wait for the next time they hear from the travelling bear.   One of the easiest ways to record these adventures is by having a map of the world and adding pictures of the bear to the relevant places on the map.

Activities using more than one device at a time
In my experience the most successful, and easiest activity involving more than one technological device to be used simultaneously is the creation of a multi-sensory space.   Children enjoying being in these spaces and exploring the different aspects of each space in their own way and at their own pace.

According to Laurea, multi-sensory spaces should promote learning through shared experiences involving all the senses.   A multi-sensory space should include at least one aspect aimed at each one of the five senses for example a space being created around a forest theme could have mushrooms or berries for the senses of touch and taste, bark chip for the sense of smell, pieces of bark, sticks pinecones etc for the sense of touch, photographs taken by the children and staff for the sense of sight, and recorded sound effects or musical instruments for the sense of hearing.   This kind of learning experience also fits in very nicely with the concept of exploring the world around you through your senses that is promoted by the national core curriculum for early childhood education in Finland (Finnish National Agency for Education 2016, 58.)

In addition to encouraging children to interact with their learning environment, a multi-sensory space provides children with a fun and creative learning experience that encourages them to think about the objects they are interacting with. The ability to think and learn through different experiences is an important skill for children to develop during early childhood education. (Finnish National Agency for Education 2016, 42.) Multi-sensory spaces are relatively easy to set up for many topics within early childhood education as they don't require a specific kind of space. The only demands a multi-sensory space makes is that all the senses are catered for, which in turn means some carefully planning to ensure that the space created is safe for the age group for which it is intended to be used.

3.3 Risks associated with children being online

One of the main concerns arising from the use of technology with children, is that of children using the internet and the risks associated with it. The most obvious, and publicised in the media, of the risks associated with children and the use of the internet or internet based apps such as social media are children innocently searching for information or a particular website and finding themselves on a completely inappropriate site, and children thinking that they are chatting with a friend, but the person they are chatting with is not a friends, but instead it is somebody far more dangerous who is posing as a friend in order to get children to trust them. As virtually every app uses the internet in some way or another, it is there important to consider these concerns and ways in which it is possible to overcome them, or at least minimise the risks as much as possible. This section of the thesis proposes some possible solutions to the problem of how to minimise these risk being posed to young children, all of which have been proved successful through experience within early childhood education over several years, and in a variety of settings with many different groups of children.

The first, and probably the easiest solution relates to the use of social media which is aimed at groups of people socialising together through an online apps. As children in early childhood education often don't know how to read or write, and are unlikely to have they own account, there is very little educational relevance to using these sites in the early childhood education environment. The solution therefore is quite simple, don't use these websites or apps with children in the early childhood education environment. When searching for images or a specific website e.g. a place in the town where the early childhood education centre is, discuss with the children what to write in the search area and then turn the screen around so that you can see it, but the children can not. By doing this, the children are involved in the process and are learning about how the internet search works, but you have a chance to check the images or that it is the correct website before the children see the screen, and therefore minimising the risk of the children seeing inappropriate images. Finally if you are searching for something more general, such as information on the current topic, use planning and preparation time to look for relevant websites that are appropriate to use with the group of children you have in mind. This way it is possible to find the most appropriate website and book mark it, which in turn allows a greater amount of time to be spent exploring the information with the children. The result of this, is that the children will be more involved because they haven't had to wait for the website to be found and there should be no awkward surprises during the activity time.

4 Methods

During this section of the thesis, the chosen methods for the practical application of the theory will be introduced.   This will include the methods themselves, and the main reasons for choosing them to demonstrate how the legislation outlined in previous sections can be put into practice.

The overall method that will be used throughout the case study activities is to incorporate technology and mobile devices into the children's learning experiences using a holistic approach to teaching and learning. This means that instead of learning the relevant skills in isolation, the children will learn to use the devices in a way that crosses different areas of the early childhood education curriculum and will therefore bring a greater sense of purpose to the children's learning. According to Piaget, children's development is holistic, the different developmental areas develop alongside each other (Penn 2008, 39). Therefore a child's ability to use ICT needs to be incorporated across the curriculum in a holistic manner. When technology is incorporated across the curriculum, the effectiveness and quality of the learning experience is much higher.   Therefore the use of technology should be incorporated into the existing teaching and learning experiences within early childhood education, and not taught as an isolated skill to be learnt (Price 2009, 7.)

The technological devices that will be used for the purpose of this thesis are all mobile devices, (mobile phone, tablet and digital camera). This is important because the devices need to be easily moved around and used by the children in a variety of places, both inside and out, in order that the idea of adopting a holistic approach to teaching and learning with technology is met. The children will spend the first few weeks becoming familiar with the devices and working out for themselves which device they prefer to use, and what kind of photographs they enjoy taking. Once the children are familiar with the devices and start showing a preference for a particular device or become more interested in other aspects of taking photographs e.g. using a zoom or experimenting with different angles, the children will be encouraged to take photographs as a means of recording their learning experiences and what has been important to them throughout their various learning experiences. This will allow for the children to develop the skills at their own pace and be given an opportunity to be creative in the way that they use their new skills. Through creating a learning experience like this that is child centred, the children will develop new skills alongside other skills and interests, which in turn will provide the children with a greater sense of relevance to the skills they are learning. (Finnish National Agency for Education 2016, 46-56.)

The photographs that the children take will be combined into a slide show as part of a multi-sensory space relating to the various themes at the kindergarten where the case study will take place. The idea of this, is to provide the children with an opportunity to enjoy their photographs and share them which each other, both in the same group and other groups at the kindergarten, and if possible their parents also.

Multi-sensory spaces are a space created that invites the participants to learn and explore the space using all their senses. These learning experiences can be created in practically any space to fit in with any topic, theme or intended purpose. The only limitations to their uses within early childhood education are the imagination and creativity of those creating them, and the resources available in any particular early childhood education centre.   The underpinning aspect of a multi-sensory space is that it incorporates something to stimulate a person's curiosity through their senses, (sight, hearing, touch, smell and taste), and draws that person into the space so that they begin to interact more with it, and the other people in

that space. As multi-sensory spaces encourage children to interact with their learning environment, they are a great way to encourage children to explore, question, try out things and become active learners.

