Laurea University of Applied Sciences

Utilizing Digital Technology to Support Child Cognitive Development in Early Childhood Education and Care

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ECEC Working Life Oriented Competence Module

Thesis

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Laurea University of Applied Sciences **Abstract**
ECEC Working Life Oriented Competence Module
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This thesis investigates how digital technology media assist children in developing their minds, being creative and using new media. The main goal was to understand how technology can help with learning and development in early years and to suggest useful strategies for digital learning. The study considered classical and more recent theories. Piaget's and Vygotsky's approaches to cognitive and social development, along with the Digital Play Framework, TPACK and neuroscience-based studies on learning and attention, were used to guide the creation of the digital guidebook. Many of these points were achieved through a qualitative research method using extensive literature review, critical analyses of current studies, curriculum frameworks and the digital learning practices. It involved looking at international research on screen time and digital literacy as well as examining the pedagogical considerations of the use of technology in early education.

A close collaboration between the working life partner and the authors kept the book focused on realistic needs and directly assisted ECEC teachers in their working environment. As a practical output, a digital guidebook was designed for educators, offering structured strategies, app recommendations, and reflection tools to support cognitive development through purposeful technology use.Using digital tools sensibly encourages children's thinking, language and social skills. Success requires three things: qualified teachers, valuable educational materials and the same opportunities for all. The risks involve children spending lots of time on screens and getting too little advice from adults. The thesis suggests that teachers should receive on-going training in using technology and plans should be in place to ensure balanced, age-appropriate technology use. We still require additional studies of digital practices that support cultural diversity.

The thesis has been conducted as a development-based thesis and in portfolio format in Bulb. Bulb link to our thesis: https://eu.bulbapp.com/DSK/portfolio

Keywords: Digital Technology, Cognitive Development, Early Childhood Educators, Digital Tools, Early Childhood Education and Care

Contents

1 Introduction

Digital technology has experienced rapid change, which has had a significant effect on children's growth. As more and more things move online, children now use tablets, apps, and interactive media during their early years. This change brings new opportunities as well as new difficulties for ECEC. Since our children are constantly using digital tools, we should use such tools in ways that help early brain development.

Growth in memory, attention, solving problems, reasoning and language form the basis for learning all our lives. Piaget's (1952) and Vygotsky's (1978) theories still greatly help us understand how children develop their understanding. Piaget (1952) explains that children develop their cognitive abilities by stepping into their environment actively and physically, thus shaping their knowledge through assimilation and accommodation. Cognitive development occurs best in the Zone of Proximal Development (ZPD) because Vygotsky (1978) explains how students learn most effectively through social interactions with more capable peers or adults. When implemented with care, technology is an exploratory platform that promotes student collaboration in learning activities.

Studying this topic is particularly important and current. The Finnish National Agency for Education (2022), utilising the National Core Curriculum for ECEC, recommends using digital technologies to boost children’s ability to use multiple forms of information. At the same time, the curriculum points out that digital resources are meant to help learning, not replace old learning methods. It calls on teachers to use technology to increase creativity, new discoveries, and group activities.

Researchers have backed the idea that we need to be cautious. According to Donohue (2015), learning and creativity happen best when digital media are used with some guidance. Just as, Plowman and Stephen (2013) emphasise that using digital platforms helps children try new skills and supports communicating and representing themselves, particularly with the help of groups. They highlight that digital technology matters less because it’s in classrooms and more because teachers know how to put it to use.

Nevertheless, how well integration works is determined mainly by the teachers involved. As these researchers found, teachers’ willingness to use mobile devices stems from how much they know about technology, their attitude toward it, and their confidence. Without letting people know how to use digital tools well, digital tools may not be used properly at all. According to Siraj-Blatchford and Whitebread (2003), adults have to be included in children’s digital learning since careful guidance ensures that children get the maximum.

It is clear that in practice, those in early education are calling for more helpful tools to use technology appropriately with children. Because of this need, this thesis was prepared by working with a working life partner who is active in early childhood education. Because of their understanding of classroom life in ECEC, the study focused on creating valuable results for educators.

This thesis aims to assemble a digital guidebook based on theories and our working life partner's feedback for early childhood educators. This guidebook aims to assist teachers in picking useful digital tools, using them wisely in the classroom, and assessing their effects on students' mental growth. Using theory, curriculum rules and actual contributions from the field, the guidebook helps promote balanced, meaningful and child-focused learning online.

In short, the study explores a pressing and changing challenge in early education. Because technology is so important to children today, educators should learn how to use these tools efficiently. This thesis aims to achieve that goal by suggesting a clear framework for supporting young children's cognitive development with digital technology.

1.1 Background & Existing Literature

1.1.1 Background

The Finnish education system has become recognised globally because it treats children as its primary focus by encouraging students to learn through play-based activities. The educational guidelines for early childhood technology implementation in Finland appear prominently throughout the Finnish National Core Curriculum for Early Childhood Education and Care (Finnish National Agency for Education, 2022). The Finnish National Agency for Education (2022) declares that digital tools must provide more than mere entertainment value because they enhance play, support creativity development through interactive learning with peers. Digital media serves the curriculum as meaningful interactive resources to support children's natural learning methods instead of substituting them.

1.1.2 Existing Literature

The education community faces ongoing practical obstacles undermining the progress shown in curricular aims. Donohue (2015) describes the lack of structured support resources for ECEC facilities, even though they receive encouragement to utilise digital media. Donohue (2015) asserts that teachers face difficulties securing focused professional development that teaches effective technology use in early childhood settings, resulting in inconsistent practice methods. Educational professionals identify obstacles related to inadequate training while facing challenges with proven learning methods for young children, combined with limited funding for digital resource integration in academic institutions.

Early childhood educators face two additional obstacles in their digital literacy development due to access challenges and unpredictable levels of technology proficiency. According to Nikolopoulou, Gialamas, and Lavidas (2020), educators demonstrate better mobile technology use depending on their tech knowledge and mindset toward growth and self-confidence. Such disparities in teacher digital competence led to differing technology usage patterns because some educators effectively embed digital tools, yet others stay away from them completely. ECEC professionals face difficulties in making decisions regarding technology integration because of non-existent or unclear instructional guidelines, while these uncertainties worsen existing inconsistencies in practice.

Home-based programs must focus on meeting the cognitive requirements of young children during digital learning environment development. The most efficient development of children's minds happens through direct physical interactions with their environment, as Piaget's Constructivist Theory (1952) suggests. According to Piaget (1952), children build their understanding by engaging with their environment. He recommends that education tools like digital technologies allow students to touch and interact rather than absorb information. Applications based on digital technology that focus on problem-solving, processing, and interactive gameplay present outstanding value for this method.

Plowman and Stephen (2013) confirm that digital play effectively enhances children's cognitive abilities. Research conducted by Plowman and Stephen (2013) proved that using digital tools for activities that combine logical problem-solving with sequencing and interactive tasks makes children more effective at reasoning and improves their memory function and attention span. Digital storytelling tools give students impressive chances to grow their language and cognitive skills. According to Siraj-Blatchford and Whitebread (2003), the cognitive development process requires storytelling applications to expand vocabulary while improving narrative abilities and creative thinking.

With proper implementation and designed digital systems, children experience accelerated mental growth. Young children benefit most when they use digital media that serves educational purposes while matching their developmental level and supports educational targets. According to Vygotsky’s Sociocultural Theory (1978), cognitive development happens through social interactions, and the conversation must occur within the Zone of Proximal Development (ZPD) for maximum success. According to Vygotsky (1978), children learn best by working with adults or peers with more knowledge than they do. Therefore, digital tools should afford users experiences in which they collaborate beyond person-to-person. Digital learning spaces that equip students with teamwork, problem-solving, collaboration, and storytelling activities will facilitate children’s better cognitive performance.

Interactive educational Technologies also allow students to work together on creative storytelling tasks, which enables them to become capable of logical Reasoning, critical thinking, and imaginative thinking (Siraj-Blatchford & Whitebread, 2003). Vygotsky's concept of social theory of learning provides young students with experiences to practice complex mental processes under the guidance of peers and adults and educational activities that come after this concept take place in these spaces.

