Developing a Gamified Digital Citizenship Online Course for Grades K-2 Using Service Design Methods

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Abstract

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Understanding digital technology, the online world, and how to behave responsibly is the essence of being a digital citizen. Teaching these important topics begins in school, but there is a considerable lack of high-quality material that would be useful for teachers and engaging children to focus and learn.

This thesis provides an understanding of how to develop online lessons for grades K-2. The development process is based on customer insights gathered from educators regarding the problems they're currently facing with teaching digital skills and their need for accessible digital citizenship online material.

The thesis follows Stefan Moritz's service design model consisting of six phases: understanding, thinking, generating, filtering, explaining, and realising. Qualitative research methods were used in the first phase in addition to geographical segmentation, net-scouting, and comparison of the digital citizenship standards in the USA and learning objectives defined in the New Literacies development program.

The research results revealed that teachers in Finland felt outside of their comfort zone when trying to teach digital citizenship to students due to needing more confidence in their abilities. The results also indicated that the quality of the material available could be of better quality, and teachers need to search for materials from different sources without certainty that it's up to date. Most respondents agreed that an online course inside an existing platform they are already using, which would save student progress and thus provide a clear indication of their knowledge level, would be beneficial.

As a result of this thesis, twelve lessons were produced for grades K-2 from different subjects, including data and data storage, online safety, different types of hardware and software, internet and browsers, and how our society has changed due to technology.

Keywords

Accessibility, Co-Creation, Content Creation, Customer Centricity, Digital Citizenship, Gamification, Online Course, Pedagogy, Service Design

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1   Introduction

Digitalization has changed our society. Digital technology has become integral to our lives and replaced human interaction in many sectors. The ever-increasing use of digital technology requires new skills from people, as noted by Sitra (2023), having included an understanding of technology in their 2023 Megatrends report.

According to Sitra's report, in addition to knowing how to use technology, it's necessary to understand it. Being educated to understand digital technology will help assess online content, recognize false information, and understand algorithms and how the data economy works. The report also emphasizes that we can care for our safety, rights, and responsibilities in a digitalized society by understanding technology. (Sitra 2023, 13)

Understanding digital technology is only a portion of the digital competence required from everyone. Understanding the online world, behaving responsibly, and recognizing trustworthy sources and fake information is the essence of being a digital citizen.

Digital citizenship education starts in schools. While digital tools and platforms have been used in schools for a long time, the COVID-19 pandemic increased their usage dramatically. Educators are finding it difficult to keep track of the evolving technology and learn about the new applications and platforms, not to mention the safe use of technology.

Teaching digital skills and digital citizenship requires extra effort from educators to get familiar with the concepts before transferring the information to their students. The time spent understanding what they should be teaching and gathering the material from different sources could be spent on other duties. High-quality, grade-level compliant learning material that can be used independently or in a classroom environment on a platform that's easy to access would take the pressure off educators' shoulders.

This thesis aims to gather customer insights from educators regarding the problems they're currently facing with teaching digital skills and their need for accessible digital citizenship online material. Based on the insights, online lessons for grades K-2 were developed using service design methods. Qualitative research methods were used during the understanding phase.

CENTRAL CONCEPTS

Accessibility

Online applications must adhere to international standards for web accessibility to ensure equal access for all learners (WAI, 2022). The European Union established a common European accessibility directive (European Commission, 2022) in December 2016. The directive states how accessibility should be achieved in web applications and services administered by the government or the public sector. The directive is expanding in 2025 to cover all digital services (Tietoevry, 2021).

Co-Creation

Co-creation is an approach to actively involve customers and staff in the process of developing services. Co-creation is commonly used in the service sector, where the services are continuously redesigned, optimized, and improved while being delivered by staff and experienced by customers (Reason, B., Flu, M. B. & Løvlie 2016, 17).

Content Creation

In an online course, content is the key. The creation process can be encapsulated into the following four requirements: 1) learners can move through the content in short segments, 2) learners can repeat and review content, 3) learners can stop and resume the lesson, and 4) learners can easily understand the intent of the lesson (Smith 2014, 17).

Customer-Centricity

A customer-centric organization looks at its business through customers' eyes, exposing their pain points and understanding their emotions better as they interact and transact with the organization. This enables the organization to increase customer value and handle challenges, often leading to increased customer satisfaction, improved service experience, and better customer relations (Reason & al. 2016, 5).

Digital Citizenship

Digital citizenship is commonly described as the appropriate, responsible behaviour concerning technology use. Nine elements comprise digital citizenship: digital access, commerce, communication, literacy, etiquette, law, rights and responsibilities, health and wellness, and security (Ribble 2015, 16-17).

Gamification

Gamification is defined as using game mechanics to make learning and instruction fun. The learning experience is enhanced with features familiar from games; the sense of achievement,

immediate feedback, feeling of accomplishment, and success of striving against and overcoming a challenge. Gamification is used in online courses to increase student engagement (Bell & Project Muse 2017, 26).

Online Course

An online course is an educational content that can be accessed only digitally, and it can be browser-based, or it could be an app that must be installed into the device. Compared to traditional classroom courses, online courses can offer extra stimulation to learners keeping them interested in the subject.

Pedagogy

Pedagogy is the activity of learning and guiding others to learn. In addition, pedagogy is also used to describe the planning and structuring process of learning and teaching activities (Beetham, Beetham & Sharpe 2013. p. 44).

Service Design

A service design approach aligns the organization and business capabilities with customers' needs, wants, and experiences. In addition, it offers tools to understand and model human and organizational behaviour, which enables the organization to deliver experiences resulting in customer satisfaction (Reason & al. 2016, 13).

2 Research Background

The need for digital education has not been unnoticed by the authorities. The European Union (EU) has adopted The Digital Education Action Plan (DEAP), whose purpose is to "support the adaptation of the education and training systems of Member States to the digital age" (European Commission, 2022). The plan was established in the aftermath of the COVID-19 pandemic when it was discovered that while the schools quickly adapted to online and hybrid learning, using digital technology revealed inequalities between students due to access to digital technologies, as well as the educators' capacities and their overall digital skills and competences. DEAP details two strategic priorities; fostering the development of a high-performing digital education ecosystem and enhancing digital skills and competencies for digital transformation. The plan aims to provide educators with the methods and tools to bring digital education to classrooms to bridge the gap between learners. Along with DEAP, the European Commission's Joint Research Centre has compiled a Digital Competence Framework, DigComp, to provide a common understanding of digital skills and competence. The framework identifies the key competencies, proficiency levels, and use cases for educators and employers (DigComp, 2023).

The Council of Europe (COE), the leading human rights organisation on the continent, describes Digital Citizens as individuals who are fluent and responsible users of digital tools. COE has worked with experts to identify the competencies digital citizens should develop and categorized them into three groups. The first group, "Being online," addresses the competencies that are required for users to access digital tools and to be able to express themselves. The second group, "Wellbeing Online," describes the competencies that will help digital citizens to engage with others in the digital world. The third group, "It is my right!" explains the competencies required to understand the rights and responsibilities when using digital technology. (Council of Europe, 2023).

In the United States, digital citizenship education is included in the education plans of each state, all addressing the need for digital skills similarly. While there's no federal digital citizenship program, the government has taken a stand against cyberbullying, an integral part of digital education, and established the StopBullying.gov website to educate teachers and students about cyberbullying. The website is managed by the U.S. Department of Health and Human Services and offers information and resources to understand what cyberbullying is, what you can do to prevent it, and how to build a safe environment. (StopBullying.gov, 2023) Furthermore, the Office of Educational Technology has published a Digital Learning Guide for teachers to help and support implementing digital learning into classroom education. (Office of Educational Technology, 2023)

In addition to government initiatives to support digital education, the United Nations is calling for all nations to increase their efforts to ensure quality education is provided to everyone as a human

right. To achieve proper digital education for everyone, the UN demands to focus on the following three aspects to make digital teaching and learning universally accessible. Content must be high-quality, aligned with the curriculum, and accessible to all learners via digital learning platforms. Capacity refers to the ability to use digital technology to ensure educators have the proper knowledge to use digital tools to teach. The third aspect, Connectivity, addresses ensuring everyone has a good quality internet connection to use digital tools properly. (United Nations, 2023)

2.1 Case Organization

Typing Master Finland Oy develops keyboarding software and services for educational institutions, companies, and consumers. Different versions of educational software have been sold to more than 140 countries and territories across the globe. The biggest markets are Finland, where more than 60% of the comprehensive schools use the NäppisTaituri keyboarding program, and the USA, with more than four million students using the TypeTastic keyboarding program.

I started working for Typing Master Finland Oy in January 2008, starting as a customer service assistant. As the company has grown, my role has changed from customer service to marketing coordinator. Since September 2022, I have been working as a Product Owner, responsible for product development using service design methods, customer experience, content production, and innovation of the services and products.

The need for digital citizenship learning material has been on the rise for several years. While we acknowledged the need for the material, we only dived into it once the company's largest US-based customer approached us in August 2021 requesting a quote for developing digital literacy material that would be integrated with TypeTastic keyboarding lessons.

Developing new material required investigation, especially when the requested material was entirely different from our previous development. Before agreeing to develop the material solely for the customer, the company went through long internal discussions about whether developing a complete digital citizenship online course and having it available for all our customers at some stage would be the way to go.

In the USA, digital citizenship has been a topic of conversation for several years, and many states have standards that detail what students should be learning. Keyboarding, or touch typing, is an essential 21st-century skill in digital literacy and digital citizenship standards.

In Finland, Agency for Education published a New Literacies, or Uudet lukutaidot, development program in February 2021. The purpose of the development program is to provide the educator

with the parameters of the skills the students should learn in the following three categories: media literacy, coding, and digital skills, including keyboarding (Uudet lukutaidot, 2022).

Typing Master Finland Oy commissioned this development-oriented thesis, and it's limited to explaining the process of developing digital citizenship lessons for grades K-2 using service design methods based on the insights gathered from our customers.

2.2   Previous Research

A few previous theses can be found related to the use of service design when developing services. Since this thesis focuses on an online service, I'm showcasing similar works connected to the same subject, i.e., developing an online service using service design methods.

Kati Routti's Master thesis, "A Service Design Approach for Online Learning Service Development," from 2018, is an excellent example of a similar thesis to another company providing an online learning service. In her thesis, Routti uses service design methods to understand Skhole's online learning service and develop new ideas for an improved service concept. (Routti, 2018)

Sanna Henttonen's Master thesis, "Service Design as a Content Development Tool on lut.fi Website," from 2022, provides a different angle from a content creation's point of view. In her thesis, Henttonen uses service design to develop the content in a more user-centered direction. (Henttonen, 2022)

Digital citizenship, what it is about, and its importance in education, is a widely researched subject over a number of years. In her research paper, Lesley S. J. Farmer (2010) discusses how the information society constantly evolves. Individuals' broad access to information has dramatically impacted institutions and cultures, leading to constant change and creating a need for technology-related skills. Farmer describes digital citizens as competent and responsible technology users and teachers as promoters of digital citizenship according to the national education technology standards. Teaching digital citizenship is complex as it crosses curricular lines; it can be taught among other curriculum subjects or by focusing on one specific digital citizenship skill at a given time (Farmer 2010, 1-2).

In a more recent study Dr. Stephanie Carretero Gomez (2021), the principal author of the European Digital Competence Framework, discusses the importance of digital skills. COVID-19 accelerated the need for digital tools and, at the same time, proved that there's a severe lack of digital skills among citizens. According to Carretero's study, across different areas, women, people with lower education, and the elderly usually didn't have sufficient digital skills, which may result in being digitally excluded (Carretero 2021, 5).

Teachers' readiness to teach important digital skills and 21st-century competencies, including ICT competence, multiliteracy, working life skills, and entrepreneurship, was examined in a recent study by Kalmi, Kortesalmi, Kruskopf, Lonka, and Ranta (2022). According to the study, teachers' ICT competencies ranked the lowest, and they didn't regard teaching these competencies as central to their duties. Teachers consider ICT a demanding topic, resulting in a lack of interest in gaining more understanding (Kalmi & al., 2022).

2.3   Research Problem

Many free digital citizenship learning materials are available online, targeted for different grade levels. Gathering the material into one comprehensive curriculum is an enormous task for teachers and ensuring that the information is current cannot be guaranteed. In addition, most of the materials don't include any result saving or reports necessary for teachers to follow up on the student's progress.

Children are expected to start learning about digital citizenship in primary school, which raises many demands for the material. 6-7-year-olds are not very fluent readers, and only some of the free materials consider this. The learning material should be age-appropriate and introduce the subject in a way that appeals to the specified grade level. Gamification is a widely used concept when providing digital materials to early learners.

Schools already use many different platforms and services, and teachers are struggling to use the existing ones. Adopting a new platform to teach digital skills may sound daunting. Instead of developing an entirely new service, a digital citizenship course could be integrated into an established service. If a school is already using the service, there's a higher likelihood that they would find it easier to teach digital citizenship skills using the existing platform.

2.4   Theoretical Framework

The theoretical framework describes the central concepts of the research and their relations to one another (Tuomi & Sarajärvi 2018, Chapter 1.1.1). The framework and the concepts selected in the research must always be explained and defined to the reader clearly and accurately (Vilkka 2021, Chapter 2).
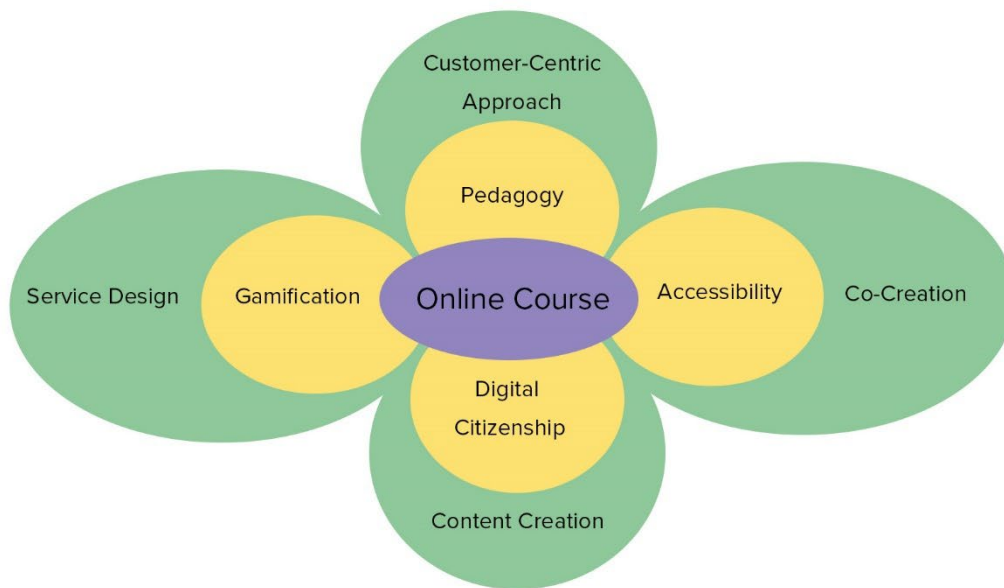
Image 1. Theoretical framework.