The final method that will be used fir the case study is that of incorporating the use of a tablet and interactive stories into story times. The interactive aspect of the digital stories will be particularly useful for those children who have either very little or no understanding of the English language because they can touch the screen and hear the words, touch the screen and watch to see what funny thing happens and enjoy the different sound effects. These features will help these children with limited language skills to be able to concentrate for longer and develop a positive attitude towards the more language based activities.

The reasons for choosing these methods are quite straight forward, coming from a practical point of view and several years of experience in using technological devices with children in early childhood education. The main reasons are that my methods needed to be relatively easy to implement and make use of technology that is many kindergartens already have. In addition to this it was necessary to create ways to introduce the technology to the children in a fun and creative way that didn't rely on a knowledge of the English language in order to learn what to do because many of the children in the group had little or no previous knowledge of the English language. Finally, these methods had to be both easily incorporated into existing teaching and learning practices, and able to be implemented by staff with less experience and familiarity with the devices than myself if the initial aims of the thesis are to be met.

5 Case study

5.1 Introduction

The approach of using a case study was chosen as a means of demonstrating some ways in which technology can be incorporated into the learning experiences of children during early childhood education. This particular case study took place during the late summer an autumn of 2017 at a multicultural English speaking kindergarten in Helsinki. There were fifteen children involved in this project, aged between two and five years of age, (with the youngest child turning three years old during the project). The kindergarten was chosen for a number of reasons, it was a multicultural environment, the group sizes were quite small, which meant that the children had short waiting times to wait for their turn, and probably the biggest factor in the decision was that I was working at the kindergarten.

At the start of the project many of the children involved were new to the kindergarten and had very little or no skills in using the English language to communicate. This meant that the methods, devices and activities involving technology had be planned and carried out in a way that required very little use of English in the beginning. The result of this limitation was that the focus of the case study was centred around using digital cameras to record the children's learning experiences, both at and away from the kindergarten building. This aspect of technology and technological devices is relatively easy for all the children to learn as a staff member can demonstrate and work with the children to show them what to do, while at the same time telling the instructions in English. This was planned so that the children would learn how to use the devices, begin to learn some English words or phrases at the same time, and have the opportunity to show what they are interested in or is important to them in their learning environment.

(Fisher 2013, 17). There were six underlying aims for the different projects and activities that the children were to experience during this time. These aims can be found in table 7.

Aim	Link to Curriculum
The technology should not take over from any other area of learning.	Learning is holistic, children are constantly learning new skills and concepts alongside each other.
The children should experience using technology for reasons other than entertainment	ICT is a transversal skill that covers all aspects of the curriculum.
The experience of technology should be in a way that is both meaningful and relevant to the children.	Activities should follow the children's own interests and learning styles. Learning is most effective through a variety of meaningful experiences.
The activities had to cater for children with little or no prior knowledge of English.	A child's previous experiences and abilities should be the foundation on which future development takes place.
The activities had to be equally acceptable to many different cultural and religious backgrounds.	To encourage children to develop a positive attitude towards different cultures.
To provide the children with an opportunity to be creative in the way they used the technology.	Activities should follow the children's own interests and learning styles. Learning is most effective through a variety of meaningful experiences.

Table 7 (Hayes & Whitbread 2006, 104; Price 2009, 43; Finnish National Agency for Education 2016, 36-65.)

During the planning phase of the case study projects and activities, it was important to consider the requirements of the new curriculum legislation, the needs of the children involved and my previous experiences of using technology within early childhood education. The combination of these three factors formed the backbone of the projects and activities that were planned. Previous experiences provided an invaluable source of ideas, inspiration and a much needed reality check at times in relation to putting such a project into practice. By the end of the planning phase, six projects or learning experiences came out as being the most realistic to incorporate into the existing teaching and learning styles of the kindergarten, whilst still being inline with the latest curriculum legislation and what had worked successfully in previous experiences. These six projects were, exploring the seasonal changes through taking photographs of the same things near the kindergarten every week throughout the year, encouraging the children to take photographs of things that interested them as the seasons changed, using technology to explore the city of Helsinki through the children's eyes, creating a multi-sensory space connected to one of the kindergarten's themes, recording the group's mascot's adventures both at the kindergarten and when visiting the children's homes, and finally introducing the children to the idea of interactive stories where they can interact with the characters in some of their favourite stories.

Before implementing these various projects and activities, the children needed some time to become more familiar with the technological devices e.g. how to hold them, how they work and which device the

they preferred to use. Only once the children were familiar with, and comfortable using the devices for taking photographs could the other projects be started.

5.2 Activities and projects in more detail

The first projects that started at the beginning of the kindergarten year were about exploring the seasons and recording how each season transformed into the next. One of these projects became known as "a year in the life of the circle park," and as the name suggests is based in the circle park, which is a park near to the kindergarten that the children regularly visit throughout the year. The other of these projects was "The seasons through the children's eyes," and focused on the children taking pictures from around the kindergarten's neighbourhood of things that they thought about relating to the seasons e.g. colourful leaves during the autumn. These two projects provided the children with the opportunity to learn how to use the devices, develop a sense for what kind of pictures they liked to take and made the idea of digital photography relevant to them. (Finnish National Agency for Education 2016, 77-79.)

As time moved on, the use of technology became incorporated within the kindergarten themes. Firstly "My city through the children's eyes" which involved the children using technology to show and create things that were important to them around Helsinki. Secondly the creation of a "Multi-sensory space, with a halloween and autumn forest theme." In addition to these projects, there were two more activities that were ongoing from the beginning of the kindergarten year, using a tablet during story times with interactive stories, and using the digital cameras to record the adventures of the group mascots.

A year in the circle park project involved the children both in the planning and implementation of the project, and was part of the process of the children becoming familiar with the kindergarten's surroundings. The children's involvement in the planning aspect was to decide in which of the local parks they wanted to record the seasonal changes throughout the year, and which aspects of that park they wanted to focus on. Through this process of exploring the environment and thinking about what aspects to explore in more detail, the children became more aware of their surroundings, began to interact with the natural elements in the local parks and started to develop a sense of curiosity about what was happening around them in the nature. (Finnish National Agency for Education 2016, 47.)

The three aspects that the children chose to record the seasonal changes in more closely were a bush and two different types of trees as can be seen in figures 2-4.