Digital technologies offer such promising opportunities that they should enter early childhood settings as additions that support hands-on learning rather than substituting it. The Finnish National Core Curriculum for Early Childhood Education and Care dictates that teachers must integrate digital tools in sensory learning areas that help cognitive advancement. Digital media should be used to promote door 3 highlighted activities based on exploration, engagement, and creativity development.

What is needed concerning educators' teaching practice is formal training programs coupled with detailed procedures for implementing and altering digital teaching materials. Training elements that will strengthen educators' digital tool functionality and their ability to match the tools with the required cognitive developmental education requirements. As described by Donohue (2015) and Nikolopoulou, Gialamas, and Lavidas (2020), there is a general shortage of a professional development framework for educational professionals concerning ECEC staff development.

The Finnish education system's foundation policies are effective, yet it lacks the support necessary to implement digital technology in early childhood education practices. To achieve this objective, educational success shall depend on the creation of constructivist and sociocultural learning theories in digital learning environments that will enhance deep cognitive growth in young children.

1.2 Purpose and Objectives

1.2.1 Purpose

In the thesis, digital tools are explored for supporting cognitive growth for early childhood students while they learn at ECEC facilities. As our society moves further into digital transformation, educators must design educational methods that appropriately use technology instead of using tech equipment that lacks practical developmental benefits. The thesis goal focuses on creating educational strategies to help ECEC facilities implement digital storytelling platforms, gaming-enhanced programs, and interactive simulation systems designed to enhance problem-solving capabilities, boost logical reasoning skills and improve memory training results.

1.2.2 Objectives

The main goals of this thesis are fulfilled through two essential objectives that it incorporates.

The creation of an educational handbook will serve educators by offering specific methods for incorporating digital technology into early childhood educational spaces and promoting cognitive growth.

The development of an evaluative structure will support educators in selecting digital tools that match developmental needs and educational standards for skill enhancement.

According to thesis studies, digital technology has proven to be influential for early learning settings when properly implemented. Plowman and Stephen (2013) demonstrate that interactive digital learning tools, including educational apps and game-based learning platforms, have proven effective at strengthening memory and thinking capacity, along with the logical reasoning of young children. Digital learning tools give children meaningful hands-on learning experiences, fostering executive functions they need for school success.

The early childhood learning environment greatly benefits from digital storytelling applications, according to Siraj-Blatchford and Whitebread (2003). Interactive storytelling enables children to develop their literacy abilities while improving their language comprehension, which simultaneously builds their vocabulary knowledge, according to research by Siraj-Blatchford and Whitebread (2003). Children gain sequence skills and cause-effect understanding while developing imaginative abilities through digital narrative creation or engagement, which leads to overall intellectual development.

The foundation of this thesis analysis depends primarily on Piaget's Constructivist Theory (1952). Through first-hand environmental exploration, which combines scientific investigation and practical exploration, children gain maximum learning according to Piaget (1952). The appropriate implementation of digital technologies within learning spaces enables students to use new platforms for performing experimental types of learning. The digital tools would allow children to handle virtual settings while resolving multifaceted problems to receive prompt responses, which help build new learning according to constructivist principles.

The thesis acknowledges that digital technologies in ECEC environments alone do not guarantee positive developmental outcomes for children. Donohue (2015) presents evidence that shows how unsupervised technology use becomes more of a distraction than an educational asset because of insufficient educational planning. Educators need to embed digital activities into educational designs that connect each tool to particular learning objectives and developmental phases, as per Donohue (2015).

Young children naturally seek to understand the world through exploration, thus constituting a fundamental assumption for the thesis. Modern technological platforms benefit children's exploration when teachers use proper selection practices to identify appropriate platforms. Children gain important cognitive abilities through interactive digital entertainment activities because these activities allow them to develop their problem-solving skills, memory retention, creative thinking, and logical reasoning capabilities.

The thesis places primary importance on acquiring field knowledge for developing practical solutions that can work in real-world scenarios. Managers and educational professionals in workplace settings provide field data through consultation. Utilising personnel from practice helps maintain alignment between the project's guides and evaluation methods with existing ECEC workplace needs and standards. The successful implementation of final resources depends on the active involvement of practising educators who contribute their professional experience and practical expression that make the resources more adoptable.

The thesis serves dual purposes by adding to academic understanding of digital education practices in early childhood while developing operational resources for early childhood educators to improve child cognitive progress via meaningful digital experiences. Finally, this study is an effort to connect the academic theory with actual practices so that both professionals and academics could tackle the bigger picture of instructional methods and teaching digital cognitive skills to new students in the near future.

1.3 Role of Working Life Partner

Therefore, by focusing directly on realistic teaching environments in early childhood education, a working life partner has the central function of introducing digital tools at this stage. Providing such essential information on digital technology practice in ECEC contexts will inform the development of a structured practical educational guidebook.

The thesis calls upon the working life partner to form a strategic digital assessment, offer expert insight, and refine essential education procedures to ensure that the guidebook meets the real needs of educators. The working life partner ensures that thesis findings are connected to classroom practice, so theoretical concepts become practical teaching methods. The content of the thesis is validated by experts in the field to be in accordance with the Finnish National Core Curriculum for Early Childhood Education and Care.

This involvement ensures that the guidebook weaves the practical field experience into the academic knowledge to exist as was once said as a final product. With their input, the thesis results are practical and relevant, helping them to be useful in the proper utilisation of digital tools to promote effective child cognitive development by providing a structured and meaningful learning experience.

2 Theoretical Framework

2.1 Cognitive Development Theories in the Digital Age: A Finnish ECEC Perspective

The field of cognitive development today should mix existing developmental theories, what modern technology lets us do, and the teaching philosophies in early childhood education. The section looks again at the main cognitive theories by Jean Piaget and Lev Vygotsky, and it connects them to current trends in educational technology and the Finnish National Core Curriculum for Early Childhood Education and Care. Digital technology is examined for its benefits and any dangers it poses to Finnish early education's main principles: choosing, play, equality and being multilingual.

2.1.1 Piaget's Constructivist Theory in Digital Learning Environments

Jean Piaget says children learn the most by interacting with their surroundings and building new understanding as they interact with objects, other people and new thoughts (Piaget, 1952). Everything that happens during the preoperational stage (ages 2–7) helps children prepare mentally for the development of abstract thinking in the future. At this point, egocentrism, animism and entering perspective-taking happen with the help of dramatic play, visual arts and telling stories.

Apps like LogicLike and Fairytale Children's Books are good tools that match Piagetian principles when focusing on symbolic thinking and including interactive scenarios. They support children in organizing, arranging, and thinking logically, all important functions Piaget noticed in his research (Kamii & DeVries, 1993). This means that interactive story apps extend traditional play by helping children practice creating a story, selecting characters, and understanding cause and effect.

However, Fleer notes in their 2018 study that non-physical digital play differs from typical physical games because it usually eliminates touch and eye contact. According to Piaget, mental operations develop through working with concrete objects. Now, digital technology lets children work with abstract versions of those objects. This, combined with the prominent place of play in VASU, creates important issues for Finnish ECEC.

Consequently, teachers in Finland should encourage digital activities that remind students of exploration and help them keep a social aspect. Studies done in Finnish kindergartens (Sairanen & Kumpulainen, 2014) found that using digital tools together can reflect and build on the learning process described by Piaget.

2.1.2 Vygotsky's Sociocultural Theory and Digital Scaffolding

A main point of Vygotsky's sociocultural theory (published in 1978) is that tools such as objects and signs play a big role in learning, which occurs mainly as people interact. ZPD is the idea that the Zone defines the things a learner can perform alone rather than with assistance. With the help of scaffolding, learners manage to conduct activities in this zone until the skills are developed.

Khan Academy Kids and other digital tools give adaptive support, helpful learning routes and engaging tutorials, supporting children like scaffolds. In their study from 2014, Neumann and Neumann claim that when coupled with adult support, children can learn early reading and thinking skills. Even so, the role of the adult is still highly significant. The Finnish field believes that digital resources must work together with human guidance. In the classroom, educators join students in building knowledge by using technology-based materials as the foundation for dialogue, questions and thoughtful contemplation.

He pointed out that cultural tools play a significant role in shaping how a child thinks. Indeed, today, digital media are primary cultural tools that direct children's learning and inform how they communicate their identities, feelings and imagination (Marsh et al., 2015). Digital literacy is included in VASU in Finland as part of broader multiliteracy skills essential for democracy and cultural understanding.