In the centre of the theoretical framework (image 1) is the online course the organization will develop for schools. Service Design is used to create customer-centric services and will also be utilized during content creation. The online course will be co-created with educators to ensure that the service fills their needs, the different parts of the digital citizenship curriculum are included, the content gamification is carried out correctly, and it's accessible for all learners.

Online Course

An online course is digitally available learning content that requires little or no teacher guidance. As opposed to a traditional classroom setup, the online course creates a learner-centred environment where learners can return to the content. (Smith 2014, 34)

A learner-centred environment has four characteristics. Firstly, learners usually choose when to access the course instead of being given a specific time to attend, and secondly, being able to work on the course materials when suitable for the learner thus leads to better learning results. Thirdly, learners can complete the course materials without being tied to a specific space. And fourthly, online courses offer a chance for all learners to proceed at their own pace. (Smith 2014, 34-36.)

Accessibility

The internet is one of the rare platforms that have the potential to be inclusive to everyone, despite their disabilities. To promote web accessibility, the World Wide Web Consortium (W3C) created the

Web Content Accessibility Guidelines (WCAG). The guidelines describe in detail the requirements a website or a web application needs to meet. The requirements are categorized into three levels: A being the lowest level, AA being considered acceptably accessible, and AAA, the strictest level meeting all the requirements. (Firth 2013, Chapter 1.)

WCAG has divided the technical requirements into four categories: perceivable, operable, understandable, and robust. Perceivable content requires that the site has text alternatives for non-text content, and captions and other alternatives are provided for multimedia. The content should be presented in different ways with assistive technologies included and made easy for users to see and hear. (WAI 2022.)

The second category, operable, requires all functionalities to be available from a keyboard. Users should also be given enough time to read and use content, and it should not include anything that could cause seizures or physical reactions. The site should help users navigate and find correct content and offer options to use other inputs besides the keyboard. The third category is about making the text readable and understandable, the content should appear and operate as predicted, and it should be produced such that users can avoid making mistakes. The final category refers to maximizing the site's compatibility with user tools. (WAI 2022.)

Co-Creation

Contrary to traditional product development, services are continuously re-designed and improved while delivered by staff and experienced by customers. Co-creation involves customers and staff in the designing process and thus acknowledges that customers have needs and how they should be met. Inviting customers to participate in the creative process helps generate ideas and, at the same time, allows the service to meet the customers' demands. (Reason & al. 2016, 11.)

Winning businesses are continuously improving their services and experts at avoiding irritating their customers. By allowing customers to contribute their design ideas and observing their behaviour, companies build a powerful combination to design services that exceed expectations. In addition to involving customers in the design process, including the staff facing the customers on a daily basis will help to decrease the possibilities of failure. As a result, the company will have a highly dedicated staff proud of being included in the development process. (Reason & al. 2016, 12.)

Content Creation

Creating online content differs from traditional classroom content. The creators of online content should consider these four requirements: the content is provided in short and meaningful

segments, the learners have the option to repeat and review content, learners can pause the lesson and resume from where they were left off, and the course instructions are clear (Smith 2014, 115-116).

Keeping the instructional design principles in mind when creating the content will help achieve the best learning results. The dual-mode effect refers to using both visual and verbal information in presentations instead of only text slides. On another note, the graphic design not coordinating with the visual and verbal material can cause a split-attention effect and a heavy cognitive load as a result. It is helpful to place text explanations on the drawings or to have an explanation pop up when hovering over with a mouse. The modality principle refers to audio explanations of visual representations leading to better learning results and can be achieved by adding narration. (Smith 2014, 117-118)

Presentation length can have a significant effect on the learning results. Segmenting the content into shorter than 10-minute chunks help to keep the learners' engaged. In addition, reinforcing the concept between short segments allows the learner to associate the information with prior knowledge. Smith (2014, 120) continues that by dividing the content into shorter segments, learners can absorb the information more frequently, which is more beneficial from the learning point of view. (Smith 2014, 118-120)

Customer-Centricity

Customer-centricity is the result of adopting service design methods. Companies can increase customer satisfaction and improve the overall service experience by identifying the key drivers impacting customers' behaviour. To succeed in developing a customer-centric organization, the focus must shift from product to customer. (Reason & al. 2016, 5-6, 143.)

To implement a customer-centric vision into reality, the company must first build its storage of customer insight. Surveys and other data can be stored in various parts of the business and collected into organized insights into customers' needs, expectations, and problems. Quantitative data is easily collected, but companies should consider qualitative research as it can give more in-depth information about experiences and moments. Then, map out the customer experience phase by phase to understand the customer's perspective to identify the critical moments on the customer journey. Customer personas can be used to represent typical customers, and they can help with problem-solving from a customer's point of view. (Reason & al. 2016, 145-146.)

Digital Citizenship

The cornerstone of digital citizenship is the correct and responsible use of technology. The internet offers access to a never-ending amount of information. Digital citizenship education emphasizes the appropriate use of technology, including the repercussions of illegal downloading and cyberbullying (Hughes & Burke 2014, 103.)

Ribble has identified nine elements of digital citizenship: digital access, commerce, communication, literacy, etiquette, law, rights and responsibilities, health and wellness, and security (2015, 13-14). The nine elements round up different aspects of using digital technology. The first element, digital access, includes students' and teachers' access to devices and equal access to everyone with special needs or physical disabilities (Hughes & Burke 2014, 105).

The second element, commerce, challenges teachers to educate students about online purchasing and recognizing safe sites. Communication is the most common way of using digital devices. In digital citizenship education, it is crucial to understand when using technology for communication is inappropriate and how we can promote responsible digital communication. The next element, literacy, refers to awareness of how technology is used. Technology can be an efficient tool but can provide little extra to classroom education (Hughes & Burke 2014, 104).

Several laws govern the legal use of technology, and education must address illegal use, such as plagiarism and copyright infringements. Rights and responsibilities refer to the ethical use of technology, including raising awareness of cyberbullying. Excessive use of technology, for example, playing or incorrect posture can have a long-lasting impact on any person's health and wellness and needs to be addressed by educators. And lastly, security defines safe online practices such as protecting your device from viruses and keeping your personal information safe (Hughes & Burke 2014, 104-105).

Gamification

Humans have adapted gameplay principles throughout history to make ordinary tasks more motivating and fun. By competing against each other, people are adopting principles at the center of today's games. (Yu-kai Chou 2016, Chapter 1).

A well-executed gamification can personalize the student experience and make the student the center of the learning process. (Bell & al 2017, 18). Yu-kai Chou's (2016, Chapter 3.) gamification design framework, Octalysis, is based on the eight core drives of gamification. Core Drive 1, Epic Meaning & Calling, refers to a person's belief in being chosen to do something meaningful or being lucky at the beginning of the game by receiving a rare reward. The second core drive,

Development & Accomplishment, refers to our drive to develop our skills and overcome challenges, and it's commonly displayed as badges and leader boards (Yu-kai Chou 2016, Chapter 3.)

Empowerment of Creativity & Feedback is the third core drive related to the creative process of playing. According to Yu-kai Chou (2016, Chapter 3.), we need a way to express our creativity, see the results, and receive feedback. Core drive four is about Ownership & Possession, which refers to users' increased motivation through ownership and the need to increase and improve it (Yu-kai Chou 2016, Chapter 3.)

Core drive five, Social Influence & Relatedness, includes the social elements that motivate people. We are naturally competitive and seek social acceptance and feedback through achieving a new skill. The sixth core drive, Scarcity & Impatience, refer to our motivation to keep playing because we want something rare and not easily available (Yu-kai Chou 2016, Chapter 3.)

The seventh core drive, Unpredictability & Curiosity, is the core drive causing, for example, gambling addictions. We like the unpredictability of games, and it's also the core drive that makes us want to watch movies. The final core drive, Loss & Avoidance, refer to our motivation of not wanting to lose (Yu-kai Chou 2016, Chapter 3.)

Pedagogy

Beetham, Beetham & Sharpe (2013, 41-44) define pedagogy as the activity of learning, guiding others to learn, and the planning and structuring process of learning and teaching. The digital age has raised a requirement to re-think pedagogy in education.

McLoughlin & Lee introduce the three P's of pedagogy: personalisation, participation and productivity as the pedagogy 2.0 framework. In today's internet society, learners are able to access more resources than ever to support their learning and as such are more self-directed and have higher control over their personal learning process, leading to personalisation of the learning experience (2008, 15-17).

The second P, participation, emphasizes the partnership between a teacher and a student, and understanding how to collaborate with others. Productivity refers to learners' capability of generating and creating ideas and concepts and through the process reach their ultimate goal of learning, knowledge (McLoughlin & Lee 2008, 16-17).

Service Design

Moritz (2005, 39) defines Service Design as the method of designing the overall experience of a service and process while providing a strategy for the company to provide the service. Stickdorn

(2018, 20-21) follows along the same path, defining service design as a process that aims to produce innovative solutions that bring customer value. At the core of service design is experimenting and prototyping to generate user feedback in cycles that eventually lead to implementation. When embedded successfully in an organization, service design can be used to innovate new services and improve existing ones. (Stickdorn, Hormess, Lawrence, & Schneider 2018, 20-21.)

Service design is a user-centred process that includes customers, employees, and stakeholders participating in the development process. The value of services is co-created by a group of people who don't necessarily work together. Service Design focuses on various touchpoints on the customer journey that make up a service experience. Services are mostly intangible, and evidencing service design can draw attention to the created value. Services are holistic experiences, and service design aims not to solve isolated problems but to improve the service as a whole. (Stickdorn et al. 2018, 24-25)

2.5   Research Questions

The research questions should be logical and originate from the phenomenon you are researching or developing. When gathering the material, the most critical aspects are defining and testing the questions and the researcher's role concerning the desirable material (Vilkka 2021, Chapter 5). This research is limited to understanding the teachers' needs regarding digital citizenship learning material and developing the course content without taking any stance on the technology used to access the content or how it is integrated into the established platform.

Primary question:

How can Service Design methods help with creating digital citizenship learning material?

Sub-questions:

What are the biggest barriers with teaching digital skills to students?

What do teachers expect from a digital citizenship course?

2.6   Research Method

The research was carried out using qualitative research methods. The most common ways to collect information are interviews, surveys, observations, and information compiled from different documents. These different methods can be used alternatively, side by side, or combined in different ways according to the research problem and resources (Tuomi & Sarajärvi 2018, Chapter 3).

The information used in this research was collected by conducting a themed interview with NäppisTaituri customers on the phone and on-site at the ITK conference. The conference participants were also shown a rough prototype of a digital citizenship lesson. A survey was also sent to NäppisTaituri customers, focusing on digi tutors and persons responsible for digital learning within the school or municipality. The research methods and the results are explained thoroughly in Chapter 3.3, together with Service Design methods.

3   Service Design

Services are interactions between a service provider and a customer that consist of different environments and touchpoints. Several elements, such as the possible product, environment, customer service person, and customer, affect the service production process. The purpose of a service is to provide solutions and answer customers' needs by creating value. To succeed, it's crucial to understand people's motives and hopes, and therefore it's essential to have the customer at the center when planning services. Even though services have been existing for a long time, service design as a field of business is relatively new. (Tuulaniemi 2011, 61-67; Korpi, Saarelainen & Taskinen 2022, 4)

Service design is a customer-centric process where the company's operations are intended to be developed by involving the customer. The customer decides what brings them value, and using service design ensures that the service responds to the customer's needs. Service design intends to understand customers' needs and to examine the service experience from the customer's point of view. An essential element in the service design process involves the end users, and the final result is a customer-centric service concept. (Alhonen & Iloranta 2021, 2; Korpi & al. 2022, 4)

Service design methods can be utilized diversely for different needs, and it's becoming increasingly popular in businesses due to the customer-centric value approach. Service design combines both the business objectives and the customer's point of view, and therefore it's suitable for developing services that create value for customers and are strategically reasonable. Service design helps to detect new business opportunities or expand existing services. With service design, companies can focus on developing their internal processes and operations into more customer-centric, deepening customer relationships, and improving customer experience. (Tuulaniemi 2011, 95-96; Korpi & al. 2022, 4)

Service design is carried out as a process utilizing creative problem-solving principles. Although developing services is about creating something new and unique, the service design process can also be used without constantly inventing new ones. The purpose of the process is to have a structure in the development of services and to take into consideration as widely as possible all the different phases of the process. Tuulaniemi (2011, 127) introduces a so-called general service design process consisting of five phases, while Mortiz's (2005, 123) model describes the service model in six phases. Alhonen and Iloranta's (2021, 4) interpretation of the process is very similar but with seven phases. Even though the number of phases differs, they contain more or less the same content, which has been divided into more phases in some models (Tuulaniemi 2011, 126-127, Korpi & al 2022, 4).

3.1 Process Chart

Service design is iterative and incremental by nature. Iterative means that the process is continuous and repetitive and will continue as long as the objectives have been achieved. Incremental, on the other hand, means that a larger entirety has been divided into smaller parts. This is also called a phased delivery model. Service design aims to understand people and their needs better, detect new business opportunities, develop functional services, and carry out plans. (Tuulaniemi 2011, 110)

This thesis follows Mortiz's (2005, 123) service design model grouped into six phases: Understanding, Thinking, Generating, Filtering, Explaining, and Realising, presented as a process chart in image 2 below. Even though the phases are presented in a specific order, the previous phase can be revisited whenever, for example, additional research is required.

Image 2. Service Design Process Chart (adopted from Moritz, 2005)

3.2 Project Plan

The project aimed to develop gamified digital citizenship learning material for grades K-2, starting with English lessons and then localizing them to Finnish. Teacher Guide was produced as a side product of the project to help teachers tackle the subjects with little prior knowledge or expertise. This thesis focuses only on the development of the learning material.

The central project team consisted of five members. The project lead, Anssi Väliaho, was responsible for guiding the overall project and managing the budget. My role within the team was to lead the content creators and provide objectives and the business point of view. I was also actively involved with graphic design and helping out with producing some of the voiceovers. The content creators, Jarno Bruun, William Muallim, and Pui Ying Law, were responsible for creating the pedagogical content.