Figure 2:
The circle park bush

Figure 3:
The circle park maple tree

Figure 4:
The circle park rowan tree

The children used a mobile phone camera for the purpose of taking these photographs because it was the easiest device for the children to use and the kindergarten's mobile was already taken routinely on all the outings. The group of children decided together with the teacher that the photographs would be taken once a week from the same spot in the park. The children were then able to look at the photographs taken and decide which were the photographs to be printed as usually more than one photograph had been taken of each object due to the fact that the mobile phone camera would take multiple pictures if the children didn't take their finger of straight away. Once printed out, the photographs were then displayed on the window at the children's eye level so that they could easily see how the circle park had been changing as the seasons changed.

Initially the children were motivated and enjoyed taking the photographs, but unfortunately after the first few weeks there were some wasps in the circle park and the children were unable to go there for a while. Once the wasps had gone and the children were able to return to the circle park, the wanted to continue the project, but were not so motivated to take the pictures themselves as the wasp nest had been near to the bush that was being photographed for the project. The children discussed what to do about the situation, and it was decided that the teacher would take the photographs, but the children would still decide which picture to print and place on the display for all to enjoy. Refer to figure 5 to see some of the photographs of summer turning into autumn in the circle park.

Figure 5: Seasonal changes in the circle park

The seasons through the children's eyes project that involved the children using digital cameras to record the changes around them as the seasons were changing, and the different activities that they chose to do depending on the differing weather e.g. swinging, building with wet sand or playing with water they find in puddles around the park. Initially it was planned to use a digital camera and a tablet for the children to take photographs with, but very quickly it became apparent that the tablet was too difficult for the younger children to hold and take photographs with. As a result the children were given the opportunity to use a mobile phone instead of the tablet, and this solved the problem. As the children became more confident and creative in the photographs they were taking they started to ask to take photographs when on field trips e.g. in the forest or walks around the neighbourhood. Some of the children quickly started to think about the kind of picture they wanted to take and so were eager to explore functions such as the zoom and selfie feature on the mobile phone. It quickly became apparent to the teachers that the children were learning many new skills, enjoyed the sense of being in control of their learning and were actively participating in they learning experiences. Unfortunately, however, some of the photographs that

the children wished to take they were unable to get themselves e.g. an acorn on the tree and they could not take the picture they wanted because the zoom was not powerful enough. In these situations the children would tell a teacher what picture they wanted and the teacher would try to take the picture that the children wanted by following their instructions and allowing the children to check the pictures.

Through this project the children became much more aware of the changes around them and were interacting with the natural environment. As the leaves started to fall off the trees the children enjoyed looking at the shapes, sizes, colours and which trees kept their leaves the longest. The children started to explain their photographs e.g. this is my favourite tree because it lost it's leaves last or this is my favourite leaf because of the colour. Some examples of the children's photographs can be seen in figures 7-16. (Finnish National Agency for Education 2016, 44-56.)
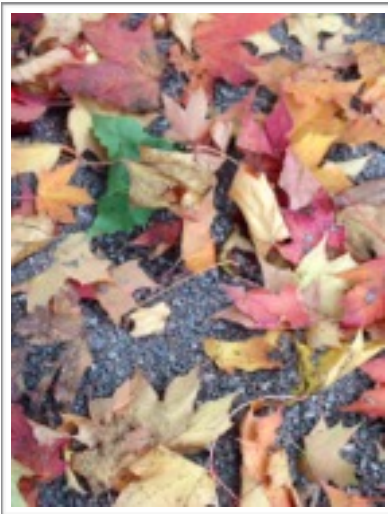
Figure 6:
Autumn leaves by the children

Figure 7:
The children's favourite tree
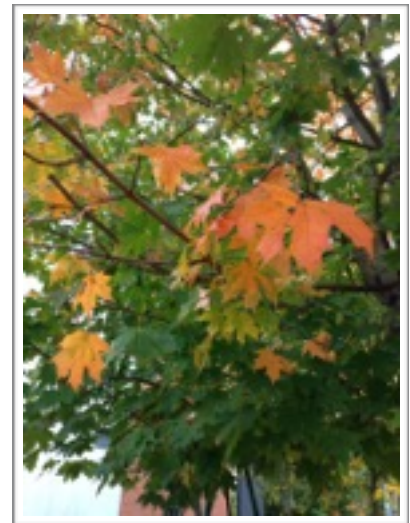
Figure 8:
The leaves changing colour

Figure 9:
Learning to use the mobile phone camera

Figure 10:
A fireplace using natural objects

Figure 11:

Autumn leaves close up

Figure 12:

Berries in the forest

Figure 13:

Colourful leaf in the forest

Figure 14:

Looking for autumn colours in the forest

Figure 15:

Changing seasons in the forest

The project about my city through the children's eyes was created as a response from the children i the group. As the thesis was designed to demonstrate how technology can be incorporated into early childhood education inline with the current legislation, the technology activities needed to follow the kindergarten's themes, which would be decided with the children. (Finnish National Agency for Education 2016, 77-83.) The children in the group were very interested in transportation, occupations and places they had visited around Helsinki during the summer holiday. The theme of my city came about by combining these interests into one coherent theme. The role that the technology played in this project was two fold, firstly by the children experiencing google earth on a tablet to find and explore their favourite places around Helsinki e.g. the zoo and theme park, and secondly taking photographs of things around the city that interested the children, starting with the area around the kindergarten. Some of the photographs could be taken by the children e.g. the local bus through the kindergarten window, and

others had to be taken by the teachers e.g. building sites and the metro for safety reasons. The children's use of google earth and some of the photographs taken inspired artwork that was created by the whole kindergarten that made a big display about "our city." Examples of this is a photograph of the metro and the resulting artwork that the children within the case study group created, see figures 16 and 17, and the rollercoaster artwork, refer to figure 18.

Figure 16:
The original metro photograph

Figure 17:
The resulting metro artwork

Figure 18:
The children's favourite rollercoaster inspired by using technology

The next theme at the kindergarten was autumn, including a halloween party at the end of the month. The way in which the technology was incorporated into this theme involved the children taking photographs of autumn related learning experiences and sights around the local area, followed by the creation of a multi-sensory space using the children's photographs as part of the multi-sensory space. Initially the multi-sensory space was going to focus on the autumn theme, but as time moved on the children became excited about halloween and the approaching halloween party. Due to this, it was decided to combine the autumn themed multi-sensory space with the halloween party theme, definitely an easier task to talk about than put into reality. The way in which the two aspects of the learning experience were combined was through the forest sounds being played in the background and a short story that linked the different activities within the multi-sensory space, refer to the appendices for the story.