Using digital reflections in the classroom, such as with portfolios or oral journals, makes it possible to engage in the reflective dialogues Vygotsky recommended. Heikka and Waniganayake (2011) found that such reflection activities help children grow their understanding of their thinking and keep them more involved in learning.

2.1.3 Application of Cognitive Theories in Finnish ECEC Practice

Finnish early childhood education is noted worldwide for placing importance on equality, children's well-being and their ability to participate in their learning environment. Piaget and Vygotsky are sources for Finnish educational practices, often shaped in more socio-constructivist and democratic directions. The VASU curriculum aims for learning to be complete, connected to several subjects and designed around play, so children can explore, be creative and ask questions.

Many Finnish kindergartens rely on pedagogical documentation to examine how children think. According to Vygotsky, scaffolding should be used, and according to Piaget, cognitive stages should be considered, all of which work well with developmental profiles in this approach (Alasuutari, 2014).

When adequately guided by dialogue and reflection, digital tools do not replace what people offer in the classroom. Valkonen, Kupiainen, and Dezuanni (2020) show that learning with tablets in daycare can encourage teamwork and various forms of literacy. They help children improve their thinking skills, socialise, and develop their sense of self and ability to act.

Most importantly, VASU encourages children to engage with digital materials rather than simply consume them. In fact, technology is most useful when it helps children notice and express their thoughts about their world. International research supports this idea, pointing out that early childhood should focus more on digital time spent with others rather than just 'passively' watching (AAP, 2016).

2.1.4 Role of Educators and Social Pedagogues

People working in Finnish ECEC, including social pedagogues, are essential to bringing cognitive theories to digital teaching. With lessons on child development, social-emotional learning, and digital ethics, tutors are equipped to organise education for all types of learners. According to Niemi and Kumpulainen (2020), Finnish ECEC teachers do more than teach; they take part in learning with children.

Social pedagogues make equity a priority when working on digital inclusion. They ensure that children from all kinds of social or language backgrounds use digital resources that fit their culture and growth, since there are increasing concerns about a digital gap affecting early education and the chance of widening current inequalities. (Livingstone & Helsper, 2007)

2.1.5 Critical Reflections and Challenges

Though cognitive development theories are helpful, their use in digital settings often faces some challenges. Although Piaget focused mainly on stages, he lacked attention to how cultural or technical advances shape learning, and Vygotsky's approaches worked well during his era before computers became so common.

People often think technology must automatically result in better learning, which is not always true. Clark and Mayer (2016) explain that making good use of technology depends on having a solid teaching strategy. The important thing for Finnish ECEC to do is ensure that digital devices enhance bonds, activities, and feelings instead of taking their place.

In addition, many digital resources are not built for children's development, focusing instead on memorization or fun instead of encouraging questions. As a result, teachers should judge the content, ease of use, and teaching approaches offered by digital tools, making sure they fit well with cognitive development principles.

2.2 Emerging Theoretical Perspectives: Integrating Digital Tools in Finnish Early Childhood Education and Care

Digital tools must be used in ECEC, supported by a strong theoretical structure that matches current teaching methods. In Finland, children are integrated using the VASU, the Finnish National Core Curriculum for ECEC, which highlights the focus on the entire development of children, encourages play-based learning, and helps children develop multiple kinds of literacy. Using technology in education, the TPACK and SAMR frameworks guide teachers so that technology supports learning outcomes and improves students' learning.

2.2.1 Technological Pedagogical Content Knowledge (TPACK) Framework

Mishra and Koehler (2006) developed the TPACK model, which suggests that technology integration in education results from understanding technological knowledge, pedagogical knowledge and content knowledge together. With this framework, educators in Finland can plan experiences using digital tools as part of their teaching.

For example, digital storytelling tools help young children gain language and storytelling skills. According to Merjovaara et al. (2020), using digital stories in Finnish ECEC centres encourages children's wider contributions and helps them build needed 21st-century skills such as teamwork and problem-solving. When digital tools match a teacher's learning objectives, the lessons become more valuable and engaging for students.

2.2.2 Substitution, Augmentation, Modification, Redefinition (SAMR) Model

Puentedura created the SAMR model in 2006 to assess how technology is integrated into education. It determines which level of technology use each case represents: Substitution, Augmentation, Modification, or Redefinition. Within Finnish ECEC, technology is often added to original activities and supports the creation of new ways for children to engage at the Augmentation and Modification level.

Interactive e-books are a great way to support traditional storytelling, adding media elements that help readers understand and practice multiple skills. The authors explore how digital-making activities in daycare centres help children participate in society and learn many types of literacy, similar to the Modification level on the SAMR model. Children learn to use technology and interact with each other as they create digital artefacts.

2.2.3 Multiliteracy in the Finnish ECEC Context

According to VASU, multiliteracy means students can understand, create, analyse and use many forms of media, including digital, visual and textual types. Digital tools in ECEC support

multiliteracy development by allowing children to work in various ways to present their ideas and thoughts.

In their study, Kumpulainen et al. (2020) show that digital literacy at home is connected to everyday family actions and promotes early literacy for children. Using these strategies in childcare, educators can maintain a connection between children's homes and educational environments.

Furthermore, using digital portfolios in Finnish ECEC helps children capture their learning moments by taking photos, recording sounds and using video. As such, it supports learning many kinds of literacy and motivates children to take charge of their lives and reflect on what is happening around them.

2.2.4 Phenomenon-Based Learning and Play-Based Pedagogy

Through Phenomenon-Based Learning, learners are guided to investigate concrete and interesting happenings from different subjects. Phenomenon-based learning is taught in Finland to support general understanding and help students develop critical thinking (Silander, 2015). The approach fits well with play-based teaching, which puts young children's curiosity at the heart of everything.

Using digital tools can help Phenomenon-Based Learning by offering interactive materials and various modes of information to encourage exploration and discovery. For example, tablets allow children to explore subjects they are interested in, look outdoors during field trips, and put together shows to display what they observe. Not only do these activities keep students interested, but they also improve their abilities to use technology and work well with others.

Proper planning and educators' help are needed to make Phenomenon-Based Learning work with new tools in preschool. The Finnish National Agency for Education (2022) pointed out that the learning environment should help children progress, learn, and interact by incorporating both real and digital resources that invite creativity.

2.2.5 Practical Implementations in Finnish ECEC

Several initiatives have been developed in Finnish ECEC centers to integrate technology with educational aims. In the "Lukuinto" project, digital stories and a variety of multimedia resources increased children's reading engagement. The initiative revealed how technological resources can be used to help children learn languages and appreciate reading.

It is now common for Finnish ECECS to use digital portfolios, which allow educators to save their children's development journeys and let everyone involved see them. This way of learning builds multiliteracy and encourages us to think about what we learn.

Teachers in Finland attend continuous training to gain new knowledge and abilities in and about technology and teaching. Training teaches staff to link their teaching ideas to digital tools and consider the children's developmental needs in their classes. With this help, integrating technology in ECEC is done purposefully, with actual impact and keeps up with what children require.

2.3 Neuroscientific Foundations: Brain Development and Digital Interaction in Early Childhood

These days, neuroscience is telling us much more about how digital interactions shape children's mental and neurological growth. Many findings suggest that digital tools designed for children can strengthen neural networks connected to attention, language, and planning skills and strengthen memories (Christakis et al., 2018; Hutton et al., 2019). Thanks to these findings, educators can build digital learning tools that fit the principles of the Finnish early childhood system, which supports full development, equality, and play.

2.3.1 Brain Plasticity and Early Childhood Learning

Brain plasticity is at its highest in the early years, so children’s brains respond powerfully to their surroundings. According to Tierney and Nelson (2009), young children's experiences help shape their brains and touch many areas like thought, language, feeling and interaction with others. Early childhood is the main time when many neural links form quickly, only in the brain's parts responsible for complex thinking.

When planned well, digital actions can benefit children in this situation. When children use sorting tasks, story games, or digital puzzles, they activate brain areas that contribute to working memory, how flexibly they think, and their ability to control their actions (Diamond, 2013). These executive skills are important for children to succeed and adjust easily to school.