The project was divided into six phases per Moritz's service design model: Understanding, Thinking, Generating, Filtering, Explaining, and Realising (image 3).
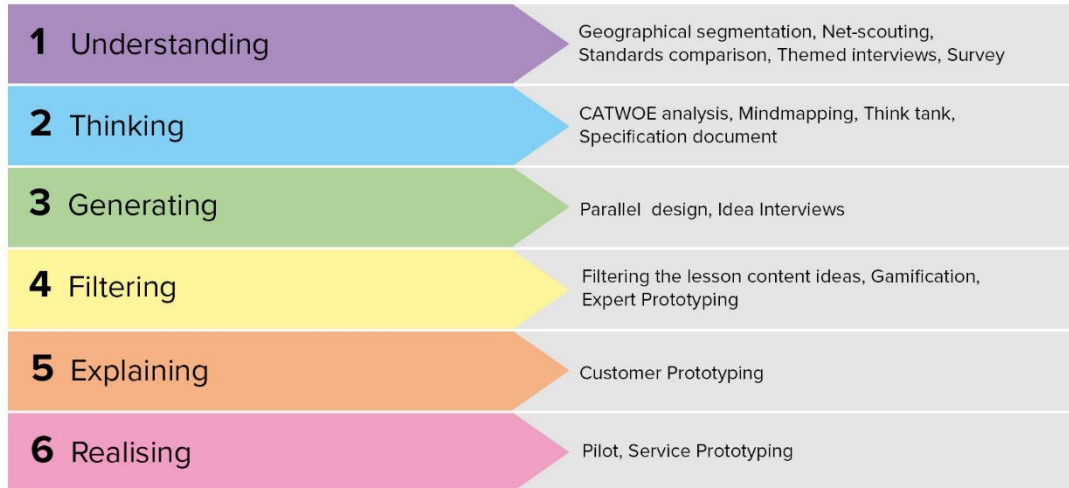

Image 3. Project phases.

In the first phase, Understanding, we collected customer data and built a foundation for the project using several service design methods, such as net-scouting, themed interviews, and a survey. The different methods and the findings are introduced in Chapter 3.3.

The second phase, Generating, focused on determining the project's strategic direction. In addition to analysing the data collected in the first phase, this phase included expert interviews and think tank sessions further understand the underlying needs for the digital citizenship learning material.

Phases three and four, Generating and Filtering, moved side by side during the project. While the content creators did most of the idea-generating while creating the learning material, more ideation and filtering took place in status meetings.

In the fifth phase, Explaining, we started testing the lessons with customers to get feedback for further lesson development. And in the last phase, Realising, the lessons were added to the platform and taken to classroom testing.

The project began in August 2021, each phase taking several months to complete. The deadline for adding the English lessons onto the platform was in September 2022, which was delayed by around two weeks. The schedule, shown in image 4, visualizes the actual timeline that the project has followed.
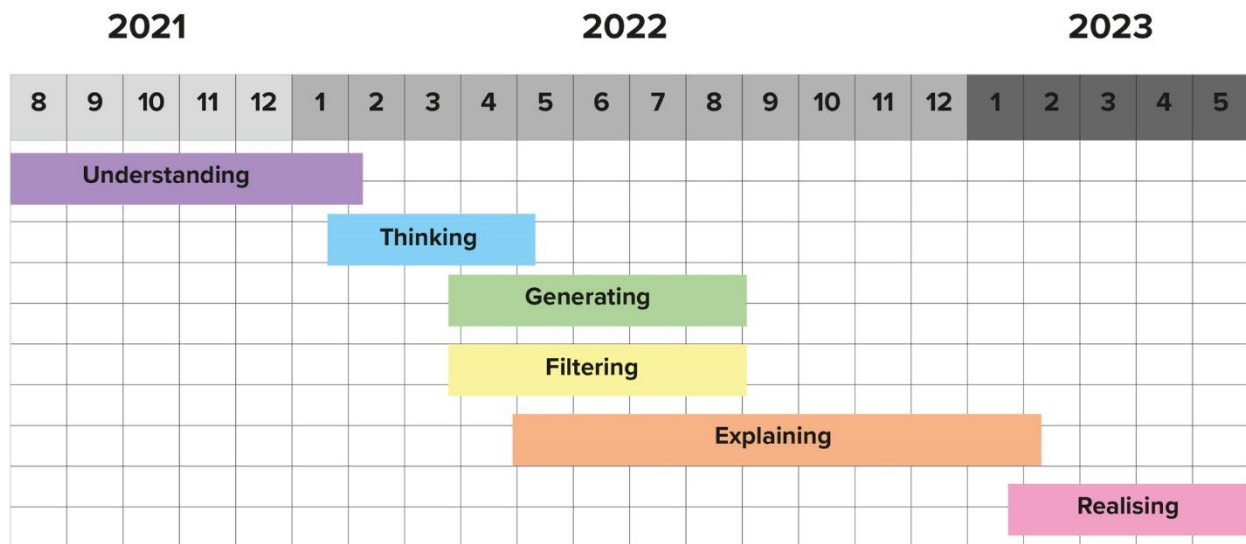

Image 4. Project timeline.

3.3 Understanding

The first phase of the service design process is to collect insights to understand customers and their needs using different methods, such as interviews (Alhonen & Iloranta 2021, 6-10). When gathering understanding, it is crucial to dig deep to figure out the customers' deepest needs and motives and understand the service's context. The first phase is time-consuming and should be conducted thoroughly to ensure the results are relevant and realistic. (Moritz 2005, 124-125)

Segmentation is an effective strategy tool used in marketing to divide markets into several groups of potential customers according to their needs or characteristics (Weinstein 2004, 4-5). In service design, emphasis should be given to understanding the various segments' different needs, opportunities, and constraints (Moritz 2005, 193).

Geographical segmentation was made in the very early stages of the project. While the company provides keyboarding material in several languages, it was clear that this project could only be delivered to some countries at a time. The problem is not only the localization of the material but also the varying digital citizenship standards in each country. Given that the company already has a

strong position in both the US and Finnish ed-tech markets in keyboarding, it was established very early on that these two markets are the ones we would be focusing on.

Both markets were then divided into sub-segments by school levels. The school levels are slightly different in each market. In the USA, elementary school typically consists of grades K-5, the middle school includes grades 6-8, and high school grades 9-12 (US Department of Education 2008). In Finland, the primary school has grades K-6 and lower secondary grades 7-9, i.e., general education, and three years of general upper secondary school, equivalent to high school in the USA (OPH 2018).

Net-scouting method utilizes the information available on the Internet. A constantly updating resource containing information from the past, the Internet gives us an insight into the market conditions and environment. It can also help identify how the existing solutions have been built and provide crucial information on the market share and development trends. (Moritz 2005, 194) We were very used to the net-scouting method, having used it in various other projects in the past. Net-scouting offers an efficient tool to quickly compare the competition and assess our company's possible advantages against the others.

We were already aware of several ed-tech companies offering digital citizenship learning material. In addition, we used Google Search to get an overall sense of the amount and quality of digital citizenship material available. The overall quality of the existing material varies, and most competitors offer highly gamified and beautifully built material with high-quality animation. The digital citizenship material generally consists of narrated videos, interactive exercises, and quizzes to test the students' knowledge and provide a benchmark of their learning. Based on our findings, we then drafted a comparison analysis of the competitors, including companies that, like us, provide both keyboarding and digital citizenship material or just the latter. The market leaders are assessed in this chapter, while the analysis of all the service providers is explored more thoroughly in the analysis in appendix 1.

Common Sense

Common Sense is the leader in the United States with extremely high-quality material designed and developed in partnership with Project Zero at the Harvard Graduate School of Education. The material is free of charge for educators and thus used in the majority of schools in the USA. The material is also available for licensing and used as such by, for example, Keyboarding Without Tears. (Common Sense, 2023.)

Digital citizenship lessons for K-2 are divided into six topics as shown in image 5:
- Media balance & Well-being (K-2)

- Privacy & Security (K-2)

- Digital Footprint & Identity (Grade 2 only)

- Relationships & Communication (Grade 2 only)

- Cyberbullying, Digital Drama & Hate Speech (Grade 2 only)

- News & Media Literacy (Grade 2 only)

2nd Grade

We, the Digital Citizens 🖼 🕑   INTRODUCTORY SONG
How can we be good digital citizens?

Device-Free Moments   MEDIA BALANCE & WELL-BEING
Why is it important that we have device-free moments in our lives?

That's Private!   PRIVACY & SECURITY
What kinds of information should I keep to myself when I use the internet?

Digital Trails 🖼 🕑   DIGITAL FOOTPRINT & IDENTITY
What information is OK to have in your digital footprint?

Who Is in Your Online Community?   RELATIONSHIPS & COMMUNICATION
How are we all part of an online community?

Putting a STOP to Online Meanness 🕑   CYBERBULLYING, DIGITAL DRAMA & HATE SPEECH
What should you do if someone is mean to you online?

Let's Give Credit!   NEWS & MEDIA LITERACY
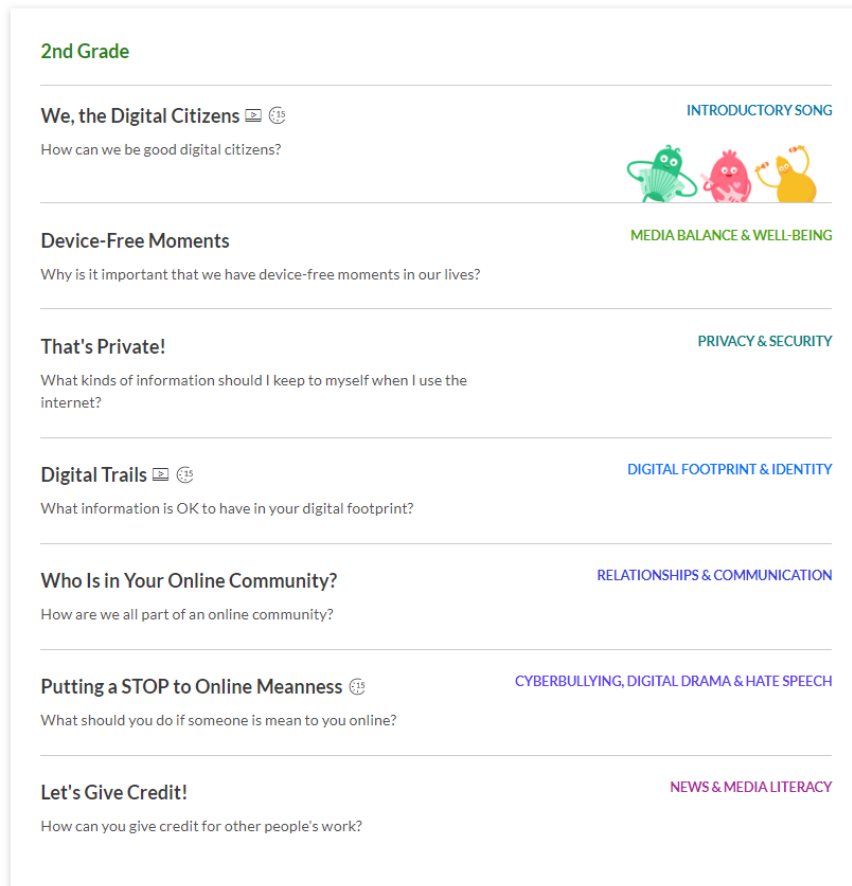How can you give credit for other people's work?

Image 5. Common Sense Digital Citizenship Curriculum for Grade 2 (Common Sense, 2023).

Each topic includes a well-drafted 30-35-minute lesson plan (image 6) or a shortened version if the teacher only has time for part of the lesson. The lessons are entirely teacher-led as offline activities. They include a Warm Up to get students ready for the topic, Explore section where students dive deeper into the topic, Create section to get the students to try the topic in practice, and, at the end of the lesson, a few minutes to reflect what the students have learnt.

Image 6. News & Media Literacy Lesson Plan for Grade 2 (Common Sense, 2023).

The lessons provide clear learning objectives and key vocabulary, enhanced with illustrated slides to promote learning and handouts for offline activities. Additional take-home resources can be given to parents or used by home schools to ensure learning continues outside the classroom. An example of a student handout is shown in image 7.

Image 7. News & Media Literacy Lesson Student Handout (Common Sense, 2023).

EdClub / TypingClub

Typing Club is the keyboarding market leader in the USA. The company was re-branded in 2022 to EdClub and simultaneously entered the digital citizenship competition by launching its learning materials. Like their keyboarding lessons, the digital citizenship material is of high quality, very well animated, and gamified to keep students engaged.

The learning material is divided into two categories, each covering six topics. Digital citizenship category includes the following:

- Online Safety & Privacy
- Communication Skills
- Recognizing Cyberbullying
- Being a Digital Creator
- Balancing Time on Devices
- Thinking Critically About News & Media

Digital Literacy forms the other category, including the following topics:

- How Computers Work
- Word Processing Skills
- Spreadsheet Skills
- Presentation Skills
- Mouse, Touchpad & Keyboard
- How the Internet Works

The lessons for K-2 cover many key concepts ranging from learning how to use a mouse and touchpad to understanding different parts of the computer and browser basics, icons & symbols, and the proper behaviour in the online world. Each lesson begins with an introductory video explaining the topic, followed by different activities, including vocabulary, a drop quiz, an article to read, a drag-and-drop activity, a sorting or decision-making game, and a summary. Image 8 shows the visualization of a grade 2 lesson plan, and image 9 shows an example of a drag-and-drop activity.

Image 8. EdClub Grade 2 Lesson Plan (EdClub, 2023).

Image 9. EdClub Drag and Drop activity (EdClub, 2023.)

The Finnish education market lacks a comprehensive digital citizenship learning solution that aligns with the New Literacies competence descriptions. The solutions currently available are Digi-adventurers online game, Spoofy mobile game, and Digital Skills card game offered by the Hearing Association. Digiadventurers, a browser-based online game, is made for 6-12-year-olds and includes activities to practice the use of computers and software, media literacy, empathy skills, and understanding of the concepts of AI and robotics (Digiseikkailu, 2023). The Spoofy mobile game focuses on cyber security, privacy, and responsible behaviour in the online world (Spoofy, 2023). The card game offered by the Hearing Association is developed for communal learning to help achieve a basic understanding of digital skills. The cards include six topics: using and controlling devices, searching and evaluating information, safe use of the internet, communication, using applications, and producing content and copyright (Kuuloliitto ry, 2023).