As the multi-sensory space was intended to be explored by all the children at the kindergarten, the children were divided into smaller groups so that there wasn't too many children in the space at the same time and all the children could interact with the environment without the need to wait a long time for their turn to try something. When each group of children came to the multi-sensory space, the first things they did was to take of their slippers and socks, and then sit on the floor to listen to the story behind the space.

The activities relating to the senses can be found in table 8, unfortunately the sense of taste wasn't provided for within the environment due to the fact that the kindergarten didn't want the children to eat anything in the space. In an ideal situation the sense of taste would have been represented by things found during the autumn in a typical forest e.g. berries or mushrooms. (Finnish National Agency for Education 2016, 44, 45, 69.)

Sense	Activity
Sight	A slideshow of the children's autumn photographs and forest objects e.g. pinecones, acorns, conkers and bark
Hearing	Sounds of a forest during the night, musical instruments. Some instruments were made by the older children using natural objects from the local forest, others were more traditional e.g. a rain stick
Touch	A variety of different textures to walk on that represented the different kinds of surfaces you might find in a forest e.g. a mossy path, fallen sticks, a stream or rocky shore. Feely boxes where the children had to put their hands in to try and find certain objects related to halloween. The feel of the musical instruments e.g. the rainstick that was made out of an old cactus.
Smell	Forest objects e.g. pinecones, acorns, conkers and bark

Table 8

Figure 19:
Rocky shore

Figure 20:
Forest smells and textures
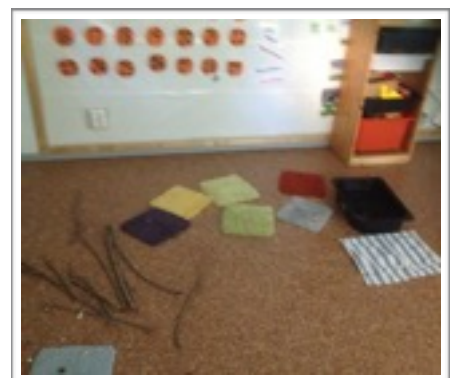
Figure 21:
Fallen sticks, mossy path and cold stream

Figure 22:
Children's photograph from slideshow
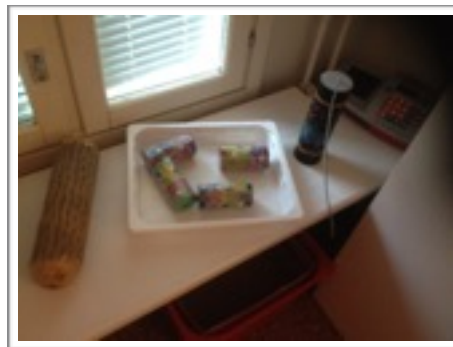

Figure 23:
Halloween themed feely boxes

Figure 24:
Musical instruments

As all the groups at the kindergarten had their own group mascot, it seemed only natural to incorporate the use of technology into the the adventures of the mascots. Traditionally these mascots had spent the weekends visiting each of the children's homes and a diary had been kept about each mascot's adventures over the year, but the rest of the time the mascots hadn't really been art of the children's learning experiences.   The younger children were very interested in their mascot, (Mona the monkey, refer to figure 25), and therefore it was decided to extend the existing tradition to cover Mona the monkey's time spent at the kindergarten. This meant that Mona started to go on trips with the children, and the children started to think about what the monkey would like to do e.g. swing in a tree when visiting the forest or find out how to return books to the library. During these trips the children enjoyed taking photographs of Mona's adventures, this added another dimension to their learning experience as they thought about what Mona would like to do and how to take a picture of Mona doing those things.   (Finnish National Agency for Education 2016, 44-45.)

Figure 25:
Mona the monkey

Figure 26:
Mona looking for signs of autumn

Figure 27:
Mona enjoying the late summer sun in the forest

Figure 28:
Mona swinging in a tree at the local forest

Figure 29 :
Mona visiting the library
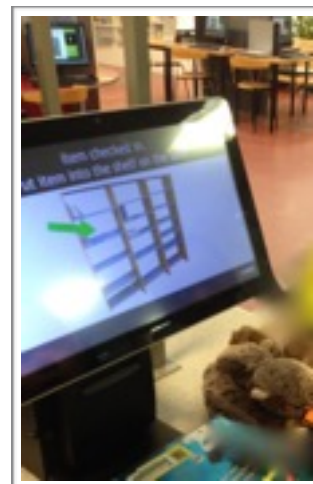
Figure 30:
Mona learning how to return the library books

The final of the activity that was part of the case study was the use of a tablet with interactive stories during story times. The main idea behind this was to provide something of interests during the story time for those children who were new to the kindergarten and had either limited or no understanding of the English language. As the children would be able to see things moving, hear different sound effects and be able to interact with the characters in the stories, this would help these children (Finnish National Agency for Education 2016, 54-56.)

5.3 Comments and reactions from families

Throughout the autumn the families of the children at the kindergarten gave positive feedback about their children's experiences at the kindergarten, especially the activities that have been planned and how the children have become more interested in using technology for reasons other than entertainment. Many of the parent's were pleasantly surprised at how easily the technology had been incorporated into existing teaching and learning practices without having the feeling that the technology was taking over or distracting from other areas of development that they felt were important.

The most common comments that were received from parents in relation to the use of technology are, "our children are much more interested in computers etc now than they were before," and "I'm amazed at the standard of the photographs the children take." Often parents would be asking if their child was really taking the picture on the WhatsApp group when they came to pick up the child because previously their child hadn't previously used the camera function on their phone or a digital camera. The parents also commented on the fact that their children couldn't wait to take the group mascot home and take photographs of the weekend to share with their friends. Usually the biggest worry for the parents and children was somehow related to the photographs e.g. they had problems printing them in time. The parents were relieved to find out that the kindergarten was able to find a solution so that all the children could enjoy al the photographs relating to the mascot's visits, even when the children created a powerpoint presentation with their parents about the mascot's visit to their home!