The kind of digital interaction is essential. Based on recent research, children learn to communicate and focus less if they watch many videos in a row without interacting or being guided by an adult (Madigan et al., 2019). Apps that need the child to engage, think, and interact have produced better cognitive results, especially if the adult and child pay special attention to the app at the same time (Hirsh-Pasek et al., 2015).

2.3.2 Neuroscience-Informed Digital Design: Focus, Repetition, and Reward

This thesis explains that the design of the digital guidebook follows neuroscientific guidelines for early learning. To help with learning, the activities in the guidebook are skillfully designed to support children’s ability to remember information for extended periods and increase communication between brain cells (Thomas & Knowland, 2014).

During early childhood, repetition teaches children lessons much more easily, because that is when our brains are best suited to learning by repetition. According to some studies, regularly working with educational materials can help preschool-aged children learn language, word sounds, and basic math (Zosh et al., 2017). Thanks to these apps, students can revisit the same story by experimenting with the order of the scenes, altering the characters or describing the plot themselves.

Neuroscience has also found that learning linked to rewards enhances memory and attention. If children earn points or manage to reach a goal, dopaminergic pathways are started in the brain (Howard-Jones, 2014). Appropriate encouragement this way can help students stay involved and determined, which is useful for developing executive functions.

2.3.3 Executive Functions and Digital Interaction

Working memory, inhibition, and cognitive flexibility (Executive Functions) are needed for both academic progress and managing behaviour around others. The initial growth of these functions can be encouraged by giving children fun activities that require attention for some time. Blair and Raver (2015) reported that students' Executive Function skills are better predictors of early accomplished results in math and reading than just their IQ.

Applying logic games, sequencing and sorting tasks, and language-learning apps, along with stepped guidance, benefits a child's Executive Functions. The digital service LogicLike supplies games suited for each age, challenging children to use methods that grow trickier over time and stop making fast decisions, both signs of good executive functioning.

Developing executive function is part of the overall care for Finnish young children. The VASU curriculum is designed to help students learn emotional control, self-reflection, working well with others, and thinking. So, digital tools are needed in teaching as part of a planned approach that helps students develop these skills together and interact socially (Finnish National Agency for Education, 2018).

2.3.4 The Role of Metacognition and Reflective Practices

Recognizing metacognitive awareness is one of neuroscience's greatest effects on teaching and learning. Although young children are just learning about thinking about their thinking, well-structured activities can help them along. Whitebread et al. (2009) reported that asking children as young as four can help them become aware of their learning actions.

The guidebook offers reflection lists and exercises for teachers and children to complete to support this. These activities help children remember what they experienced, how it made them feel, what difficulties came up, and how they might have dealt with them differently.

Reflective activities also help children increase their ability to control their emotions, think, and plan, all of which are tied to better results in school and social life (Berliner, 2011).

Since reflective pedagogy is part of everyday life in Finland, tools that encourage conversations support the purposes of early childhood education. Educators frequently rely on pedagogical documentation to share what children think and encourage them to talk about their progress (Formosinho & Formosinho, 2012). When combined with digital portfolios or visuals, recording such information helps children better remember themselves and what they have learned.

2.3.5 Aligning Neuroscience with Finnish ECEC Policy

In the VASU framework, ensuring all children grow in their minds, feelings, bodies, and with others is especially important in any kind of learning environment. Neuroscience supports this integrated model, showing how the brain's systems are related and that learning should be enriched by multiple senses and emotions early on.

Besides, Finland realizes that all learners, especially those with special education needs, have a right to equal use of technology. Digital learning environments that follow neuroscience can support children with difficulties paying attention, learning language or managing executive functions by adjusting learning to their individual stages of development (Kirkorian et al., 2016).

2.4 Critical Perspectives and Equity Considerations in Early Digital Learning

Digital technology integration in early education has considerable potential, yet examining the topic using equity, ethics, and inclusivity is important. According to scholars and policy experts, digital tools can widen current inequalities in education and society if they are not applied with intention (Livingstone & Helsper, 2007; Warschauer, 2003). Adhering to the emphasis in the Finnish National Core Curriculum on equality, access and full support for all children, this section discusses important aspects of equity in early digital learning.

2.4.1 The Digital Divide: Access and Infrastructure

The digital divide means that some groups do not use digital technology because of their economic status, place of residence or where they learn or work. It is shown by frequent research that children in low-income families do not have ready access to good electronic equipment or high-speed internet (Chaudron et al., 2015; OECD, 2021). Not having access may negatively influence how well children develop digital skills and join in digital learning.

To tackle these different challenges, the guidebook this thesis discusses focuses on using low-cost or free educational apps such as Khan Academy Kids, PBS Kids, and RV AppStudios. Many of these are available offline and do not use a lot of data. Where there is little or unstable

access to the internet, using apps offline becomes especially important, both in Finland and around the world (UNICEF, 2020).

Moreover, the VASU (2018) policy requires that each child have equal opportunity to learn. Helping all children have access to digital resources through inclusive financial access follows this policy directive and SKILL 4 of the United Nations Sustainable Development Goals, which is focused on inclusive and equitable education for everyone.

2.4.2 Cultural Equity and Representation

Fair digital learning should be culturally inclusive. Since most digital applications come from a Western point of view, they do not always support children with minority, immigrant or multilingual experiences (Yelland, 2011). As a solution, the guidebook recommends tools that support multilingual options, present a wide range of cultures in their characters and include globally focused content. Let us say a child is using Lingokids or Endless Alphabet. These apps let you change the interface into different languages so the child can learn in their home language and Finnish.

It follows the Finnish curriculum goal of children keeping and growing their own languages and cultures. VASU (2018) states that a child's linguistic and cultural background should always guide teaching offline and online learning.

2.4.3 Educator Digital Literacy and Inclusive Pedagogy

In addition, the level of digital expertise among teachers is significant. According to Ertmer and Ottenbreit-Leftwich (2010), much technology is available, but teachers are not always ready to use it meaningfully. In early childhood environments, where decisions are closely linked to the needs and interactions of children, a lack of staff confidence in technology can make it hard for all children to use technology the same way (Plowman & Stephen, 2005).

Accordingly, the guidebook gives step-by-step instructions, illustrations, and simple language to assist educators at any level of digital experience. In this vein, new evidence from Lindhal and Folegsson (2012) shows that strong development and access to resources are needed for educators to be active learners and partners along with children and avoid merely watching.

As a result, the program supports collaborative learning, requiring educators to facilitate and improve children's education. This guidebook can benefit every educator and potentially lessen gaps in digital learning.

2.4.4 Ethical Use of Technology in Early Childhood

Ethical problems linked to what children watch, how much time they spend on screens, and their data privacy are most relevant in early learning contexts. Based on its recommendations from 2016, the AAP (American Academy of Paediatrics) fears the negative consequences screen exposure can have on attention, sleep and the emotional development of children. Using digital media should be done carefully, for a limited duration and as part of activities guided by a relationship with another learner or teacher.

For this reason, the guidebook promotes guided and intended use of digital resources. Among other duties, educators help guide their children, ask questions, and work together to explore digital resources. This also fits with "joint media engagement," which studies have found can both increase learning success and help limit problems tied to watching media alone (Takeuchi & Stevens, 2011).

Essentially, this guide advises selecting the right content, protecting digital health and using data privacy, agreeing with the Commission's recommendations for children online (European Commission, 2021). These guidelines fit with the ethical ideas behind the Finnish curriculum, which focuses on the happiness, safety and democratic education of children.

2.5 Implementation Frameworks

Standardised pedagogical frameworks are used to develop and create a high success rate of Effective digital technology. The TPACK model by Mishra and Koehler (2006) describes successful digital teaching as a process that depends on three (3) fields of technological expertise and teaching methods. According to Hsin and colleagues (2018), proper implementation of scaffolded digital inquiry states that it is built on higher-order intelligent skills. Further, these approaches must be adjusted according to local cultural and institutional requirements based on the Finnish National Core Curriculum's (2022) principle of technology usage.

Digital play pedagogy (Arnott, 2016) reveals a concept that offers a valuable framework for early childhood surroundings. Digital instruments serve as cultural objects that children can use to develop their cognitive abilities and social and emotional growth. Skilled educators have proven that open-ended digital play activities lead to creativity development and problem-solving abilities, according to research by Bird and Edwards (2015).