The Finnish and US school systems have specific standards that the learning material should be aligned with to comply with the educational requirements. In addition to the customer's state standards (appendix 2), we also investigated CSTE standards (appendix 3) and the New Literacies competence descriptions (appendix 4) for early education to get an understanding of the scope of the requirements. These requirements were then added in Excel to find the similarities by grade level, and we would, later on, utilize the document when laying out the standards in the Miro board to compile the lesson structure (Chapter 3.6).

The state standards are based on CSTA, which stands for Computers Science Teacher Association. According to the association, the standards "delineate a core set of learning objectives designed to provide the foundation for a complete computer science curriculum and its implementation at the K–12 level" (CSTA 2022). Corresponding grade levels identify the standards, and the goal is described very accurately, which helps teachers to measure students' knowledge and competence. The standards are focused on the technical side of digital competence, cyberbullying, and practicing proper behaviour on the internet is only briefly mentioned in a few standards.

The New Literacies (Uudet lukutaidot 2022) development program is divided into three sections: media literacy, programming competence, and digital competence. The competence descriptions are based mainly on the existing National Core Curriculum for different stages of education, which is expected to be updated in the next couple of years to include New Literacies more clearly. Contrary to the CSTA standards, New Literacies' competence descriptions are more general and give much room for interpretation. The descriptions don't provide specific goals, for example, in programming. The Finnish mindset lets municipalities and schools decide how to implement the New Literacies into the curriculum and how the students' competence is measured.

A themed interview moves forward within a particular theme and related specifying questions that have been selected before the interview. The advantage of this method is that based on the interviewees' answers, the interviewer can go into more detail with their questions (Tuomi & Sarajärvi, 2018).

The themed interview was chosen as the first qualitative research method so that we could get unfiltered feedback and reactions regarding the idea of developing digital citizenship material. We first interviewed NäppisTaituri customers at the ITK conference, an educator event, especially for digi tutors. The audience was ideal for gathering first impressions of the digital citizenship project. The interviewees were also shown an early prototype (image 10) of a lesson to give them an idea of the online material we would probably be developing.
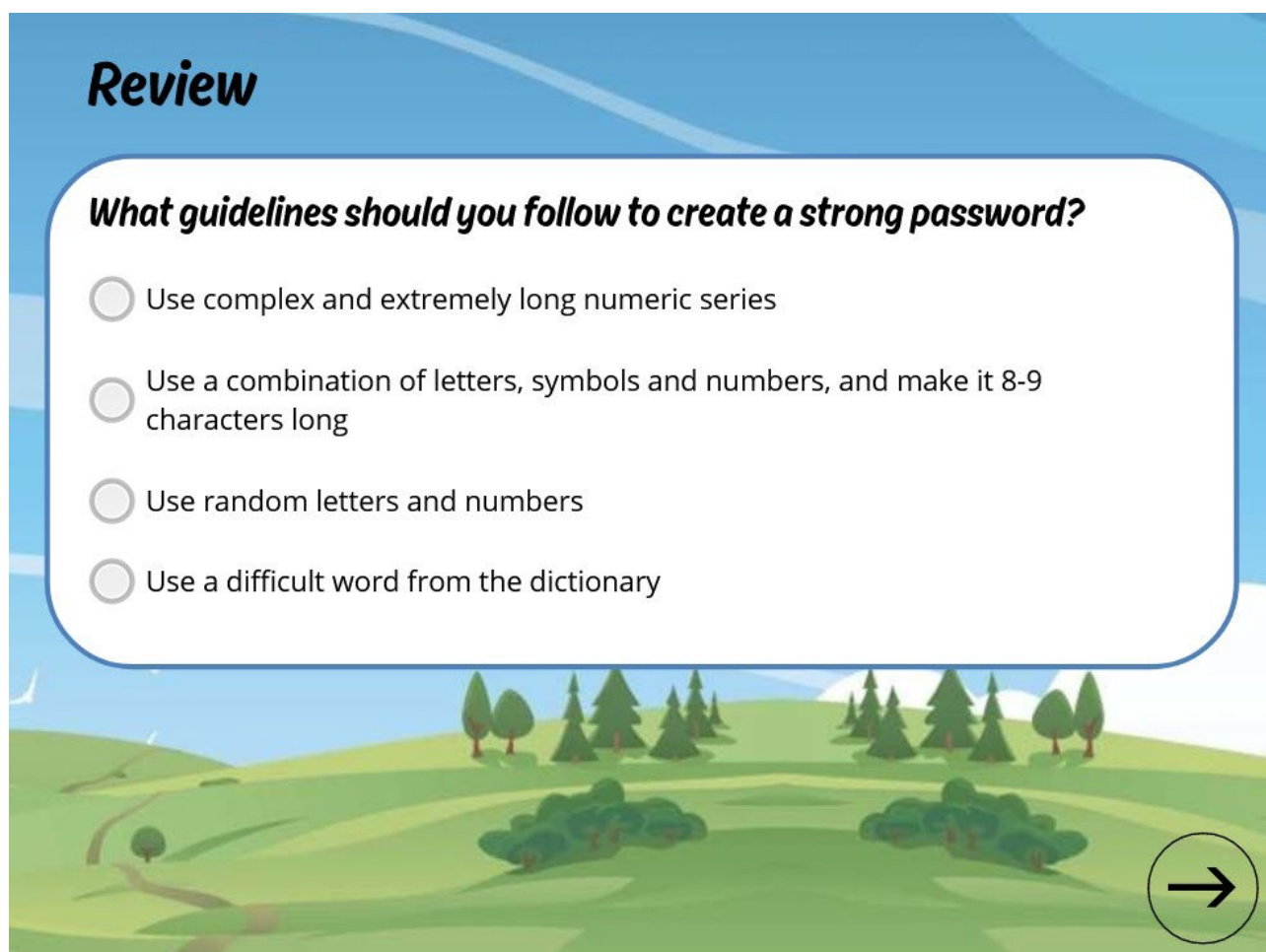

Image 10. Early prototype.

The second interview was carried out as a phone interview. The interviewees were selected among the largest municipalities that are currently NäppisTaituri customers. Adding the digital citizenship learning material would benefit all the existing customers. Therefore, the focus was on our

clientele rather than interviewing educators that are not that familiar with the NäppisTaituri platform. In the phone interview, we utilized the information we had gathered during the themed interviews and guided the conversation based on the earlier findings. The interview outline can be found in the appendices (appendix 5).

In a survey, all respondents are asked the same questions. Researchers can gather information using self-completion questionnaires, face-to-face by an interviewer, or an online tool such as Zoho Survey, which was used for the survey in this research (Bell & Waters 2014, 15).

The purpose of the survey was to compare the answers to the information we had gathered through themed interviews. We needed to ensure that our assumption about the need for digital citizenship learning material was valid. The survey was sent out to the contact persons of the schools and municipalities. The survey featured mainly open-ended questions to allow the respondents to answer freely from their point of view, as well as three closed-ended questions to assess the general status of the digital skills path implementation and the respondent's role. The entire survey questionnaire is included in the appendices (appendix 6).

Customer insight is the basis for developing a successful product. Based on our experience working with educators for many years, we already had a reasonable assumption if the educators would be excited about centralized digital citizenship learning material. The overall feedback was very positive, and the consensus was that there is a need for this type of service.

Most schools and municipalities had either an existing plan or were starting to plan how digital skills would be implemented in the core curriculum. However, the respondents agreed that even though there is a plan, executing it has not been working as hoped or serves merely as a reminder that this is another subject that should be taught to kids.

New Literacies development program is tackling the issue and providing schools and municipalities with more in-depth guidelines about the objectives in different categories and grade levels. The number of goals is overwhelming, and it will require significant time and effort to internalize them and turn them into action. Teachers don't have time to learn all the objectives, search for valuable materials from different sources, compare them to the goals, and then incorporate them into lessons.

Many teachers feel outside their comfort zone and wish to keep teaching as they have always done. Teaching digital skills is very difficult when a teacher is not very confident in their abilities or interested in studying the matter, thus putting the students in an unequal position. In addition to feeling uncomfortable teaching the skills, specific concepts such as coding are regarded as highly challenging.

Most respondents agreed that while they have a digital learning path for students, they need essential material to teach the skills. Teachers combine materials from different sources with varying success, and schools within one municipality can have entirely different approaches to teaching digital skills. When students move from one school to another, it is challenging to prove that they have gained the necessary knowledge required for their age. Educators want students' progress to be saved, but without a centralized solution, all the scores and learning badges must be collected from different locations and saved elsewhere.

The idea of a digital citizenship course inside the NäppisTaituri platform was received positively. One solution that's easy to use with MPASSid (national identification brokering service) integration (Finnish National Agency for Education, 2022), and students can proceed without teacher guidance, was the preferred solution compared to scattered material all over the internet. Teachers struggling with teaching digital skills would benefit from having all material in one place without needing to have much knowledge of the subject.

The solution would need to produce a clear learning path for students to reach the objectives. It should save student, class, school, and municipality data and provide a clear picture of the student's progress. The teacher should also be provided with material regarding each topic and offer guidance on teaching the subject at different grade levels. Schools could use the centralized solution as the basis when teaching digital skills and use additional materials as a supplement.

3.4   Thinking

The second phase, thinking, determine the strategic direction of the service design project (Moritz 2005, 128). The purpose of this phase is to encapsulate the collected data into a compact, easy-to-understand form that's easy to use in the other phases of the process (Alhonen & Iloranta 2021, 11-13). In this phase, data is identified and analysed with the purpose of finding the problems. The findings set the direction for the project, and the targets, are the basis for the vision of the new concept. The methods used in the thinking phase can, for example, CATWOE and mind-mapping (Moritz 2005, 130-131).

CATWOE is an analysis tool in the form of a checklist to help analyse the business problem (image 11). The acronym consists of the first letters of the following elements on the checklist: Customers, Actors, Transformation, World view, Owners, and Environment (Moritz 2005, 202). CATWOE analysis tool was used to define further the purpose of creating digital citizenship content.

Customers	Schools and districts: administrators, teachers, students
Actors	Content creators, developers, marketing, sales and customer service.
Transformation	From typing to inlcude Digital Citizenship: expanded learning content.
World View	Keyboarding is a niche product. Combining it with Digital Citizenship material can be beneficial.
Owners	TypingMaster Finland Inc. Board of Directors
Environmental constraints	USA and Finland only. Expanding the material to more markets would require assessment of local Digital Citizenship standards and translation in the local market's language.

Image 11: CATWOE Analysis.

Customers refer to the users of the service. In digital citizenship courses, the end users are students, but teachers assign the activities to students. School or district administrators, in general, are responsible for the purchase process. While not directly involved with the study material, they provide access.

Actors are the key persons involved with the service making it happen. The content creators responsible for the pedagogical approach are the key actors in developing digital citizenship lessons. The developers ensure that the material is accessible from the platform. The marketing department generates interest by communicating information about the lessons to customers. The sales department turns the interest to sales through free trials, and customer service is available to help whenever assistance is required.

Transformation answers the vital question of how the business will change. The company has been in the industry for 30+ years, always focusing on providing keyboarding lessons. Adding digital citizenship material to the lesson curriculum transforms the material offering into a more general learning content provider. It opens the possibility of expanding the material even more in the future.

World view refers to the broader context of how the customers' view of the world is affecting the business. Keyboarding is considered a niche skill mostly taught as an extra activity rather than vital for learning. As schools' budgets are increasingly tight, it's essential to consider whether to spend money on a keyboarding curriculum or an ed-tech platform providing curriculum-specific learning material. Keyboarding is an integral part of digital citizenship, and providing both materials together can benefit the company's competence.

Owners are the persons with the highest authority on transformational change. The company's Board of Directors holds the final decision on large-scale projects such as developing digital citizenship lessons.

Environment describes the limitations that may affect the implementation of the service. The digital citizenship lessons are limited to two geographical areas: USA and Finland. Developing the lessons is a demanding project, requiring significant dedication to ensure that the material is suitable for both markets. Should the company expand the material to other markets in Europe or Asia, changes are likely required according to each country's digital citizenship standards. Everything should be translated into the local language.

Mind mapping is a helpful tool for documenting thoughts and connections. The basic idea of a mind map is to have the central idea of which lines, symbols, words, and images are connected to create a map of connected insights, ideas, and solutions. Understanding different systemic connections is essential in the service design process, and a mind map helps visualize them (Moritz 2005, 205).

The data collected in phase one gave us lots of information we needed to process before moving on to generating ideas. Mind-mapping the customer insights from interviews and surveys helped pinpoint the most crucial ones to focus on. It gave us a helpful map for future learning material and platform development.

With the help of a mind map, visualized in image 12, we could categorize the findings into different topics and evaluate how helpful the content we were planning to produce would be for teachers. Even though this thesis involves only the development project of the lessons for students, we need to consider the bigger picture: how the material will be used.
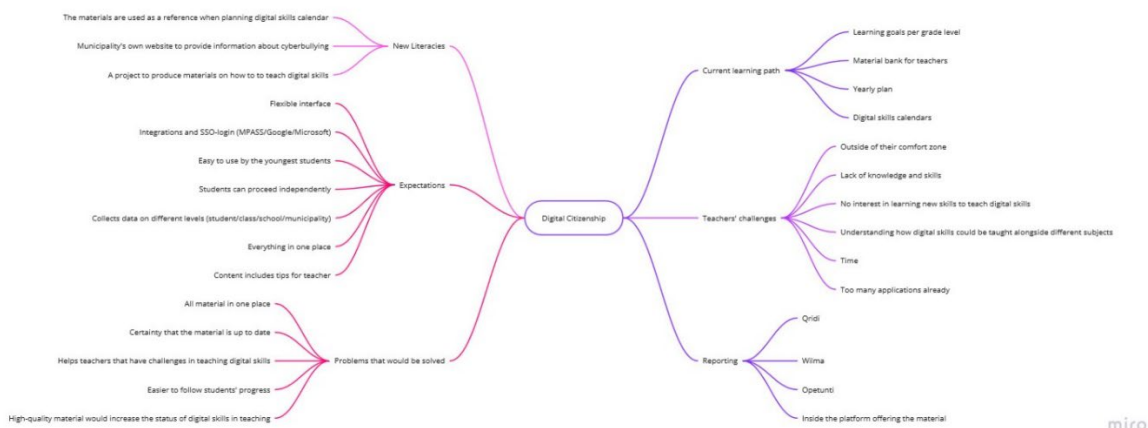

Image 12. Mind map showing the customer insights based on themed interviews and survey.