5.4 Reactions from the children and kindergarten staff

Throughout the course of the autumn term all the children involved in the case study were motivated by one or more of the learning experiences designed to introduce them to using technology for reasons other than entertainment. The children enjoyed taking photographs of things important to them, changes in the environment and their mascots. The youngest children particularly enjoyed taking Mona the monkey on trips and recording all the fun things Mona was experiencing through taking photographs with a mobile phone.

The multi-sensory space was an experience that all the children in the kindergarten thoroughly enjoyed because it combined technology with other more traditional learning techniques e.g. the ability to interact with the environment and a hands on approach to learning. Also many of the older children enjoyed watch the slideshow because they didn't know that what the younger children had been doing during their outdoor activity times (the younger children had been going outside at a different time to the older children during the first couple of months). Children of all ages found something fun in the multi-sensory space, and asked to have the space available for more than one day. The result was that the space became a choice during the free play times for a week.

Other staff working with the older children in the kindergarten saw what the the younger children were experiencing and decided that they would like to incorporate more technology into their activities in a similar way.

As a result of the activities that were part of the case study, the kindergarten's own tablet was found and a child friendly case was bought so that the children could start using it. This would mean that the use of technology would become less reliant on the the staff bringing their own devices to use.

5.5 Evaluation of the case study

This section of the thesis is going to tackle the task of evaluating the case study, both from the point of view of the individual projects and the case study as a whole project. This section will begin with a short summary about each of the individual projects, the ups and downs, and the things that could be improved in the future. After this the focus will move to evaluating the case study as a whole project, including the process of carrying out such a project, the limitations there were, how these limitations could be reduced in future research and ideas for future research projects.

The individual projects

The first project that started, recording how the circle park changed through the seasons, was initially interesting to the children as they were actively involved in the planning process of the project and the idea of focusing on certain elements was a great experience for them to master the basics of taking digital photographs. However as time progressed the children became more capable and creative with their skills in this area, and there was a period of time when the children were unable to go to the circle park due to wasps. After the break from visiting the circle park, the children were less motivated to go to the circle park and the weather was starting to get colder which made taking photographs more challenging due to the children wearing gloves. At this point it was discussed with the children whether or not to continue the project, the children wanted to continue seeing the transformation of the circle park through the seasons even though they wouldn't necessarily be able to take the pictures themselves. The solution was for one of the teachers to take the pictures and the children could still enjoy watching the transformation unfold. It was intended that once the weather warmed up again during the spring time that the children would once again start to take the photographs themselves.

The project that involved the children recording the changing seasons through taking photographs with digital cameras proved to be a motivating and creative approach to learning about digital cameras. The children were eager to experiment with both the digital camera and the mobile phone camera function. At the beginning of the project the mobile device being used by the children was changed to a mobile phones because the children found the tablet more difficult to use than was expected. This was probably due to the case which the tablet had and the size of the tablet. The main limitation of this project was the availability of devices, there were only two devices available between all the children in the group. This meant that the children often had to be patient and take turns with the devices, which in turn meant that the experience of learning to use these technological devices also developed the children's skills in other developmental areas e.g. social skills, and that is the essence of holistic teaching and learning. (Finnish National Agency for Education 2016, 44, 45, 56.)

Once the children had mastered the basics of using the cameras, the standard of their photographs was surprisingly high with many of the photos taken by the children looking like those taken by adults, and the

children started to ask about other functions of the devices e.g the zoom, how you can tap the screen to choose the spot where the camera focuses on and the selfie function of the mobile phone camera.

The inclusion of technology into the city theme really brought the theme to life for the children as they were able show and explore their favourite places from the safety of the kindergarten, and were actively involved in planning what was going to be included in the kindergarten display about the city. It was amazing to see how the children enjoyed using the technology to investigate their favourite places, and then use that experience e.g. photographs they had taken or saved images to enhance their work in another area of the curriculum.

It would be a great experience to do this kind of project again, but with a couple of changes to improvement the overall experience.   These changes would be to include some of the children's photographs on the display alongside their more traditional arts and craft, and to create a slideshow as part of an open day or other event where the children's families could visit and share the children's achievements and interpretation of their city.

Children from all the groups at the kindergarten thoroughly enjoyed the multi-sensory learning experience and were eager to visit the space again. This had the result that instead of the space being set up for only one day, the space was left available for a week and the children took turns to be there during their free play time. Despite this place being successful with both the children and the other kindergarten staff, it could have been more so if.   This is because the other staff members were not as familiar with the concept as myself, and there was a limited time to explain the concept to them. As a result the space was not created entirely inline with the basic idea of the multi-sensory space e.g. there was not something for all the senses present in the environment and the space was trying to cover more than one theme. If this kind of learning experience would be done again at this kindergarten, then some changes would need to be made in order to improve the activity's learning experience. The changes needed would be to create an environment where the is only one coherent theme present throughout the space, the area should be planned in a way that allows the children to obtain the same experience no matter what order they explore the activities and items in the space, all the activities e.g. feely boxes should be created so they look like they are part of the theme, and finally there should be something to explore through all the senses. If there are multiple groups of children to visit the area, then the elements of the experience that are limited should be divided equally between the groups so that all the groups get the complete experience. Such elements would be things that the children will taste, smell or a possible craft activity that is set up in the area.

The idea of incorporating technology into the already familiar mascot activity was a great success. The children were eager to take Mona on trips with them, even if just to the local forest or library as the little monkey was an important member of the group.   The children interacted more actively with the environment and thought more carefully about the photographs they were taking when Mona the monkey was around than on the occasions where it wasn't possible to take Mona.   The children were genuinely disappointed if it wasn't their turn to take Mona home, they had to wait to take Mona's picture, or if it wasn't possible to take Mona on a particular trip.

All the children really enjoyed the interactive stories. Even the children who had the language skills to be able to understand the story from the original story book appeared to be more actively involved during story times, and for a longer period of time. There were two stories that stood out from the rest as being the children's favourites, "Who's in the Loo" and "Hugless Douglas." This was due to them having funny sound effects and either something that moved or something that the children could interact with on every page of the story. In the case of "Hugless Douglas" some of the interactive elements were designed to encourage the children to play around with them e.g. when Douglas hugs some sheep tightly and depending on how many times the children touch the screen a different number of sheep are pushed out. In this case the children discovered that the number of sheep was always the same number as the number of times they touched the screen.