2.6 Future Research Directions

Research has delivered worthwhile findings, but further knowledge gaps persist. To study the cognitive effects of long-term digital tech use during early childhood development, research must follow children through time. The quick advancement of virtual and augmented reality

technologies requires active research to understand their impact on human development. Studying digital integration across different cultures would create opportunities to develop insights about practices that respond well to cultural variations.

3 Output

3.1 A practical guidebook for educators

The main thesis output features a practical guidebook for educators that functions as an educational and practical tool for ECEC educators who serve young children. The guidebook encourages digital integration methods that enhance children's cognitive development and follow the educational guidelines of the Finnish National Core Curriculum for Early Childhood Education and Care (2022).

The practical guidebook for educators provides teachers with structured curricular digital activities that foster problem-solving abilities, logical thought processes, memory retention, creative thinking and collaborative work. A working life partner from a Finnish international kindergarten, along with developmental learning theories, supports the content development, which follows the curriculum guidelines. The lessons follow developmentally appropriate principles, making them pedagogically strong tools that work well across all early learning settings.

3.2 Selection, Design, and Implementation Process

The project to create the practical guidebook for educators evolved from the identification of a working-life need for structured early education digital integration. Discussions with our working-life partner revealed that there are no clear digital resources that support child cognitive development at various developmental stages.

3.2.1 Stakeholder Collaboration

The working life partner demonstrated a first-hand understanding of present educational tools and staff members' teaching difficulties.

The initial framework's foundation relied on a digital pedagogy thesis concerning cognitive development, together with national curriculum goals, which the teachers used to align lesson content.

3.2.2 Design and Pilot Phase

The activities underwent multiple modifications aimed at enhancing usability and adherence to the memory domain logic and creative thinking domains.

3.2.3 Implementation Strategy

The final presentation contains versatile provisions for classrooms that use different devices and specific accessibility adjustments and add-in features for non-digitised contexts when needed.

The educational platform provides teachers with a structured procedure for selecting tools, which helps them deliver effective lessons while performing reflective assessments that work well in various teaching settings.

3.3 Collaboration with the working life Partner

This thesis was carried out in partnership with a private international kindergarten. Once the authors discussed the study's aim, the kindergarten supervisor allowed the authors to assemble a digital guidebook complete with recommended educational apps. The supervisor agreed that the chosen apps concentrated on helping children with cognitive development.

Being part of a private kindergarten meant authors could pick apps that fit best. However, educators say that apps should be designed to improve memory, logic, problem-solving, and creativity. In partnership with the kindergarten supervisor, we investigated different apps and selected the ones that fit our goals for children's brains.

Children aged 3 to 6 became the leading group for the activities. During the testing phase, the group teacher demonstrated the apps he had chosen during real classroom sessions. We want to see the children learn, record their reactions, and observe their interest in the apps.

As part of testing the "Puzzle Quest" app, the teacher had the students solve digital math problems guided by the teacher. We found that children's abilities to focus, work together, and reason logically improved. Following the teacher's input, we simplified some parts of the guide and provided ideas for children to work together with other children.

In general, having a working life partner meant we got helpful feedback throughout the process. Teachers were given suggestions for timing their activities, working with groups of students and connecting digital experiences with learning things in the classroom. With their aid, the guidebook was made to be easy and valuable for other educators to use.

3.4 Guidebook

The guidebook is structured around two primary methods.

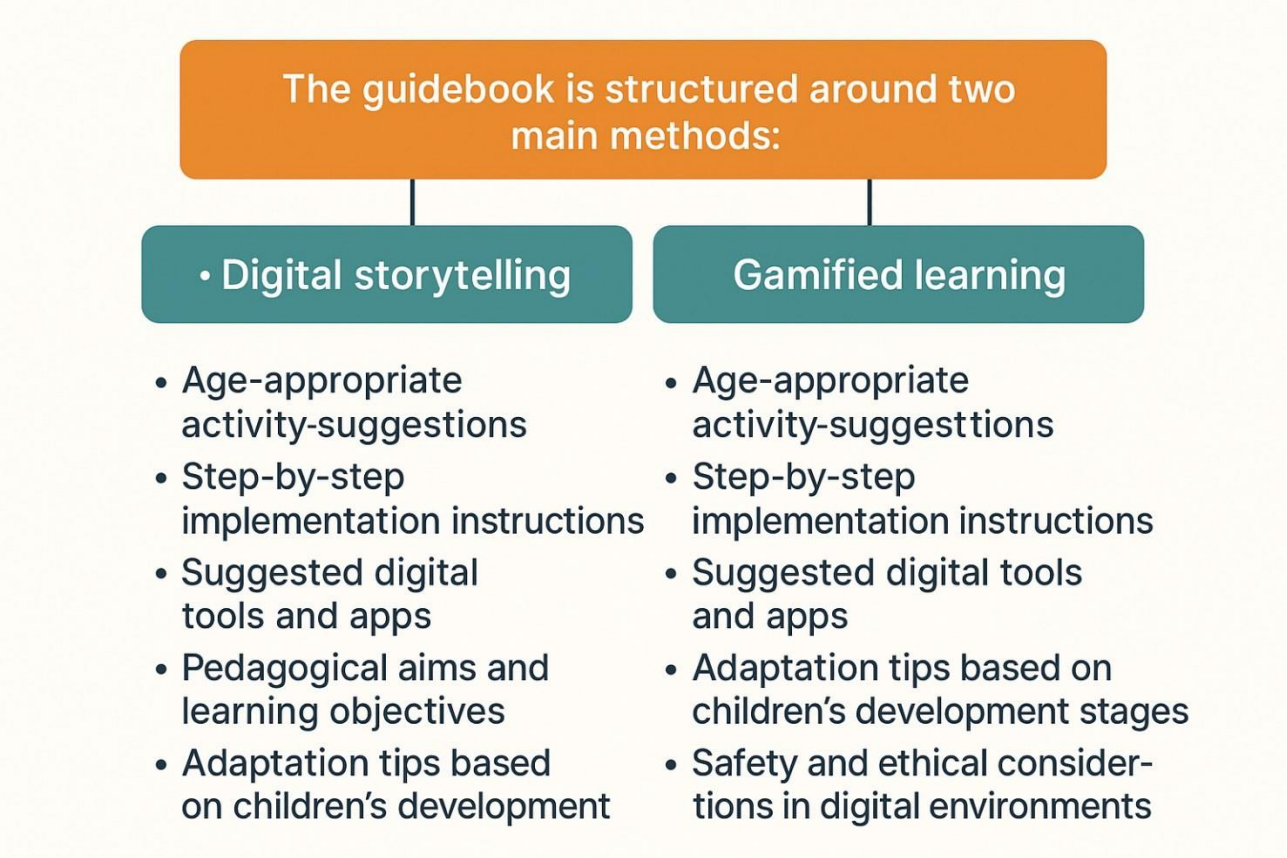

Figure 1. The guidebook structure

The practical guidebook for educators consists of three main divisions, each offering structured content on selecting and evaluating instructional materials.

3.4.1 Digital Cognitive Learning Activities

The program provides a complete, ready-to-use curriculum with digital storytelling components, gamified challenges and interactive group projects (Plowman & Stephen, 2013).

The planned activities in the practice guide teachers to align educational content with development targets and teaching objectives that develop students' logical thinking abilities while teaching digital skills and promoting social teamwork through purposeful digital activities (Plowman & Stephen, 2013).

3.4.2 Digital Tool Selection Framework

A structured tool evaluates and selects digital instruments which match both pedagogical purposes and educational stages of cognitive development.

Choosing digital programs for students should not fall only on one teacher's shoulders. Since it gives support through its tools and rubrics, this guidebook exists to assist instead of forcing someone to work alone. The decision on digital tools to use should be made by the members of the institution's leadership or specially designated educational coordinators. In this way, chosen apps meet guidelines from public and official sources, are of the same quality and reflect beliefs about teaching and learning shared among teachers. Educators can use the guidebook for guidance, but the organisation's job is to ensure every classroom benefits from fair, strategic and appropriate digital learning.

3.4.3 Lesson Implementation Guide

The templates include every necessary lesson component, from learning objectives to preparation steps, activity guides, resources, and duration requirements.