By incorporating the digital citizenship learning material inside the current keyboarding platform as a new course, teachers would benefit from not having to learn a new tool. Keyboarding is included in the core curriculum in Finland, and it's also included in New Literacies. The platform already features the integrations schools are looking for, and the reports to follow students' progress would also be visible in Teacher Dashboard.

The purpose of the think tank is to discuss with experts to develop a solution based on questions, problems, or ideas. A think tank is a helpful tool to involve the senior staff and extend the service strategy to set objectives, criteria, and direction for the project. (Moritz 2005, 207)

Multiple think tank sessions were organized between the company's different departments to have a sense of the scope of the project initially. The information gathered in the project's first phase gave us an excellent insight into the requirements on the district and school levels and how much material would be required to cover the standards.

During think tank sessions, we planned how to proceed with the project. We needed one person to lead the overall project and another to lead the content creation. Anssi Väliaho was selected as the project leader, while I took responsibility for the content creation. Anssi and I held one-on-one meetings where we discussed the direction of the project, the budget, and the steps to proceed.

To develop digital citizenship lessons, we needed to focus on specifying what the content creation project required. We needed internal content creators with a pedagogical background; therefore, the first step was to start searching for content creators with experience in creating digital learning material and knowledge about digital citizenship.

To find content creators, we reached out to Education Alliance Finland's Olli Vallo. Education Alliance Finland (2023) offers evaluation and certification services for ed-tech companies and to improve pedagogy. We previously worked with Olli and his team with good results when developing typing games for elementary students. After explaining our concept and our need, Olli was able to recommend potential content creators, and upon contacting them, we soon had a list of candidates to organize meetings with. We introduced the project to the candidates and discussed their experience and interest in collaborating with us. We proceeded to the parallel design method (Chapter 3.5) with the content creators, that expressed their interest and confirmed they would have time to dedicate to this project should they be selected.

A specification document describes the scope of a Service Design project representing a detailed description of the goals and success criteria. The document can grow during the project's duration based on new insights but always in line with the Service Strategy. The specification document is helpful for the team to ensure that the project stays on schedule. (Moritz 2005, 206)

The project specification was compiled into a PowerPoint presentation, which also helped us easily show where the project was heading in the meetings instead of browsing through a long, written document. The specification document included goals and success criteria, a schedule that was updated accordingly, and a budget that included all the costs involved with the project. We also created a separate task list on Teams where team members could quickly check which tasks were due and what had already been completed.

3.5   Generating

In the third phase of the Service Design process, it's time to start generating ideas. The purpose is to develop new innovative ideas, concepts, and solutions to problems, always considering the customer's needs. Ideation requires creativity; therefore, selecting the right team and a proper and inspiring working environment is vital (Moritz 2005, 132). It's essential to think about how to create value for the customer, what the customer would appreciate, how to make the service more accessible, and what the pain points are. Efficient methods for ideation are, for example, brainstorming and Lotus Blossom -methods that are easy to carry out either in a group or alone (Alhonen & Iloranta 2021, 15-16). The problems and challenges in the ideation phase are usually too early for a critique, too ordinary or too abstract ideas that can't be executed (Kantojärvi 2012, 123). It's important to define what the ideas are generated for, give clear instructions, and pursue as many ideas as possible to allow creativity. In this stage, the purpose is not to criticize or concretize, which is done in the later phase. (Kantojärvi 2012, 132-133)

The same brief is given to two or more teams to work on in the parallel design method. The goal is to brainstorm or prototype ideas for the same problem, which can then be compared. The teams can be swapped at some point to allow them to continue working on the concept the other team has already started. This method promotes fresh and different views on the same subject and the outcome and produces multiple useful solutions. Various elements from different ideas can be combined later to create one strong concept. (Moritz 2005, 213)

We used an adapted parallel design method to explore how the content creators would approach different topics. The content creators were sent test package instructions (appendix 7) which included six different pre-selected topics from the standards in English or Finnish. The content creators could freely choose any two topics to create a 20–30-minute lesson on both. The lessons didn't need to include animation or sound at this stage; the purpose was to understand what they thought the lessons could be like.

After receiving the submissions, the company reviewed the lessons to select the creators we were keen to work with. The company consensus was unified, and three content creators were chosen to move forward with. These creators were then invited to one-on-one meetings where they were presented with the lessons created by the other content creators, as shown in image 13 below. The creators were asked to give their opinion about the quality of the lessons, what changes they would make, and if they were prepared in working together.
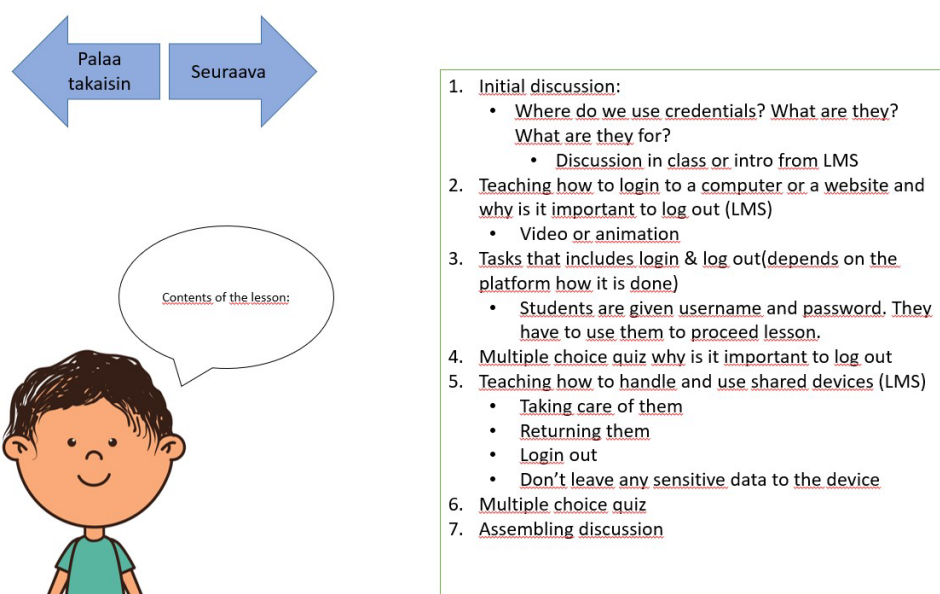

Image 13. Example of a lesson produced by the parallel design method.

Having more than one creator to spar with each other while creating the lessons was important. The selected three content creators had individual strengths that they could bring to the creation process. The first creator, Pui Ying Law, was very well acquainted with the fundamentals of digital citizenship and security and the US school system. The second creator, Jarno Bruun, knew the New Literacies and could assess that the lessons aligned with the requirements. The third creator, William Muallim, was experienced in carrying out similar content creation projects on a more extensive scale and was familiar with Storyline 360 (Articulate 360, 2023) tool used to produce the lessons and became the leading content producer.

Idea interviews are organized with experts or clients to introduce an idea or a concept. The interviews generate more understanding and help to develop the ideas further. The basis of the interview can be a simple idea statement or a prototype. (Moritz 2005, 212) The parallel design method outcomes were shown to Olli Vallo to get his perspective. The lesson concepts were very different, with Pui's vision focusing on the lesson plan and the teacher's point of view guiding the lesson. At the same time, Jarno and William brought in the gamified elements. Olli's expertise helped us to

evaluate how we could combine the different aspects of the concepts to produce high-quality learning material.

3.6   Filtering

After generating ideas, it's time to filter or select the most interesting and useful ideas. In this stage, evaluating the feasibility of the ideas and measuring their efficiency and quality is recommended. The decision-makers should be included in the filtering phase (Moritz 2005, 136-137). Voting or evaluation matrices are helpful tools that can help with filtering. The criteria can be the attractiveness of the idea, business potential, or how it generates value for the customer. It's also important to consider whether the idea is realistic and how easy or difficult it could be to carry out. The essential purpose of filtering is to select the ideas that will be taken forward into prototypes. (Alhonen & Iloranta 2021, 18)

Generating and filtering phases were intertwined when creating the lesson content. The process began by sorting out the standards by key competencies: Digital Literacy, Computing Systems, Networks & Internet, Data & Analysis, and Impact of Computing. Each key competence was then dissected into smaller chunks by focusing on the standards and sub-standards by grade level. We used the Miro board to illustrate which standards could be included in each lesson to understand how many standards we could cover and how many lessons we would be producing. Image 14 shows the breakdown of Computing Systems' key concepts and associated standards.
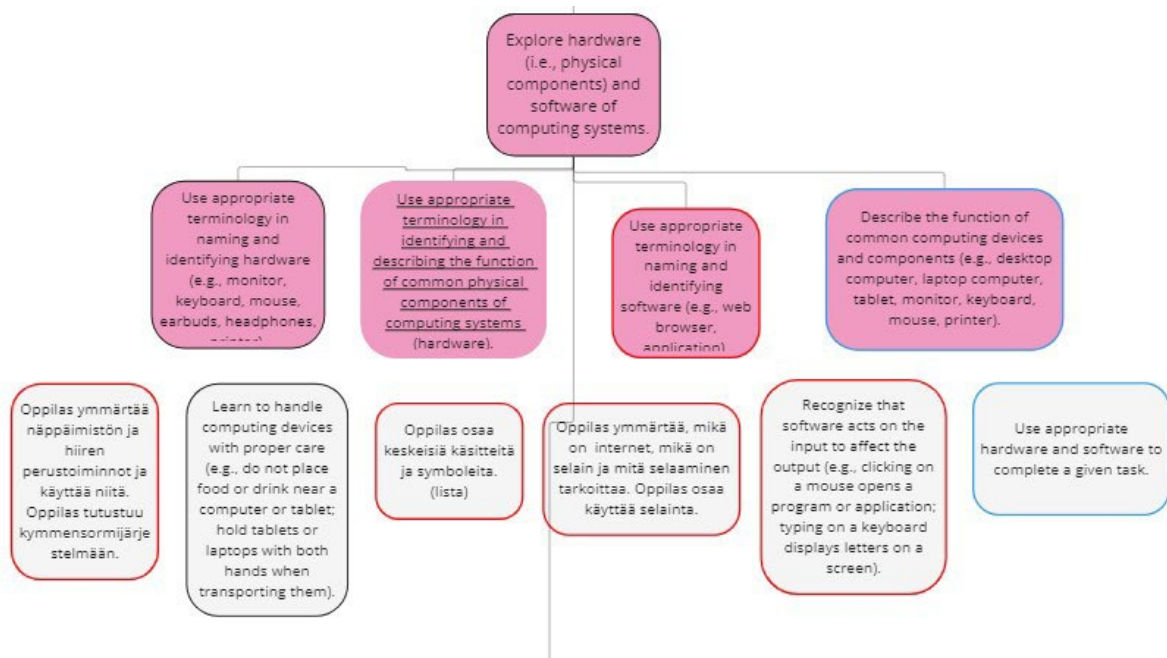

Image 14. Breakdown of Computing Systems key concept in Miro board.

After we had the overall lesson plan ready, we divided the lessons among each content creator and discussed the themes of the lessons. All the lessons were created in English first and to be localized into Finnish later. Since the lessons were built for K-2, we knew the lessons needed to be suitable for 6-8-year-olds with limited reading skills and understanding of abstract concepts. Kids learn by playing, and we set out to plan a gamified experience that would also teach the skills required in the standards. The original gameplay is explained in detail in appendix 8.

The company's existing customers are very familiar with the keyboarding courses and the island theme, where students proceed from the ocean depths to the beach and finally to the top of the mountain on the island after typing different exercises. For the K-2 digital citizenship course, we came up with a group of DigiSmart Islands, as shown in image 15, that were named according to the key concepts the kids would be learning.

Image 15. DigiSmart Islands

DigiSafe Island features password and online privacy, netiquette, and cyberbullying lessons. Digi-Ware Island hosts hardware, software, and troubleshooting lessons, while DigiNet Islands tackles

crucial lessons about the internet and browsers. DigiData Island focuses on the types of data, data storage, and how to display data in various formats, and DigiFuture Island looks at how technology has changed our society.

In addition to the islands, the kids are introduced to six different cat characters. DigiCat is the main character traveling around the islands, helping their friends Marshmallow, Dr. Glee, Little Furry, Evil Hacker, and Creepy Paw, and learning simultaneously about digital skills. We requested a graphic designer to give us different options to vote from. Image 16 shows the final characters with different facial expressions; each character was given 12 expressions that were used throughout the lessons in various situations.

Image 16. Cat characters.

Each island follows a different storyline based on the topic, described in detail in the gameplay document (appendix 8). Each lesson includes short teaching sections to explain the concept, followed by an activity to test how well students understood the lesson topic. Teaching sections and activities alternate throughout the lessons, building on what was previously learned. The activities include gamified sections where students are, for example, proceeding through a maze or collecting keys to advance in the lesson. Scored activities determine if the student passes the lesson and include activities like drag-and-drop, quizzes, and combining the correct answers. Learning is

awarded with a badge at the end of the lesson, showing that the student has mastered the topic. The badges will be later displayed in the reports section of the user interface.

Before testing the prototype on actual customers, a quick and cost-efficient way to evaluate the implementation and usability problems is to have experts on board to try it out and get their perspectives. The experts are able to identify issues and pitfalls quickly due to their experience in the field. (Moritz 2005, 219)

The first lesson prototypes were introduced in May 2022 to Olli Vallo and a group of Finnish teachers with a background in lower elementary and knowledge of New Literacies. The prototypes featured placeholder graphics while we were still waiting for the characters from the graphic designer.

The first iteration round gave us an excellent understanding if we were going in the right direction with the lessons. Teachers were quick to understand what the activities were aiming for, and the most significant shortcomings were related to the wordiness of the exercises. In addition to showing text on screen, especially the youngest students also require visual aids to understand the concepts and audio that would read the text out loud to help the youngest students that are not yet fluent readers.

The experts appreciated the lesson structure, where the concepts were introduced to students little by little. In between teaching about the concepts, students were given games and activities to complete to enhance their learning before moving on to learn more. Learning was amplified with quizzes and exercises that would repeat what the students had just learned.

The content creation picked up rapidly after the first iteration round, and the lessons were given more interactive elements to support gamification. Accessibility standards were kept in mind by keeping the on-screen text large. Storyline 360 features built-in accessibility features in the player, allowing students to zoom in on the material and switch to the accessible text, which basically increases the font size even larger.