In addition to the use of interactive stories at story time, technology started to be used in another way. This was due to changes in staff and some of the children's favourite books no longer being at the kindergarten as a result. You tube was used on a tablet to find animated versions of the stories that the children missed, and once again the children were able to sing along with their favourite stories about pete the cat.

The case study as a whole project

Overall this case study was successful in achieving it's aim of demonstrating how the use of technology within early childhood education could be implemented inline with the latest regulations from the EU and Finland, without distracting from or taking over from other areas of the curriculum or teaching and learning activities that are equally important for the children's overall development. This case study was also successful in the way that the different projects and learning experiences opened up the use of technology and mobile devices to children beyond the realms of entertainment.

Throughout all the projects the children had many different opportunities to use the mobile devices (digital camera and mobile phone camera).   The project as a whole allowed the children to become familiar with the different devices, discover for themselves which device they were most comfortable using, what kind of photographs they liked to take, and finally the opportunities to learn and develop their skills in their own style and at their own pace. This included having the freedom to be creative in the way they chose to take photographs.   Some of the children started thinking about the photographs they wanted to take and could visualise them, but didn't have the ability to take the photograph themselves. This was made obvious to the staff in the way the children asked the adults to help them, as the were able to describe the photograph they wanted, refer to figure 11 on page 31 for an example of this.   The photo in figure 11 was taken by myself for one of the older children in the group. The child wanted to take a picture of the autumn leaves on the oak tree, but the child wasn't tall enough to get the photograph they wanted, so the child explain that they wanted a picture of only the leaves on the tree. The child looked at the photographs I had taken and refined the instructions until the picture on the screen matched the picture the child had imagined.   As the children's abilities increased and their skill to use the devices improved, many of the children also started to think about how they were using the devices, e.g. how they were holding the device, learning how to use the zoom, checking the screen both before and after taking the picture to see if they had the picture they wanted, and even the selfie feature on the mobile phone.   It was impressive to see how quickly the children took to taking the photographs,

the creativity they developed and their level of motivation to learn more in order to get the pictures they wanted.

As the individual projects started and the overall project started to take shape there were aspects that needed to be modified, unforeseen circumstances to be dealt with and other aspects of working within a kindergarten that affected the original plans. This was exactly the part of the implementation process where previous experiences within early childhood education and technology were to be the biggest asset in making the overall project the success that it was. These somewhat unexpected situations varied from relatively easily solved issues such as the children experiencing difficulties with using a tablet or not having access to one of the parks due to wasps, through to more complicated issues like staff leaving and the structure of the groups involved in the project being changed. The result of these issues was that it took a slightly longer time than planned for the children to become familiar with the devices being used, and the overall timeframe for the project was extended to allow the children to adapt to the changes that had to be made along the way. The impact of all these changes was that everybody involved had to be flexible in there approach to the different projects and how the technology was being incorporated into the existing learning experiences that had been planned with the children at the start of the kindergarten year.

Limitations of the case study

As with any kind of research or project work involving a group of people, this thesis' case study inevitably had its limitations as to what could be achieved and the reliability of the results obtained. In the case of this case study, these limitations are related to the number of children included, the variety of early childhood eduction providers involved, and the relatively short time scale in which the study was carried out.

There was a very small number of children involved in the case study because the kindergarten involved was a small kindergarten with only 24 children in total, and only the younger children were involved in the case study. The implications of such a small group of children were that it was difficult to establish a general idea of what devices are most appropriate and easily used for each age group, or the kind of activity that the different age groups are most motivated by. As a result of this, the findings are specific to the group of children involved, and don't provide an overall view that other early childhood education providers can necessarily follow. A larger group of children would be needed in order to obtain a more realistic picture of the age group and the most effective ways of incorporating the use technology into their early childhood education experiences. In addition to this, there was only one early childhood education provider in the case study, which in turn means that the reality of putting the new legislation into practice was only experienced in one setting, and therefore, doesn't give an overall view of the reality of the task. To obtain this overall view of the reality of incorporating technology into early childhood education, a variety of different establishments would need to be included in this kind of research e.g. different sizes, both privately run and state operated, and those that already have a particular emphasis on something such as learning a new language or being outdoors most of the time. Unfortunately it was not possible to take into account may of these variables because of the circumstances under which the case study took place. The final limitation that had a big impact on the case study was the element of the timescale in which the case study needed to completed. Ideally the case study should have been ongoing for a longer time period e.g. covering the whole of the kindergarten

year, as this would have given more results about the children's use of technology and provided more ideas about how the technology could be incorporated throughout the year. This would have provided a greater insight as the legislation expects the technology to be part of the children's learning experiences throughout the year. This would have been particularly interesting to document through the winter months when it is much colder and the battery life of many mobile devices is much more limited due to the colder temperatures.

One other aspect of this case study that affected the results of the projects, especially regarding the multi-sensory space, was the fact that it wasn't possible to have total responsibility for the planning and implementation of the projects. This limited the outcomes and children's experiences, because other team members were involved in the projects, both in the planning and implementation, but were not necessarily as familiar with the concepts behind the activities as myself. If there had been more time available, it would have been worthwhile to explain the concepts and create an example for the other team members to experience.

All of these limitations experienced in the implementation of the case study would need to be carefully thought about, and minimised in future research or similar projects considering the incorporation of technology within early childhood education.

6 Conclusion

Through this final section of the thesis the process of implementing the project will be evaluated, including the experiences of the process, things to keep in mind when planning activities for children that involve using technology, concerns about using technology, and how successful it was in achieving the aims set at the beginning. The section will close with a few thoughts about the future of early childhood education in relation to the use of technology.

Experiences from the process
Despite all the unexpected twists and turns throughout the process of this thesis and the practical application of the case study, the overall feeling is one of a successful and enjoyable experience. However, if a similar project would be approached in the future there are several aspects that should be done differently in order to achieve better results and maintain the energy levels needed to drive the project for a longer period of time. The aspects that would be changed are the timescale of the project planning and implementation, the situation surrounding the project, and the number of children and early childhood education providers that are involved.