The classroom activities can adjust to multiple educational settings, helping teachers manage co-teaching and small groups and combine digital and corresponding content.

3.5 Impact on Digital-Based Guidebook

The digital-based guidebook provides an essential strategic transformation within early childhood education methods. The guidebook establishes a systematic approach through research evidence, teaching educators methods to implement technology integration successfully. The organised way of conducting things matters most in ECEC settings because they need to balance development appropriateness with engagement. The guide uses LogicLike and Khan Academy Kids digital applications while linking them to learning objectives to ensure technology functions within defined pedagogical purposes. The mobile application design enhances the guide's functionality because teachers can easily access it in classrooms, thereby they can adjust their lesson plans and perform reflection evaluations.

This digital guidebook displays responsive features and flexible capabilities that make it attractive. It works for all teaching staff regarding digital experience levels while establishing a standardised, evidence-driven application process. Many teachers doubt which digital devices meet child development guidelines while attempting to link virtual resources with conventional educational approaches. This guide resolves such worries by presenting examined educational activities and assessment instruments. The guide applies instructional techniques that stem from educational research and contemporary educational theory, especially in active learning domains and constructivist approaches (Piaget, 1952; Vygotsky, 1978). The systematic system

creates beneficial digital learning conditions that reduce unproductive screen time while making each digital interaction valuable for cognitive learning.

The guide helps create an environment where staff members should both reflect on and evaluate their work. Staff need to adopt the implementation of digital tools and evaluate their success rates. Post-activity checklists with the system are assessment tools to help teachers improve their practice. Digital tools gain intentional meaning within ECEC, so they replace their role as mere entertainment to become core elements in cognitive learning curricula. Staff are then able to help one another, as it stimulates discussions. Therefore, the professional learning community improves by using instructional techniques.

3.6 Positive Impact on Digital Literacy and Gamification in Pedagogy

It directs early childhood educators to grow digitally competent. It simplifies the implementation of technology in teaching due to various factors. Therefore, educational professionals who do not have experience with technology education need to have mastery of digital skills to implement digital tools in their teaching practice. The guide is a bridge, teaching the teachers through structured activities, usage tips and detailed explanations to develop their skills. Teachers have mastery of only a limited app selection. It leads to the application of chosen applications, which increases teaching effectiveness and stability.

Gamification is promoted by the guide as its key component, which promotes student participation and provides for different types of learners. LogicLike is a game platform that aids in developing students' problem-solving abilities by highlighting identification patterns with logical reasoning. These platforms attract students because they use the application of rewards, tracking elements and level design to teach basic cognitive skills, which students should be able to master. Teachers are aided in recognising these learning mechanics and applying them in the field of education with skill.

At the pedagogical stage, the guide adopts constructivist teaching methods, allowing students to learn through practical experiences under the guidance of active curiosity. The guide enables children to participate actively instead of passively receiving knowledge through its implementation of digital storytelling together with gamified simulations. The benefits of social interactions during learning increased through adult input and peer involvement (Vygotsky, 1978, p. 80).

Through the guide, educators gain better skills to personalise instruction. The child's progression rate allows digital tools to deliver immediate feedback, which helps teachers personalise their instruction methods. Digital literacy among teachers develops positively due to this guide's user-friendly interface, as in Nikolopoulou et al. (2020), and the resulting growth of teacher self-efficacy and mindset.

3.7 Impact on Child’s Cognitive Development

The leading benefit of this guidebook emerges from its direct assistance in the cognitive development stage of 3–6 6-year-old children. The digital tools used in the guide have specific purposes that match children's developmental stages and help build necessary cognitive abilities. The games from RV AppStudios, as opposed to Fairytale Children's Books, aid children in developing their sequencing abilities and number sense capabilities, enhancing their narrative skills alongside symbol interpretation.

These activities encourage children to actively use digital tools, which develop their memory skills, attention span, executive functioning skills, and critical thinking abilities. Activities involving prediction tasks, logic puzzles, and story sequences present children with complex opportunities for cognitive development. According to Piaget’s theory (1952), the activities match genuine problem-solving tasks, which leads to early childhood cognitive development.

The guide prevents learning from becoming limited to digital platforms. These educational tasks contain conclusion segments that link students' virtual communications to larger educational environments. Educators use this reflective cycle to track student development and step in when needed so they can provide suitable support for all children.

Through its implementation, the guide helps reduce potential dangers from free digital exploration. The approach uses meaningful digital tasks to guarantee that digital screen use maintains equilibrium by engaging and intellectually stimulating. The guide presents an ethical framework for digital learning practices that matches the Finnish National Core Curriculum for ECEC (2022) requirements regarding integrating digital activities for fostering creativity alongside play-based learning and collaborative efforts.

3.8 Exploration of Child’s Curiosity in Early Learning

The instinct to learn in young children develops from their natural curiosity. The guide adopts this inherent quality through its tool recommendations, which facilitate exploratory activities, open-ended questioning, and creative problem-solving. National Geographic Kids introduces real-world phenomena through easy-to-understand formats that interest children in animals’ nature and science. Children utilise these platforms to learn beyond memorisation because these platforms support inquiry-based learning methods.

The instructional resource shows how teachers should start the investigation using digital tools. Stories or apps are presented to children, and they then ask questions (or ask more questions), draw what they were presented with, or participate in role-play activities pertaining to the material. The dual approach to education is the electronic search combined with practical engagements, helping to cultivate mental and emotional interest for learners.

Observing the activities of students who are actively interested in what they are doing leads the teachers to recreate the additional lessons based on these findings. The adaptive method ensured that educational activities were carried out by the students and maintained their interest in continuing the activities. It is a source of motivation to be taken into the digital content that is a final point, but is a source to launch into more profound learning experiences.

Through its open-ended education and using the student's curiosity as a point of departure, the guided digital learning framework supports the open-ended education system. Its design makes computers an adaptive environment that can serve as an educational tool and lets children explore the world of questions and discovery.

3.9 Overall Benefits of the User Guide

It is a daily teaching tool that combines theory with practical applications and technological elements into one resource, the user guide. This guideline continues in its structured form, with easy accessibility and appropriate development level approaches. The guide gives educational staff certainty about digital integration that is provided with standardised research-based methods combined with selected educational tools and adaptable evaluative frameworks. It is a daily teaching tool that combines theory with practical applications and technological elements into one resource, the user guide. This guideline continues in its structured form, with easy accessibility and appropriate development level approaches. The guide gives educational staff certainty about digital integration, providing standardised research-based methods combined with selected educational tools and adaptable evaluative frameworks.

Following Finnish national curriculum guidelines ensures that the position aligns with national priorities and provides quality assurance for ECEC services. A guide of interactive but purposeful digital or non-screen activities that promote ethical technology practices can be achieved. The measures ensure children's welfare and improve their academic achievements.

There is a ready-made structure that helps educators implement and evaluate the work. With just the application format, users can access the guide anytime, anywhere, adjust lessons instantaneously, and quickly review the day's activities. The guide is continuously used by teachers to become more flexible, reflective, and innovative.

Guidelines provide support for the systematic betterment of digital teaching methods. When teachers start using this approach, they will collectively promote a common language and expertise of the digital methods in use at early childhood education facilities, thus making improvements to curriculum-based learning more consistent. The guide makes teaching more instructional due to the development of teachers' instructional knowledge and digital literacy.

This guidebook is more than a simple digital resource collection because it is a learning tool, ethical framework, and professional advising system. Thus, the tool helps the early childhood instructor purposefully and safely use technology; each interactive component is oriented toward a complete learning development goal for young children.

3.10 Methodology

This thesis adopts the developmental methodology to create a research-based director for early childhood teachers. It is based on building pedagogical concepts, recognised best practices, and curriculum standards into a working methodology that uses digital technology to develop children's cognition. I thought the development of the guidebook focuses on theoretical alignment, working upon what are already the primary problems faced by ECEC educators in the context of daily work practices.

The idea of the guidebook is designed mainly out of two main educational theories, which are Jean Piaget's work and also draws from Lev Vygotsky's work. Both Piaget's constructivist theory and Vygotsky's sociocultural theory validate children's active learning practices during ages 3–6, and Vygotsky's sociocultural theory argues that social interactions are necessary for guided learning. Based on these selected theoretical points of view, digital tools that foster the exploration and collaboration of learners with cognitive activity were selected—the research of Nikolopoulou et al. Vygotsky (1978, pp. 85–86), particularly on the side of digital literacy in early education, particularly regarding training and bolstering the confidence levels of the educators, helps structure and focus the guidebook.