Accessibility standards require the ability to listen to the on-screen text. Storyline 360 has a text-to-speech feature that converts the text into speech and inserts it into the timeline, just like any other audio file. We found the in-built feature too robotic and decided to use Play.ht (2023), an AI-powered text-to-voice generator instead. Play.ht offered a more comprehensive range of voices that fit better for children's learning material. During the filtering phase, when we were testing different ideas, and the text kept changing, Play.ht was a flexible and valuable tool allowing us to quickly generate new audios without waiting.

3.7 Explaining

Explaining is the next phase in Moritz's (2005, 123) service design process. The purpose of this phase is to visualize an idea or a concept and test it with customers. The stakeholders must be able to explore the planned concept and try how it works. The goal is to gather feedback and understanding to help develop the concept further (Moritz 2005, 140-141). With the help of a prototype, ideas can be visualized in a simple manner. A prototype doesn't have to be a polished end-product but aims to generate conversation and understand the possible problems. With the prototype, a concept can be tried out with the customers and gather feedback. (Alhonen & Iloranta 2021, 19-21)

The service must be put into a temporary existence to test the prototype in real life environment. The purpose of experience prototyping is for the customers to use it in as normal conditions as possible. This may require lots of effort in creating a space and setting for the service, but it's crucial to make sure that the service experience is as close to similar to a real-life experience. (Moritz 2005, 225)

The majority of prototyping took place in June 2022. Despite our efforts in getting a hold of teachers to set up Teams workshops for testing, we had to come up with new solutions. We decided to utilize our email list of more than 30,000 educators in the USA and send a newsletter first to technology teachers with a link to one lesson as a preview and two weeks later to all teachers. The newsletter included an additional call-to-action for teachers to click on if they wanted to review extra lessons. This way, we got a hold of educators genuinely interested in giving their thoughts about the lessons. Altogether 144 teachers signed up to review more lessons during June. More than 54% of the subscribers opened the emails, and 37 teachers ended up giving vital feedback on the lessons.

A similar email was also sent to Finnish teachers, and a review link to a lesson was published in our blog. The blog post was also advertised on Facebook to all Finnish teachers to maximize visibility. In addition to the blog post, we found three enthusiastic Finnish K-2 teachers through our content creator contacts to review all the lessons. This cooperation was significant for us at this stage since it took a lot of work to find dedicated teachers to play all the lessons and give instructive feedback.

Our Storyline 360 subscription included a review feature that allowed us to publish the prototype lessons as links available via web browser without having to log in to the platform itself. The comments were shown on the review page next to the lesson, connecting the comment to the slide it was referring to and making it easier for us to understand where the possible problem was. All the

comments were also shown in the feedback section, which could be read continuously and was organized by corresponding slides (image 17).
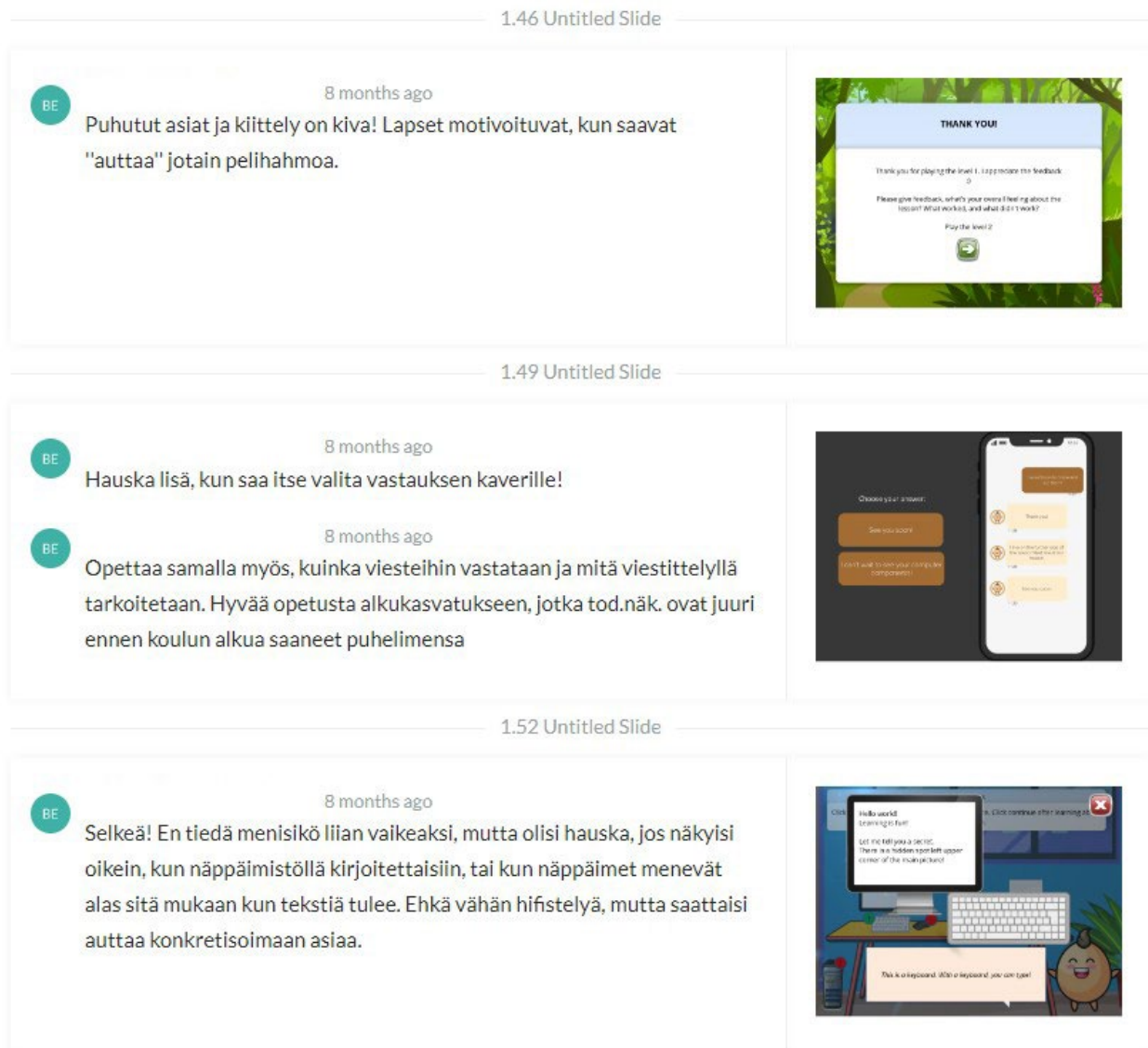

Image 17. Storyline review tool.

The feedback gathered after sending multiple emails and contacting teachers was worth it. Although the number of teachers giving feedback was lower than we had hoped for, the quality of their feedback was top-grade. Teachers pointed out which of the activities for working well and gave thoughtful feedback on what could be improved and if they thought the language was too difficult or the concepts were still hard to understand. Although informing teachers that voiceovers would be included in the final version, this missing feature from the prototype was the most commented on.

Moritz recommends that the service or component should be tried out also by the Service Design team members. It allows us to try the service as a customer and understand what they think. It's important to emphasize to the team members to try the service as a person with feelings rather than making a robotic observation to tick off what works technically and what doesn't. (Moritz 2005, 232)

The lessons were honed during July and August 2022 based on teacher feedback. Voiceovers were added, and graphics were updated to the ones received from the graphic designer as we approached the deadline for publishing the pilot version in the USA for our largest customer. Before the launch, the company's employees were asked to play the lessons as customers. One of the company's game designers has a background in early education, and he played all the lessons providing us with helpful feedback regarding gamification. Other employees played the games with their children to get authentic feedback from the eventual end-users.

3.8   Realising

The final phase in the Service Design process is realising, which is when the solution or a concept is implemented. This phase includes all the planning and execution required to bring the service into the market. Continuous evaluation of the concept is essential because the service environment and the market are constantly changing, and therefore the service concept should also be developed along with the change (Moritz 2005, 144-145). Monitoring and development should be constant, and it can be made easier by using an annual clock. The performance of the concept should be evaluated using different measures to see the value of the resources. (Alhonen & Iloranta 2021, 22-24)

The pilot lessons for the US customers were implemented inside the TypeTastic platform in early October, slightly late from the original schedule. The pilot included 12 lessons altogether. Some lessons, e.g., Password and Online Security, had two levels instead of just one. The first level was targeted at kindergartners and the second at 1st and 2nd graders. The lessons were easily available for the schools using TypeTastic, in their own tab on the student side, as shown in image 18. The tab will only be visible if the teacher has enabled the digital citizenship lessons for their class. The pilot only allowed students to play the lessons; it didn't save scores or produce progress reports for the teacher.

Image 18. Digital Citizenship User Interface inside TypeTastic.

We added metrics into Amazon AWS S3, the host of the digital citizenship lessons, to gather data about how many times the lessons were loaded from the server daily. This only gave an estimation of the usage; we needed information about the possible problems or what teachers and students thought about the lessons. While trying to gather feedback from the USA, we localized the material into Finnish, and the translations were finalized in early December.

Service prototype is similar to experience prototyping, where the service ideas and components are tested in real life. This requires the service to be put into temporary existence and the people using it to have as natural and real-life conditions as possible. (Moritz 2005, 237) Since getting proper feedback from the USA proved difficult, we decided to take the Finnish lessons to another test round in classrooms.

For classroom testing, we contacted Education Alliance Finland again and explained our need to Saila Juuti, Head of Product & Co-Founder. Saila didn't have time to conduct the classroom tests and recommended taking Petra Raivonen from Creaamo on board to help run the tests. Creaamo (2023) helps companies build their training materials or products to support learning and provide content production support.

After the first meeting, we agreed with Saila and Petra that they would start drafting a plan for classroom testing. In addition, they would also complete an expert evaluation of the usability of the lessons. The evaluation report was received in mid-January 2023 with a focus on critical bugs that prevented completing the lesson and must be fixed before classroom testing, notable errors that will most likely be reproduced during testing and should be fixed, and cosmetic bugs that probably won't cause problems but would need to be fixed at some point. In addition, the report included remarks about pedagogy, accessibility, and fluency.

We discovered that most of the issues mentioned in the report were cosmetic and easy to fix, and even the critical bugs resulted from Storyline 360 export errors. According to the report, the main problem with the material was the sometimes-busy lesson view with many icons visible. The audio icons were placed next to text boxes simply because iPads don't support audio play by hovering over the text boxes. The problem was solved by adding a setting that would hide or show the audio icons to the user's preference. The fixes took around three weeks, and we could finally start classroom testing in the second week of February 2023.

The classroom tests were completed during one week in February in Rajatorppa and Hiekkaharju schools in Vantaa with six pre-schoolers, sixty-five 1st graders, and seventy-eight 2nd-grade students. The student played eight different lessons altogether in varying conditions; the class size played a significant part in how easy it was to instruct students what to do and take notes. It's also worth noting that these two schools have many language classes, and the difference between students' skills can be pretty significant. In addition, Hiekkaharju school has lots of S2-students (Finnish as their second language), which plays a substantial part in how easy to understand the lesson materials should be.

The classroom test report gave us much to think about. Overall, the students liked the characters and thought the lessons and activities were fun to play. The teachers considered the topics very important and would definitely use them if they had access. However, the lessons' vocabulary was considered too complicated, they contained too much text, and the audio needed to be shorter. Teachers were hoping for more visual instructions, and due to the lack of them, students didn't fully understand what was being taught. Some of the lessons were too difficult for pre-schoolers and even for 1st graders, and some of the games had some usability challenges.

4 Conclusion

The primary question of this thesis was to learn how service design methods can help with creating digital citizenship learning material. Understanding the users and their needs is critical. User-centric content can be created using service design methods to build understanding and by taking the users to review further and develop the lessons in workshops and classroom tests.

The first sub-question was to understand the most significant barriers to teaching students digital skills. When planning digital learning content, we must consider educators and students. While the content is targeted at students, it also needs to serve educators. Teachers' primary concern about teaching digital skills is the lack of confidence in their digital abilities, and they feel uncomfortable teaching skills they don't have enough knowledge about.

The second sub-question was to learn what teachers expect from a digital citizenship course. Despite having digital learning paths for students, the materials are combined from various sources, and there needs to be an equal way to teach these important skills. A centralized solution that saves students' progress, provides teacher material for each topic, and is available via MPASSid integration would provide much-needed help.

The requirement for digital skills has become more and more critical since the COVID-19 pandemic. The digital world is also constantly changing. Technology evolves, and new ones emerge, making it difficult for teachers to stay on top of things. Teachers need to be able to trust that the material they use for teaching is up-to-date and reliable. By using learning content from a trustworthy operator, teachers can focus on teaching instead of spending time gathering the material from different sources.

4.1 Evaluation of the development project

The timeline of the project was decided according to the needs of the largest customer in the U.S. In a project like this, where the content to be produced is new to everyone on the project team, it would be wiser to provide an extended timeline and adjust accordingly if the content appears to be ready sooner than expected. Lesson content development is a creative process that includes multiple factors that can affect how quickly the content is ready. Customers are always delighted to get what they ordered earlier than what was agreed upon rather than having to wait longer.

Collaboration between the content creators and the company was fluent throughout the project, which is extremely important. Having a constant dialogue between all the project participants helps ensure that everyone is aware of where the project is heading. The creators had an excellent understanding of the key concepts and how to structure the content. In hindsight, it would have been

beneficial to have an early education teacher on board from the beginning, to help with the language and ensure that the content was easy to understand, especially by kindergartners and 1st graders.

The content creation, from ideas and concepts to functional lessons, was carried out mainly by the leading content creator, with my assistance when required. It would have been more efficient if all the content creators had been able to create functional lessons by themselves, and the leading content creator could have finished them. When designing so many lessons at once, agility in content creation makes all the difference, and during this project, most of it was on one man's shoulders.

The iterative process of service design is perfect for content creation. To develop valuable content, it needs to be tested and evaluated by the actual users. By testing in the classrooms, we could see the usability problems and if the students were engaged. Teachers helped to evaluate pedagogy and how it could be improved. Ultimately, the purpose is to develop a solution to benefit teachers and students.

4.2   Follow-up and improvement suggestions

Online lessons should be constantly reviewed and evaluated. The first release of the lessons is only the beginning of the extensive content creation journey. To ensure the content stays relevant, the material must be revisited and updated frequently. On-going conversations with the teachers must be established to identify the issues that may prevent them from using the learning material in the classroom.

Customer insight is needed at the beginning of the content creation project and when the lessons have been published on the platform. It would be helpful to create a straightforward process of how the company will continue collecting data on the usage of the lessons. Instead of relying only on survey feedback, interviewing customers can provide much more in-depth knowledge regarding using digital citizenship lessons and the overall platform.