The timescale for this kind of project would need to be much longer, and include time to plan both the practicalities of implementing the projects in each environment, and the activities thoroughly with the early childhood education providers before starting the various projects and activities. In this situation it wasn't possible to include some time for this kind of planning as many of the kindergarten staff were changing over the summer, which resulted in the project being started with an overall plan in mind, but the finer details were worked out in the process e.g. where to create the multi-sensory space. This

situation had the advantage of being quite flexible in it's timing of activities, which was very beneficial when unexpected events occurred e.g. the appearance of wasps that prevented children visiting parks or the groups of children being reorganised due to staff changes. The disadvantage was that because projects were not planned so thoroughly beforehand, it was all too easy to become side tracked from the original idea, and as a result the original timescale for the case study could be easily extended for no apparent reason. The methods, planned activities and timescale need to planned carefully so that there is enough information to prevent becoming side tracked from the original ideas, but to also allow for a degree of flexibility that enables the project to take into account any unexpected situations surrounding the project e.g. changes to the working life of an early childhood education provider involved in the project or your own life outside the project. When planning for this kind of project, there needs to have an element of expecting the unexpected, and be able to factor in different approaches, activity options or timings as an alternative plan to make it easier to continue the project while taking into account these unexpected events.

As the topic was interesting and enjoyable to everyone involved, it was relatively easy to maintain the motivation throughout. However due to several unforeseen situations along the way, the amount of energy that the staff and myself had to put into the project was much less than expected towards the end of the project, mainly due to unforeseen circumstances that took the staff's energy and time away from this project.

Through the experience of implementing this project there are a couple of changes that if made would improve the overall experience, and provide more reliable and realistic results about incorporating the use of technology within early childhood education. There needs to be a much larger number of children participating in the project, a variety of different early childhood education providers involved, and one person responsible for the design and implementation of the various activities throughout the project to ensure that the same experience is offered regardless of the early childhood education setting the children attend. In addition to this, the person responsible for the activities throughout the project should not have other responsibilities outside the project that are demanding or time consuming. Throughout my experience in this project of having several demanding or time consuming aspects to my life running simultaneously to this project demonstrated that even when you are motivated and interested in a particular project, if there are other equally demanding elements to focus on outside of that project, then you do not have the time or energy reserves available to spend on that initial project. This in turn meant making compromises, which otherwise would not have been needed.

Through the implementation of the case study it became clear that the concept of incorporating the use of technology into the existing early childhood education teaching and learning experiences inline with the latest legislation, isn't as difficult or problematic as many people working in the field expect. In fact by keeping a few key words in mind when considering how to implement the use of technology with a group of children, the only preset limitations as to what can be achieved is the technology available and how confident you are at using the available technology. These key words are, familiarity, involvement, flexibility, creativity, relevance and fun. Familiarity is a good starting point, consideration should be given to what aspects of technology and technological devices you and the children are already familiar with? This provides an opportunity for the children to demonstrate what they already know and are capable of doing, which will naturally help when planning future activities with technology, reduces the risk of the

activities being too easy or difficult in the beginning and can help to motivate the children. The second most important aspect is the involvement of the children, not only because the legislation requires the children to be involved in the planning process, but also by involving the children, the activities will be appear more motivating and relevant to the children Throughout my many years of experience in early childhood education, it has always been clear that when the children feel they are involved in the decision about and planning for their learning experiences, they are more motivated to take an active role and become more efficient learners. This project proved that this is also relevant to the use of technology, especially when trying to steer the children away from the idea of technology being just for entertainment purposes. The third important point is to be prepared to adopt a flexible approach to the use of technology. This refers to the kind of activities planned, the timescale the children are given to complete tasks and the devices the children are offered if at all possible. A flexible approach is useful and important for young children as they all learn in different ways and at different speeds. (Finnish National Agency for Education 2016, 36, 44-65.) By combining these first three points, the activities planned will naturally appear more relevant to the children's daily lives and lead to more creative ways of using technology, which in turn will make the learning experience fun for the children.

The main concerns that early childhood education providers and parents have in relation to the incorporation of technology into early childhood education are the safety of the children and devices, the cost of the equipment, technology taking over, permission from parent's about using their child's photographs, and issues relating to the use of copyrighted materials.

The most obvious issues regarding safety and technology are using the internet and devices getting. If searching for information or pictures on the internet, it would be advisable to check what comes up in a basic search before doing so with the children. This approach to searching for images or information provides you with the opportunity to check out which sites are appropriate for the group of children so that there is minimal time wasted in finding the relevant information or pictures. When planning to use mobile devices with children e.g. tablets or phones, don't just think about the devices, but also the type of case that is used. It is definitely beneficial to spend a little more money and buy cases that are designed with young children in mind. These cases may not look attractive, but they are designed and manufactured for this purpose. This means that they should be durable enough to protect the devices from the kind of treatment they will put it through e.g. being dropped or having something spilt on it. In addition to this, create clear and simple rules with the children about how to behave with the devices from the beginning. By including the children in the process of making the rules, the children will have a better understanding of them and why they are need, and therefore they are more likely to follow them.

In my experience, the cost of technology is a major concern for many early childhood education providers because they don't have a large budget to cover their day to day running expenses, let alone to buy technological devices. As a result of this, it is most likely that all the groups will share the one or two devices available instead of having their own device. This in turn means more careful planning for staff to ensure that all groups get an equal opportunity to use the devices, and all the staff have the necessary time to familiarise themselves with the device before being expected to use it with the children. The best way to minimise costs is to start with the technological devices already at the kindergarten e.g. smart phone, digital camera or tablet. Once the children and staff become more familiar with, and

confident using the existing technology with the children, then consider investing in other devices or applications.

Many early childhood education providers are well aware of the need for parental permission to use the children's pictures e.g. advertising, Facebook or WhatsApp groups, and even consider the possibility to blur the children's faces so that they are not recognisable. However, there is less awareness about copyrights and the use of digital material e.g. early childhood education settings using such sites as Netflix or apps such as Spotify with personal accounts, which are not licensed for public use. The use of such sites in an early childhood education setting can be interpreted as public usage, and therefore such places need to check with the relevant authorities as to whether or not they need to acquire a licence in order to use this material.

As with any new tool or concept for teaching and learning, technology should be viewed as an addition to the existing methods, experiences and approaches currently being used to aid the children's development. It is however, a very real concern for parents and staff alike that the incorporation of technology into the early childhood education curriculum, will sooner or later mean that technology will start to take over as indeed it has in many other aspects of today's society.