Following national educational standards is guaranteed through the Finnish National Core Curriculum for ECEC (2022) as the reference framework on which the guide is based. It teaches students online ethical awareness and developmental play learning methods, which aim to help the child progress in all aspects. Evaluations on developmental appropriateness and user engagement for all digital tools contained in the guidebook: LogicLike, RV AppStudios, Khan Academy Kids, Fairytale Children's Books and National Geographic Kids, and on the aspects of cognitive skill promoting and accessibility. It includes the list of applications, which were recognised for their ease of use and also factual scientific purposes. LogicLike and RV AppStudios help support the children's logical reasoning and numerical abilities, as National Geographic Kids helps develop curiosity through inquiry-focused multimedia content.

The thesis design adapted a methodology to connect identified educational targets in cognitive development with interactive digital activities. The tasks which built a child's memory, attention, sequencing, problem-solving, and early reading skills were linked to the chosen applications. The tasks had been designed especially for the children to keep their interest, while being too easy to use and allowing them to explore their learning while reflecting and deciding. Because teachers efficiently use the provided format from the guidebook to introduce

digital lessons, the teachers can integrate digital lessons while doing daily class activities without using more technological knowledge.

One side includes using evaluation instruments and tools for reflection, which are both important. Likewise, reflective worksheets and evaluation checklists are educational resources that facilitate teacher analysis of program activities' performance. Teachers can also use these tools to track students' emotional and cognitive responses and additional methodological changes to promote development and follow student growth throughout the year. The practice of reflection facilitates educational development of both individual teachers and entire classrooms through continuous assessment procedures. The mobile application format for the guidebook emerged as part of the strategy for developing the methodology. The guide's presentation in mobile application form allows teachers to access this resource at any time in any teaching context, including during lesson time, planning sessions, or during children’s interactions. The resource is highly usable in a mobile format, providing sufficient capacity to accede to a high-speed ECEC operational environment. It has a basic, user-friendly interface and structured step-by-step activity instructions for users of all technology backgrounds.

Ethical factors strongly influenced the development process of the guidebook. The increasing worry about excessive screen use by young children has led this project to promote quality digital engagement rather than prolonged screen time. App developers received directions to select programs which supported interactivity and creativity, together with educational content, while programs that served as diversions were not to be added. The activities operate under scheduled times with physical or spoken follow-up steps, which help students balance technology-based learning against face-to-face classroom experiences.

The methodology selection happened because it allows researchers to immediately apply research findings to educational classroom settings. The thesis converts previously published research findings into an implementation guide that teachers can utilize without further experimentation. Through this approach, researchers build an academic-theoretical to educational-practical connection. The final guidebook product merges research foundation with functional capabilities and adaptability to match the evolving wants of early childhood educational needs.

The methodology promotes the structured, ethical, and pedagogically validated deployment of digital tools, which helps develop young children's minds. The guidebook reflects the practitioners' deep commitment to implementation while aligning with developmental principles and providing teachers with the freedom to enhance their performance, thus creating an effective and theoretical resource for educators in the early childhood classroom.

3.10.1 Helping Students Learn by Using Digital Technologies

The guidebook shows educators how digital devices can support active learning, help students gain new skills and get involved. The lesson plans encourage teachers to guide children in activities that train their minds, help them interact and foster personal progress.

A significant approach is asking questions without simple answers. Teachers should ask students, “What will happen next in the story?” or “How did you work out that challenge?” Asking these questions helps children explain their thinking, reflect on their lessons, and improve their communication and thinking abilities.

It mainly highlights two kinds of digital learning: storytelling and games. Children use these apps to build language skills, creativity, and memory as they design and tell their stories. Children who solve puzzles or complete tasks on a screen learn and develop better attention, logic, and persistence.

Educators are advised to observe and help students during online activities simply. In other words, please pay attention to their interactions with what you are doing, help when necessary and make changes according to how each child responds. Screen time becomes part of a structured learning process by using these tools in education instead of stopping there. As a result, the guidebook supports technology in early education to foster thinking, learning and creativity by using stories, games and teacher guidance.

4 Reliability, Ethical Considerations, and Evaluation Plan

4.1 Reliability and Ethical Considerations

This development-based thesis must be proven reliable to be academically valid and practically worthwhile. Instead of conducting empirical fieldwork, the study draws its findings from peer-reviewed research publications, established theoretical models, and national curriculum standards. The thesis analyses multiple reliable academic findings to support its digital technology integration recommendations for early childhood education.

For this, the thesis incorporates important theories from learning, including Piaget's (1952) constructivist framework and Vygotsky's (1978) sociocultural model, combined with modern research such as Plowman and Stephen (2013) and Siraj-Blatchford and Whitebread (2003). These conceptual and educational research-based frameworks supply substantial educational information on how children's minds grow and how young children develop through digital media, and how technology helps children's early learning settings. The research links its findings to the present educational requirements of the country based on the Finnish National Core Curriculum for Early Childhood Education and Care (Finnish National Agency for Education, 2022).

Bearing these perspectives in mind, we devised this thesis strategy with many sources of information and cross-validation methods to establish the credibility and dependability of the study. The first two used multiple educational standards to validate information, then reduced bias, which made the practical application of theory-based recommendations possible. Continuous validation gives researchers confidence that their findings are built and applied to the needs of those who work with early childhood students in various practical settings.

Because the target participants for this thesis are young children who have to be protected, the thesis considers the ethical implications equally important. Wholly, the right to protected meaningful development-based learning as a foundational ethical standard is upheld by this study. The ill use of digital technology makes them face such risks as they become physically disconnected, experience sensory overload, and receive mindless content. Researchers through this thesis pronounce on interactive electronic activities as opposed to feature stationary screen use to promote learning opportunities that encourage interaction to facilitate creativity, problem solving, and conciliation.

This thesis has selected digital tools and strategies that align with the ethical best practice of early childhood education that nurtures the emergence of the entire child's capabilities. The guidelines stipulate that the selection of entertainment-based digital applications actively discourages the selection of such applications because they can hinder the physical, social, and cognitive development in children. Through selection processes for technology, emphasis

is put on the educational and ethical responsibilities while focusing on improving thinking and active exploration and cognitive stimulation.

Ethical commitment is evident in the practice of child-centred methods regarding dealing with the different developmental stages of the learners. Whatever strategies or tools are discussed in the guidebook are subject to the children's autonomy and agency, and therefore take precedence over all strategies and tools to develop children's readiness to learn. This thesis adopts national ethical standards in early childhood education because it guarantees the positive contribution from these strategies in the children's development activities while ensuring their safety and social welfare.

This thesis aims to create an educational resource that interfaces reliable methods that are designed appropriately and ethically oversee processes well.

4.2 Evaluation and Assessment Plan

Several assessment methods were developed to demonstrate the theoretical strength and practical implementation capabilities of this book, which resulted from this thesis. The evaluation procedure features several stages to verify both the scholarly importance and readiness to be used operationally for the product in early childhood education.

In examining the first stage of its evaluation, the conceptual basis of the guidebook is considered. An analysis of learning theories and recent research evidence takes place across all the recommendations and strategies made, in order to achieve a thorough evaluation. Studies such as Piaget (1952), as well as Vygotsky (1978) and Plowman and Stephen (2013), provide supporting studies for the evaluation process to validate the recommendations of digital practice grounded in developmental and educational psychology.

The second evaluation phase establishes if the guidelines fit Finnish educational standards. The leading authority in verifying that the guidebook guidance tracks the national educational objectives is the Finnish National Core Curriculum for Early Childhood Education and Care (2022). The integration process is designed to fit with Finland's child-centred core principles, whereby the child learns through play-based learning, emphasising child-centred pedagogy and active exploration.

Theoretical evaluation and policy considerations are followed by practical feasibility testing on the guidebook. This evaluation checks whether these digital integration approaches can be practical in standard ECEC settings.

Key evaluation criteria include:

- Easy to Use in Everyday Classroom Activities

Digital tools should have simple features that enable teachers to integrate them without modifying their teaching methods.