The K-2 lessons were created first in English before localizing them to Finnish due to the timeline given at the beginning of the project. Due to the difficulties with organizing a proper testing environment in the US where we could collect appropriate feedback, the materials created for grades 3-6 should be completed first in Finnish. This would help us to improve the iterative process and take the prototypes into classrooms as early as possible. We can co-create the lessons with educators and students by taking the lessons into the classroom environment early on. In addition, students can learn from a real ed-tech company how digital material is developed and provide their ideas of how the material could be more engaging.

There may be more useful solutions than grade-banding the material for multiple grade levels. Kids' cognitive skills are very different depending on the grade level, and that should be considered when creating more material. Each grade should have individual lessons based on the key competencies defined in the standards and New Literacies development program. The lesson storyline can remain the same, but the content can gradually get more difficult the higher the grade level. Grade 3 lessons, for example, should follow the same path as K-2 lessons and include an equal amount of text as the lessons for Grade 2, but for Grade 6, the text portions can consist of more text and more complex key concept explanations. This contributes to the ongoing understanding of the concepts when students repeat the lessons on different grade levels, learning more about the subject each time.

If we continue creating ten or more lessons at once for different grade levels in the future, I suggest finding one or two additional content creators to help with putting the lessons together. Together, they could divide the workload and focus on specific tasks, thus speeding up the process. Later, one person could continue with the process when the material is ready and needs to be revised and updated.

5   Validity of the research

A Master's thesis aims to demonstrate the student's ability to apply research data and use selected appropriate methods to analyze and solve problems in working life, thus demonstrating their capability for demanding expert work (Haaga-Helia, 2023).

The qualitative research methods used in this project were selected by the project team leader and myself, complete with my own research using different service design methods. The number of respondents could have been higher, but on the other hand, the answers were very alike, and the consensus was clear that there is a need for digital citizenship learning content. The lesson content creation for grades K-2, to which this thesis is limited, was planned by the project team and approved by the CEO, Hannu Sehm, and the company's owners, Petteri Väliaho and Tommi Utriainen.

Iteration rounds were planned by myself and the project lead, and the iteration process will be used and developed further along the content creation process. The classroom testing was planned with Saila Juuti and Petra Raivonen, and Petra was present with the teacher and students during the first testing. Later, the process will be amended so that a teacher or one of the company's employees can carry out the classroom tests without Petra's attendance.

References used in this thesis are mainly professional literature available as e-books from Haaga-Helia's virtual library. Additional references include links to official websites of applications, bodies of government, and research papers that were used as tools or sources of information during the development.

The process was documented digitally in Microsoft Teams folders and conversations. I also took notes on each meeting as a reminder for myself of what we had agreed on and to have a recollection of how the project proceeded. The lesson layout is visible to the entire team in a Miro board, including the corresponding US state standards, CSTA standards, and New Literacies competence requirements. Classroom testing documentation was created as the result of the cooperation with Education Alliance Finland and Creaamo.

My employer, Typing Master Finland Oy, commissioned this thesis. The unfinished work was sent to the CEO, Hannu Sehm, and the project lead, Anssi Väliaho, for comments before the thesis was returned for evaluation. The project team will continue developing the materials produced during the process.

6   Discussion

The learning content development project has been very eye-opening in many ways. This was the first time the company stepped outside its comfort zone to develop something other than keyboarding content. Digital citizenship learning materials tackle various topics, and the pedagogy behind them differs significantly from teaching keyboarding.

The inexperience in tackling a project of this scale was evident from the beginning, and it took a good while before a final decision was made to start the content production. The schedule was already rather tight, with the delivery of the K-2 lessons in the USA promised for August, and the Finnish translation was projected for October. We could only start the content production in April. When the first lesson prototypes were ready in May, it wasn't easy to find dedicated teachers to review and test the material.

Using service design methods proved to be a useful way to develop learning content. Even though some of the phases were intertwined, the basic idea of service design was carried out. It would have helped to have a more precise project plan for iteration rounds and the objectives each iteration round aimed for. We can take this knowledge for the next part of the project when developing lesson content for higher grades.

This thesis follows the content creation until the final phase of the service design process, where the lessons were taken into classroom evaluation. After the evaluation, the lessons were modified accordingly, and the iteration process continued until the material met the objectives to pass the classroom testing.

Everyone in the company learned a great deal from this project, and we can utilize the knowledge in other areas of the business as well, such as platform development. This has been an exciting journey for me, being able to use service design methods and seeing how the lessons come together as a result. I'm looking forward to using service design more in my work, as it provides a straightforward process and beneficial results.

I'm excited to see how the materials continue to transform in the next few years. Like keyboarding, we can be at the forefront of teaching these important skills to everyone in Finland, from kindergarteners to adults. Even though the development process started from K-2 lessons, we can expand the material to cover all ages. The subjects are broad in range and offer many possibilities, from stand-alone online courses to face-to-face training sessions with teachers.

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Appendices

Appendix 1. Net-scouting Analysis

	BrainPop	Common Sense	Digiseikkailu	Digitaidot	EduTyping	Keyboarding Without Tears	Learning.com	Neptune Navigate	Spoofy	Typing.com	TypingClub	Yeti Academy
URL	https://www.brainpop.com/	https://www.commonsense.org/education/digital-citizenship	https://digiadventurers.com/fi/	https://www.kuulo.fi/digitaidot-peli/	https://www.edutyping.com/	https://www.lwtears.com/solutions/technology	https://www.learning.com/easytech/	https://neptunenavigate.com/	https://www.spoofy.fi/	https://www.typing.com/student/digital-literacy	https://www.typingclub.com/	https://yetiacademy.com/digital-citizenship-curriculum/
Languages	EN, ES, FR	EN, SP	EN, FI	FI	EN	EN, SP	EN, SP	EN, SP	FI, SE	EN, ES, PT	EN, DE, ES, FR, PT, CH, RU, SL, IT, BU, PO, MA, SE	EN
Standards	ISTE	Common Core (ELA), ISTE, CASEL, AASL, TEKS	N/A	TIEKE digital learning standards	Common Core (CCSS-A)	Common Core (ELA), ISTE, CASEL, AASL, TEKS	Common Core, ISTE, CSTA	N/A	N/A	ISTE, Common Core, State	ISTE	Common Core, NGSS, ISTE
Grades	K-8	K-12	K-6	Adults	K-5	K-5	K-8	K-12	K-2	K-12	K-5	K-12
Learning material	Digital Literacy divided into several sections, including coding. Each section contains an information video and exercises related with the video. Various exercises, eg. Quizzes, identify items, mindmaps	73 lessons across 13 grades with 32 videos. Characters and song videos, digital dilemma scenarios, select lessons also have interactive games and extension activities.	Adventure maps for different grade levels, each including age appropriate gamified activities.	A card game including 75 activity cards and 64 truth cards divided into six topics. The cards describe different situations in everyday life and players can use their smartphones or tablets to complete the	Lesson content presented in short, narrated videos, followed by lesson content in graphically illustrated text format, downloadable worksheets and quizzes.	Limited demo included a narrated video and drag&drop exercises to test how well students have learned the topic.	EasyTech includes the entire Digital Literacy material divided into 8 different topics. Lessons include narrated videos, interactive content and adaptive sequencing.	Narrated videos followed by interactive knowledge checks, reading assignments and quizzes.	Interactive mobile game that teaches about cyber security and cyberbullying.	Narrated video and a quiz in the free material. Licensed material could include more interactive exercises. Videos are also available as transcripts.	Narrated videos and animated exercises eg. Identification, drag & drop and quizzes. Plenty of activities.	Narrated videos and gamified exercises. Engaging storytelling, students are taken to different parts of the Yeti world.
Price	N/A	Free for educators	6,90€/student / 6 months, 9,90€/student / school year	Free for the use of associations	$10.99/student/year. Min. 25 students. Price/student is lower the more licenses you purchase	$9.99/student/year	$9.99/student/year	N/A	Free	$9.59/student/year. Price/student is lower the more licenses you purchase, down to $1.37/50.000+ licenses.	Bundle: $14.50/student/year (min. 20 students), Digital Citizenship $4.99/student/year (min. 20 students)	N/A
Comments	Demo material very limited. BrainPop is very popular and the few activities that were able to try out were very well made, high quality animation and pedagogy on various	The market leader, extensive learning material developed together with Harvard University. Includes family engagement resources in various	Doesn't have MPASS integration. The material has pedagogical elements but the activities are poorly assembled.	Not for schools but demonstrates how digital citizenship can be taught for students with disabilities.	Lots of reading for younger students. Cyber Citizenship is combined with Computer Basics which investigates how computers work.	Has licensed Common Sense material.	Learning.com offers both Digital Citizenship and coding. The platform is very old, expecting a big update in the next few years.	The material itself is well made, although it doesn't have much gamification.	Focuses on only one important topic of digital citizenship. Doesn't include media literacy.	Digital Citizenship material consists of Computer Basics + Internet Basics.	Rebranded as EdClub, includes TypingClub keyboarding + Vocabulary & Spelling, Digital Citizenship and SEL (Social Emotional Learning).	The same company with TypingAgent. Includes lessons for coding. Digital Citizenship themes are repeated in different topics.

Appendix 2. State standards for K-2

Kindergarten

How to use applications

Standard 1: Use software applications to create an authentic product.

The student will:

- Recognize a program to use for word processing.
- Recognize a program to use for creating presentations.

Safe use of a computer

Standard 2: Learn the fundamentals of digital citizenship and appropriate use of digital media.

The student will:

- Understand safety rules when using a computing device.

Standard 3: Exhibit responsibility when using connected computing devices.

The student will:

- Learn how to protect personal information (e.g., username, password).

Keyboarding

Standard 4: Demonstrate effective keyboarding skills on a computing device.

The student will:

- Locate letter and number keys.

Networks and the Internet

Standard 1: Discover that computing devices and the internet enable us to connect with other people, places, information, and ideas.

The student will:

- Recognize that people can communicate with others by using connected computing devices (e.g., cell phones, tablets).

Impact of computing

Standard 1: Understand how computing devices have changed people's lives.

The student will:

- List different ways in which computing devices are used in your daily life.
- Discover how some tasks can be completed with or without a computing device.

Standard 2: Discover how computing devices have affected the way people communicate.

The student will:

- List different computing devices used for communication.

Grade 1

How to use applications

Standard 1: Use software applications to create an authentic product.

The student will:

- Produce a simple sentence using word processing software.
- Create a simple presentation with text and/or image.

Safe use of a computer

Standard 2: Learn the fundamentals of digital citizenship and appropriate use of digital media.

The student will:

- Demonstrate appropriate behaviors toward others when using a connected computing device.
- Recognize and avoid harmful behaviors (e.g., sharing private information).

Standard 3: Exhibit responsibility when using connected computing devices.

The student will:

- Demonstrate how to log in and log out from a connected computing device.
- Recognize the importance of logging out from a connected computing device.
- Recognize the difference between public and private information (e.g., personal information).

Keyboarding

Standard 4: Demonstrate effective keyboarding skills on a computing device.

The student will:

- Locate and use letter and number keys.
- Demonstrate the location of the home row keys.
- Develop proper keyboarding technique when keying letters and numbers (e.g., use both hands; utilize proper finger placement on home row keys; use letter and number keys).

Networks and the Internet

Standard 1: Discover that computing devices and the internet enable us to connect with other people, places, information, and ideas.

The student will:

- Recognize that the internet can be used to gather information.
- Identify ways to connect with other people (e.g., direct message, voice talk, email, video chat).

Impact of computing

Standard 1: Understand how computing devices have changed people's lives.

The student will:

- Recognize that many different careers use computing devices.
- Describe how some tasks can be completed with or without a computing device.

Standard 2: Discover how computing devices have affected the way people communicate.

The student will:

- Describe the different ways people can communicate using computing devices.

Grade 2

How to use applications

Standard 1: Use software applications to create an authentic product.

The student will:

- Create text documents using a word processing program.
- Format a text document using a word processing program (e.g., change font style, including underline, italicize, bold; change font size).
- Create a multi-slide presentation with graphics or images using presentation software (e.g., create a new slide; rearrange slides).

Safe use of a computer

Standard 2: Learn the fundamentals of digital citizenship and appropriate use of digital media.

The student will:

- Demonstrate how to use appropriate behavior when sending messages online.
- Recognize how to credit work found online (e.g., image, photograph).

Standard 3: Exhibit responsibility when using connected computing devices.

The student will:

- Identify the characteristics of a strong password.
- Discuss the effects of password misuse.

Keyboarding

Standard 4: Demonstrate effective keyboarding skills on a computing device.

The student will:

- Locate and use letter, number, and punctuation keys.
- Demonstrate the use of function keys (e.g., shift, enter, backspace, delete, spacebar)
- Develop proper keyboarding technique when keying letters, numbers, and symbols (e.g., use both hands; utilize proper finger placement on home row keys; use letter, number, and punctuation keys).

Networks and the Internet

Standard 1: Discover that computing devices and the internet enable us to connect with other people, places, information, and ideas.

The student will:

- Gather information from the internet with supervision.
- Identify email as one way to communicate digitally.
- Use technology to work cooperatively and collaboratively with peers, teachers, and others.

Impact of computing

Standard 1: Understand how computing devices have changed people's lives.

The student will:

- Identify the ways that computing has changed throughout society.
- Demonstrate how some tasks can be completed with or without a computing device.

Standard 2: Discover how computing devices have affected the way people communicate.

The student will:

- Explore similarities and differences between in-person and online communications.