How successful was the thesis in achieving the aims set at the beginning?
The case study was very successful in achieving all the aims and objectives that were set at the beginning, but only on a very small scale, with a select group of children, and only involving one kindergarten. The overall success is therefore limited because of the small number of participants, both in relation to the number of children, and the number of early childhood education providers involved in the project. In order to increase the overall successfulness and reliability in the results of this thesis project, it would be important to rectify all the limitations stated on page 40 and learn from the experiences outlined on pages 41 - 43.

Thoughts for the future
The use of technology and mobile devices within early childhood education is likely to increase as the reliance of technology in society continues to increase. As to what format technology will take, or the extent to which technology will be use within early childhood education is yet to be seen. Through the experience of this project, there are a few possible scenarios that I imagine may happen. These range from the legislation and curriculum guidelines become more specific in relation to what technology, apps, programmes etc are to be used with which age groups or the use of technology starts to take over from more traditional styles of teaching and learning, through to the use of technology in early childhood education remaining flexible as it is now, with those working in early childhood education to be creative in how they incorporate the use of technology so that children are able to have the technology tailored to fit their needs and interests. The one thing that is certain, is that it will be very interesting to see how the changes and developments regarding the use of technology in early childhood education unfold over the coming years.

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Figures

Tables

Appendices

1. Agreement form I created with the kindergarten involved in this project.

LAUREA | *Yhdessä enemmän* | Thesis agreement in the field of Social Services, Health and Sports | 1 (2)

Concrete campus-specific instructions related to the thesis agreement are added at the beginning of this agreement.

Student:

Emily Aitchison

Project this thesis is part of:

Social services degree including kindergarten teacher qualification.

Topic and purpose of thesis:

How technology can be used within early childhood education. How to put the new curriculum into practice in a positive manner.

Connection between thesis and project goals:

The goals are linked to the new curriculum expectations.

Key concepts and preliminary frame of reference of thesis:

Children using and experiencing technology for reasons other than entertainment e.g. games.

Central sources:

Finnish and EU regulations / guideline relating to the topic, other relevant books and websites.

Methods used in thesis:

Teaching children how to use devices e.g. cameras, and then allowing them to be creative in the way they use them to record their experiences e.g their neighbourhood / city through their eyes.

Creating learning experiences using technology e.g. multi-sensory space related to the current topic. The photos used would be take by the children as much as possible.

Preliminary title of thesis:

How can technology be integrated into the early years classroom / curriculum?

Role of working life partner in thesis (enables the implementation of the thesis e.g. photocopies, mailing, facilities and other material issues):

As the thesis is related to the new curriculum, there will be no extra impact / expectations relating to the working life partner. The methods and activities done with the children are inline with the new curriculum expectations, and therefore are part of my working life at the kindergarten regardless of whether I have a thesis to write or not. The writing process will take place outside working hours.

Publication and dissemination of results in working life:

The kindergarten will be offered a copy of the finished written work.

Agreement form continued

Student's declaration that he/she
agrees to comply with the principles of research ethics in the thesis:

I am aware that the obligation to secrecy is applied to theses completed by students of Social Services and Health, as provided in e.g. the Act on the Status and Rights of Social Welfare Clients (Laki sosiaalihuollon asiakkaan asemasta ja oikeuksista 812/2000, Section 15) and the Act on Health Care Professionals (Laki terveydenhuollon ammattihenkilöistä 559/1994, Section 17). I may not reveal to a third party any information about a private person or family that I have learned on the basis of the thesis. I agree to keep confidential any information about individual persons that I have learned in connection with information acquisition. The obligation to maintain secrecy shall continue after the studies have ended.

I shall observe confidentiality and truthfulness in acquiring information and handling material. I shall pay special attention to ensure that the thesis will not cause any harm to persons who participate in it. I shall comply with Laurea's guidelines for research ethics in my activities.

Agreements on supervision:

Signatures

	Date	Place	Signature
Student:		Helsinki	October 2017
Supervisor(s):		Helsinki	October 2017
Workplace representative(s):			

One copy of this agreement will be given to each party (student, supervisor, workplace representative) and one copy will be stored in the project's work space in Optima.
Concrete campus-specific information can be added according to the thesis process.

2. Ideas for comparing today's technological devices with those they replaced.

Device used today	Devices used previously for the same task
Smart phone.	Older mobile phone models, cordless phones, landline phones from different periods.
Digital music.	Cds, cassettes, records, radio, pictures of older machines for playing music.
Ipod or smart phone.	mp3 players, discman, walkman.
Internet based or 3D television.	Television channels where you can't choose when you watch something, DVDs, blue ray discs, videos.
Digital HD projectors.	Over head projector, slide projector.
Electric trains.	Diesel and steam powered trains.

3. The top seven findings for good pedagogical practices within early childhood education across Europe.

1. A focus on pedagogical interactions, especially relationships and social interactions.
2. Children being encouraged to learn through "hands on" exploring, a project based environment, play and narratives.
3. Adults guiding, supporting and facilitating children to ensure that all areas of development are covered, while at the same time providing opportunities for the children's own interests and choices to be taken into consideration.
4. An ability for staff to use their observations of children to reflect on children's development.
5. The provision of an environment that is stimulating, encourages the children to explore. There is space and time provided for the children to explore the environment in their own unique way.
6. Cooperation and partnerships e.g. with parents and other relevant professionals.
7. Recognition of other organisation and services that can support and guide pedagogical practices e.g. therapists or professionals with expertise in special educational needs.

4. The story behind the multi-sensory space

There is a witch who lives in a small house at the other side of the forest. The witches cat has been playing with her spell ingredients, and the witch has lost some important ingredients for making her magical spells.. She has left a note asking for some help in finding the missing ingredients. There are some instructions about how to get to her house and what she is missing.

Walk along the gravel track until you the gravel turns into moss, then follow the mossy path until you find an old stick bridge, (cross the bridge carefully), continue along the mossy path as far as you can. You will come across a stream at some point along your way, I hope the water isn't very cold because there is no bridge across this stream. Once you are over the stream you need to find a hole in the rock, there is a small tunnel you need to crawl through. You will find my small house at the other end of the tunnel.

I have many boxes around my house that contain different spell ingredients, but I can't find the eyeballs anywhere. Feel free to put your hands in all the boxes and if you find any eyeballs please tell me how many and where you found them in case my cat hides them again.