Affordable and Easy to Get

The digital tools must be inexpensive so every institution within this sector can afford them while staying easily implementable for staff.

Works for Teachers with Different Technology Skills

All educators should find these digital instruments easy to use regardless of their technical skills range.

Different early childhood centres can implement these tools

These digital tools must function efficiently throughout different types of child care facilities, regardless of size and location.

4.2.1 Feedback and Reflections from the Working Life Representative

The perspectives of the working life representative guided much of this thesis's outcome. A senior educator at a private international kindergarten was involved from start to finish in planning and piloting the lesson plan book. Their knowledge ensured the guidebook was applicable and appropriate for real early childhood programs.

From the early stage, the representative pointed out a central issue: schools often do not offer easily accessible support and helpful tools to teachers using digital applications in their teaching. This made it clear that we needed a guidebook that was both organized and easy to follow. They added that many teachers rely on apps mainly for entertainment rather than for supporting learning. With this feedback, we decided to help parents encourage learning instead of just using screens.

After using a few activities from the guidebook with students, the representative offered feedback in writing and person. Teachers observed that the lessons were well written, easy for students to follow at their level and understandable. They were very pleased that the program offered challenges, storytelling and encouraged teamwork. The representative said that including these elements helped children become more engaged and good at communication during tasks done on the computer.

Among the feedback, the developers suggested adding time estimates for assignments and a more detailed description of teachers' roles during the digital parts of learning. These points were discussed and added to the official version of the guidebook. By joining forces, we were

able to make the result both academically solid and helpful for early childhood educators. Having reflected, it became evident that having ongoing communication with working life partners benefits educational research. As a result of teacher feedback, the guidebook became a valuable tool for everyday classroom work.

5 Conclusion

This thesis has explored the ways that digital tools can be used in early childhood education, mainly to benefit the cognitive development of children between the ages of 3 and 6. Considering Finnish early education, the study looked at digital learning and its benefits and challenges and created a guidebook based on development theory, national curriculum and the experiences of educators in private kindergartens. As technology steadily enters our schools and classrooms, the main question we explore is not about using them but how we can use them correctly, fairly and in a way that benefits students.

5.1 Bridging Theory and Practice

Exploring classical and contemporary ways of thinking about child development is central to this project's focus. Using Jean Piaget's idea, the guidebook highlights learning by engaging with activities, building new things and using logic. Tasks in the guidebook, such as making digital stories and playing games, involve children doing activities that use symbols, try out new ideas and solve problems, all closely connected to Piaget's preoperational and concrete operational stages.

The thesis also makes use of Lev Vygotsky's sociocultural theory, which places a key role for language and interaction with others in child development. With Vygotsky's ZPD as the guide, the digital activities support teamwork, supervision and assistance between students and teachers. Apps that have stories and sequencing tasks encourage children to discuss and explain things to each other, and teacher-guided conversations help the learning stay suitable for them.

Also, the design of the guidebook has been enhanced based on developments in educational neuroscience, especially regarding how attention, memory and cognitive flexibility play a role in learning at the beginning of education. According to research, children's use of interactive apps can promote development in the prefrontal cortex, strengthening executive functions (Diamond, 2013; OECD, 2021). With regular repetition, feedback and rewards in the lesson plans, the guidebook uses children's brain flexibility to remember things for extended periods.

Importantly, the theory presented here comes from real-life practice because it was created with the help of an experienced private kindergarten educator. Their feedback improved how the digital tasks were made useful for learning and easy to follow. During the pilot implementation, children started to engage in more conversation, work together, and become more motivated, as predicted by literature (Plowman & McPake, 2013; Yelland, 2011).

The thesis follows the approach taken in the Finnish National Core Curriculum for Early Childhood Education and Care, especially emphasizing whole development, literacy in several forms and child-directed learning activities. The guidebook helps strengthen these values by

improving digital and reading skills, supporting every child's education and helping teachers engage their classes rather than leaving them alone with screens.

Moreover, the project supports what is set forth in national strategies like Digitalisation in Education 2027 and the Framework for Digital Competence (ePerusteet). These strategies ensure technology plays a role, but they also require a fair way of accessing it, teacher training, and critical thinking. This thesis introduces a Digital Tool Selection Framework, guiding teachers to choose tools wisely based on educational and growth factors, since many private kindergartens lack clear evaluation tools.

The thesis also addresses thoughts by critical experts, who point out that certain groups have less access to effective digital services and tools (Livingstone & Helsper, 2007; Warschauer, 2003). By including free or offline apps within the guidebook, people living in difficult economic situations are not left out. Allowing apps for young people to be understood in many languages and present many kinds of backgrounds is another aspect of cultural equity required by VASU.

Another outstanding contribution is found in the role of social pedagogues. Focusing on people's feelings and accepting everyone and the way the group works is vital when using technology for groups. The thesis urges educators to play a key role in designing and guiding digital learning so that technologies encourage connections and motivate kids through play.

5.2 Reflections and Personal Learning

Working through the thesis has been a true mental challenge that has also changed us personally. The project was initially centred around improving cognitive development using digital tools. Thus, through literature reports, team collaboration in the field, and pilot tests, we began to view digital education from a larger, systemic perspective. We realised that what makes digital teaching in early childhood work is not only tools but also the values and relationships children and teachers develop.

We discovered just how vital co-construction is for children, teachers, practitioners, and researchers in the field. Getting advice from a kindergarten professional improved the way we approached design and made the theories useful in real classroom situations. The project showed that a successful educational innovation depends on people from different disciplines, being modest, and keeping at it.

We also learned to pay close attention to the ethical and equity concerns associated with technology. Because digital tools are becoming so widespread, the threat of unequal use, a merged culture, and mismatched developments grows. These issues cannot be handled only with technical fixes. This means educators must examine their beliefs, understand practices in their context, and ensure the child is fully heard.

5.3 Analytical Summary

This thesis brings a timely suggestion with its theory-driven, policy-suited and practice-focused model for ECEC digital integration. This book helps Finnish private kindergartens by providing clear guidance on digital equipment that can improve children's minds, speech and relationships with others. Digital tasks are blended into activities like storytelling, dialogues and collaborative play so that the guidebook highlights a more balanced learning approach in the 21st century.

5.4 Recommendations

Using the results from this project, theoretical thinking and findings, We present the following ideas.

5.4.1 Institutionalize Shared App Evaluation Processes

Selecting apps is not something educators should handle alone. Institutions ought to develop common, open criteria following child development ideas, data privacy and the curriculum's aims. Leaders should make certain that all digital technologies are used according to VASU and the country's digital plans.

5.4.2 Invest in Digital Pedagogy Training

Moving from technical skills to learning how to apply them in teaching, understanding children's needs and reflecting is necessary. Support is required for educators to handle the balance of interactivity, how developmentally appropriate it is, and what is considered ethical. All training needs to support the Framework for Digital Competence and take place regularly.

5.4.3 Centre Social Pedagogues in Digital Learning

Social pedagogues should be involved in digital planning to ensure tools are accessible, promote social life and fit with the group's well-being. There needs to be an official place for their role in digital policy implementation within the organization.

5.4.4 Embed Multiliteracy Across the Curriculum

Being literate in both digital and narrative forms should be the focus of early childhood curriculum. Multimedia storytelling, drawing directly on a screen, coding, and designing are all important in helping children make things, instead of just watching or reading them from others.

5.4.5 Foster Cross-Sector and Cross-Disciplinary Collaboration

Networks formed by ECE institutions should connect teachers, researchers, app developers and municipal authorities. By partnering closely, teachers and technologists can create tools for everyone, provide frequent feedback and stay true to the highest pedagogical and equitable standards.

5.4.6 Expand Research on Long-Term Digital Impact

Researchers could focus on how performing different kinds of digital activities affects work memory, attention, creativity and self-control in the coming years. Taking account of observation, child reports, and long-term monitoring would improve what can be discovered.

With digital media playing a bigger role in early childhood education, it is vital to build its use based on scientific development, standards of proper conduct, and approaches for all children. The thesis suggests that digital tools can help with cognitive growth, but only when used with planning, reflection, and strong relationships. This project has produced a practical guidebook adaptable to educators' daily challenges in modern ECEC.

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