Appendix 3. CSTA Standards for K-12

Source: CSteachers.org (CSTA, 2022)

Progression of Computer Science Teachers Association (CSTA) K-12 Computer Science Standards, Revised 2017

Concept	Subconcept	Level 1A (Ages 5-7) By the end of Grade 2, students will be able to...	Level 1B (Ages 8-11) By the end of Grade 5, students will be able to...	Level 2 (Ages 11-14) By the end of Grade 8, students will be able to...	Level 3A (Ages 14-16) By the end of Grade 10, students will be able to...
Computing Systems	Devices	1A-CS-01 Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use. (P1.1)	1B-CS-01 Describe how internal and external parts of computing devices function to form a system. (P7.2)	2-CS-01 Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices. (P7.2)	3A-CS-01 Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects. (P4.1)
Computing Systems	Hardware & Software	1A-CS-02 Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7.2)	1B-CS-02 Model how computer hardware and software work together as a system to accomplish tasks. (P4.4)	2-CS-02 Design projects that combine hardware and software components to collect and exchange data. (P5.1)	3A-CS-02 Compare levels of abstraction and interactions between application software, system software, and hardware layers. (P4.1)
Computing Systems	Troubleshooting	1A-CS-03 Describe basic hardware and software problems using accurate terminology. (P6.2, P7.2)	1B-CS-03 Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies. (P6.2)	2-CS-03 Systematically identify and fix problems with computing devices and their components. (P6.2)	3A-CS-03 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. (P6.2)
Networks & The Internet	Network Communication & Organization		1B-NI-04 Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination. (P4.4)	2-NI-04 Model the role of protocols in transmitting data across networks and the Internet. (P4.4)	3A-NI-04 Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing. (P4.1)
Networks & The Internet	Cybersecurity	1A-NI-04 Explain what passwords are and why we use them, and use strong passwords to protect devices and information from unauthorized access. (P7.3)	1B-NI-05 Discuss real-world cybersecurity problems and how personal information can be protected. (P3.1)	2-NI-05 Explain how physical and digital security measures protect electronic information. (P7.2) 2-NI-06 Apply multiple methods of encryption to model the secure transmission of information. (P4.4)	3A-NI-05 Give examples to illustrate how sensitive data can be affected by malware and other attacks. (P7.2) 3A-NI-06 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. (P3.3) 3A-NI-07 Compare various security measures, considering tradeoffs between the usability and security of a computing system. (P6.3) 3A-NI-08 Explain tradeoffs when selecting and implementing cybersecurity recommendations. (P7.2)
Data & Analysis	Storage	1A-DA-05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. (P4.2)	Continuation of standard 1A-DA-05	2-DA-07 Represent data using multiple encoding schemes. (P4.0)	3A-DA-09 Translate between different bit representations of real-world phenomena, such as characters, numbers, and images. (P4.1) 3A-DA-10 Evaluate the tradeoffs in how data elements are organized and where data is stored. (P3.3)
Data & Analysis	Collection, Visualization, & Transformation	1A-DA-06 Collect and present the same data in various visual formats. (P7.1, P4.4)	1B-DA-06 Organize and present collected data visually to highlight relationships and support a claim. (P7.1)	2-DA-08 Collect data using computational tools and transform the data to make it more useful and reliable. (P6.3)	3A-DA-11 Create interactive data visualizations using software tools to help others better understand real-world phenomena. (P4.4)
Data & Analysis	Inference & Models	1A-DA-07 Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4.1)	1B-DA-07 Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea. (P7.1)	2-DA-09 Refine computational models based on the data they have generated. (P5.3, P4.4)	3A-DA-12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process. (P4.4)
Algorithms & Programming	Algorithms	1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. (P4.4)	1B-AP-08 Compare and refine multiple algorithms for the same task and determine which is the most appropriate. (P6.3, P3.3)	2-AP-10 Use flowcharts and/or pseudocode to address complex problems as algorithms. (P4.4, P4.1)	3A-AP-13 Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests. (P5.2)
Algorithms & Programming	Variables	1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4.4)	1B-AP-09 Create programs that use variables to store and modify data. (P5.2)	2-AP-11 Create clearly named variables that represent different data types and perform operations on their values. (P5.1, P5.2)	3A-AP-14 Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables. (P4.1)
Algorithms & Programming	Control	1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem. (P5.2)	1B-AP-10 Create programs that include sequences, events, loops, and conditionals. (P5.2)	2-AP-12 Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. (P5.1, P5.2)	3A-AP-15 Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made. (P5.2) 3A-AP-16 Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions. (P5.2)

Practices
P1. Fostering an Inclusive Computing Culture
P2. Collaborating Around Computing
P3. Recognizing and Defining Computational Problems
P4. Developing and Using Abstractions
P5. Creating Computational Artifacts
P6. Testing and Refining Computational Artifacts
P7. Communicating About Computing

Progression of Computer Science Teachers Association (CSTA) K-12 Computer Science Standards, Revised 2017

Concept	Subconcept	Level 1A (Ages 5-7) By the end of Grade 2, students will be able to…	Level 1B (Ages 8-11) By the end of Grade 5, students will be able to…	Level 2 (Ages 11-14) By the end of Grade 8, students will be able to…	Level 3A (Ages 14-16) By the end of Grade 10, students will be able to…
Algorithms & Programming (continued)	Modularity	1A-AP-11 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3.2)	1B-AP-11 Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P3.2)	2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs. (P3.2)	3A-AP-17 Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. (P3.2)
		1A-AP-12 Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5.1, P7.2)	1B-AP-12 Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. (P5.3)	2-AP-14 Create procedures with parameters to organize code and make it easier to reuse. (P4.1, P4.3)	3A-AP-18 Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs. (P5.2)
			1B-AP-13 Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences. (P1.1, P5.1)	2-AP-15 Seek and incorporate feedback from team members and users to refine a solution that meets user needs. (P2.3, P1.1)	3A-AP-19 Systematically design and develop programs for broad audiences by incorporating feedback from users. (P5.1)
		1A-AP-13 Give attribution when using the ideas and creations of others while developing programs. (P7.3)	1B-AP-14 Observe intellectual property rights and give appropriate attribution when creating or remixing programs. (P7.3)	2-AP-16 Incorporate existing code, media, and libraries into original programs, and give attribution. (P4.2, P5.2, P7.3)	3A-AP-20 Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries. (P7.3)
	Program Development	1A-AP-14 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (P6.2)	1B-AP-15 Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended. (P6.1, P6.2)	2-AP-17 Systematically test and refine programs using a range of test cases. (P6.1)	3A-AP-21 Evaluate and refine computational artifacts to make them more usable and accessible. (P6.3)
			1B-AP-16 Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P2.2)	2-AP-18 Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts. (P2.2)	3A-AP-22 Design and develop computational artifacts working in team roles using collaborative tools. (P2.4)
		1A-AP-15 Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7.2)	1B-AP-17 Describe choices made during program development using code comments, presentations, and demonstrations. (P7.2)	2-AP-19 Document programs in order to make them easier to follow, test, and debug. (P7.2)	3A-AP-23 Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs. (P7.2)
Impacts of Computing	Culture	1A-IC-16 Compare how people live and work before and after the implementation or adoption of new computing technology. (P7.0)	1B-IC-18 Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices. (P7.1)	2-IC-20 Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options. (P1.2)	3A-IC-24 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. (P1.2)
			1B-IC-19 Brainstorm ways to improve the accessibility and usability of technology products for the diverse needs and wants of users. (P1.2)	2-IC-21 Discuss issues of bias and accessibility in the design of existing technologies. (P1.2)	3A-IC-25 Test and refine computational artifacts to reduce bias and equity deficits. (P1.2)
					3A-IC-26 Demonstrate ways a given algorithm applies to problems across disciplines. (P3.1)
	Social Interactions	1A-IC-17 Work respectfully and responsibly with others online. (P2.1)	1B-IC-20 Seek diverse perspectives for the purpose of improving computational artifacts. (P1.1)	2-IC-22 Collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact. (P2.4, P5.2)	3A-IC-27 Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields. (P2.4)
					3A-IC-28 Explain the beneficial and harmful effects that intellectual property laws can have on innovation. (P7.3)
	Safety, Law, & Ethics	1A-IC-18 Keep login information private, and log off of devices appropriately. (P7.3)	1B-IC-21 Use public domain or creative commons media, and refrain from copying or using material created by others without permission. (P7.3)	2-IC-23 Describe tradeoffs between allowing information to be public and keeping information private and secure. (P7.2)	3A-IC-29 Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users. (P7.2)
					3A-IC-30 Evaluate the social and economic implications of privacy in the context of safety, law, or ethics. (P7.3)

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Appendix 4. New Literacies competence descriptions for K-2

Source: New Literacies (Uudet lukutaidot, 2022)

Media Literacy

Interpretation and evaluation of media

Interpretation of media content

Early childhood education

- Children become familiar with the media and media content containing images, moving images and sound and their combinations: they examine images in newspapers, magazines and books, watch videos, play digital games and listen to audio books.
- Children learn to understand that some of the things presented by the media are true while others are fictional, and that media content has been created by people. Children learn to understand the difference by taking and editing photos, for example.
- Children are immersed in media content and encouraged to talk about what they have seen and heard as well as the feelings that the media content has awoken through the use of varied methods of expression.

Pre-primary education

- Children experience a wide variety of different media content such as news, media art, films and music suitable for children. Together, they use media content that includes written text.
- Children study the difference between fictional and truthful media content, for example, by examining children's programmes and news suitable for children.
- Children learn to understand the media as content produced and selected by people.
- Children learn to understand media contents. They process events and characters of fairy tales, games and children's programmes by means of different methods of expression and are encouraged to produce their own interpretations.

Grades 1–2

- The pupil is familiar with the concept of media and is able to give some examples of media, containing images, moving image, sound and combinations of these, such as digital games or videos.
- The pupil practices reading media content containing written text. The pupil familiarises themselves with a comic strip, for example.
- The pupil uses age-appropriate media content including written text with ease.
- The pupil understands the difference between fact and fiction, divides media content into factual and fictional content under guidance and gives an example of these. The pupil understands that all media content has been created by someone.
- The pupil understands that different media content has different purposes, such as entertaining or communicating information. The pupil is able to give an example of a type of content.
- The pupil is able to divide media content into truthful and fictional.
- The pupil identifies media content that has different purposes and gives some examples.

- The pupil practices understanding and interpreting images and the sound environment. The pupil analyses their observations and experiences.
- The pupil is able to describe the course of events and characters in a piece of media content or issues presented in it by means of personal expression.
- The pupil also draws their own conclusions and makes interpretations of media content.

Understanding the influence of media

Early childhood education

- Together with the personnel, children look at how the media are visible and influence their everyday life, such as play and the living environment.
- Sympathising with the features and operating practices of media characters is discussed through play.
- Children explore advertisements together and discuss the difference between wanting, needing and buying.

Pre-primary education

- Children reflect on the media's influence on thinking and actions, such as information and games.
- Children learn to understand that media can create impressions and generalise things. Children examine the ways of presenting fairy-tale and animal characters or genders in children's programmes and films.
- Children explore advertising in the nearby environment and reflect on the link between advertisements and consumption.

Grades 1–2

- The pupil becomes aware of the influence media has on the thinking and actions of an individual, such as their views and interests. The pupil is able to give an example from their own life.
- The pupil observes generalisations created by the media under guidance. The pupil examines the characters of films or games, for example.
- The pupil understands that media can shape impressions and views, and is able to give an example.
- The pupil knows that media is used to influence and is able to name some type of content which aims to influence, such as advertisements.
- The pupil identifies some method of influencing found in media content, such as repetition used in advertisements or visual effects.

Media as a source of information

Early childhood education

- Children learn to use media to acquire and structure information. They examine the environment and the world together, for example, by taking photographs or searching media content for information on issues they are interested in.
- Children are encouraged to have a curious attitude to media content. They are also taught to be critical: they are guided to ask questions about what they see and hear.

Pre-primary education

- Children use media in varied ways to find and structure information in everyday situations.
- Children contemplate and assess whether the information they have found is usable.

Grades 1–2

- The pupil is able under guidance to search for information in some digital media content by using a search engine and search terms.
- The pupil knows how to use the media as a tool when examining the environment and matters.
- The pupil knows how to search for information from digital media content independently and together with others.
- The pupil understands the different nature of factual and fictional media content as a source of information. The pupil understands that not all information found in the media is usable or reliable.
- The pupil becomes familiar with media content that communicates information, such as the news.

Personal use of media

Early childhood education

- Children discuss their media use at home: media content, the time spent using it and the experiences they have had.
- Children's own topics of interests are handled by playing in the media or by means of creative expression.
- Children are supported in building a relationship with media through encouragement to use different media content.

Pre-primary education

- Children's own media use is examined. Children discuss different media use situations and how the media are used in different ways alone or together.
- Media content meaningful to children is examined without evaluating it and children are encouraged to tell about it using diverse methods of expression. Children reflect on why it is meaningful.
- Children understand that different people experience and use media in different ways. Children are encouraged to discuss their experiences of media use and compare them with one another.

Grades 1–2

- The pupil is able to talk about media content they find interesting and situations in which they use media in different ways.
- The pupil recommends meaningful media content to others. At the same time, the pupil learns to respect individual choices made by others.
- The pupil understands that there are different media tastes and ways to use the media.

Media production

Creative expression

Early childhood education

- Children's verbal, visual and physical expression in media production is supported using diverse methods.
- Children generate ideas and create different kinds of media content, such as digital story-telling, sound recordings or drawings, through experimentation.
- Children engage in play and games related to media production together. For example, children draw up a report on everyday events.
- Children familiarise themselves with different media devices, digital applications and programs, wonder about them together and use them in a playful manner, experimenting them in content production.
- Children participate in the different stages of media production: generation of ideas together, creative implementation and appreciative examination of the finished product.

Pre-primary education

- Children are supported in verbal and visual expression within media production.
- Pieces of media content such as animations, images, videos, digital books or self-made music are prepared through experimentation together with the children.
- Children use different media devices, applications and programs in producing media content.
- Children participate in the different stages of production together: design, experimental and playful implementation, and appreciative examination of the finished product. The different stages are verbalised with the children.

Grades 1–2

- The pupil prepares some kind of simple creative media content under guidance, such as a digital story or a video.
- The pupil is able under guidance to use the required media devices, applications and programs to produce media content.
- With guidance, the pupil uses text, images, moving images or sound in their own production and utilises them as means of expression and narration.
- The pupil is able to use the required media devices, applications and programs to produce media content.
- The pupil designs and creates media content under guidance with other pupils. The pupil evaluates the production by discussing its meaningful and challenging stages and the lessons learned with others.
- The pupil practises giving constructive feedback on the work of others and to receive feedback.

Involvement

Early childhood education

- Children's rights and opportunities to become involved in shared issues. Children are encouraged to tell about their thoughts in shared generation of ideas and in decision-making. Media is used to help.
- Children are involved in pedagogical documentation both when the presentation method is selected and in shared production.

Pre-primary education

- Children learn that they have the right and opportunity to become involved in shared issues. Media devices are used in varied ways as tools for expressing children's thoughts and opinions in the shared everyday planning and decision-making.
- Children create a piece of media content together which expresses their views or wishes or aims to impact on a shared issue.

Grades 1–2

- The pupil expresses their thoughts and opinions through media.
- The pupil expresses an opinion through the media content they have created and gives a justification for it.
- The pupil produces a simple piece of media content under guidance which aims to influence, such as an advertisement.
- With guidance, the pupil uses one of the ways of influencing, such as repetition or humour.

Communication of information

Early childhood education

- Children explore and wonder about the production of fictional and truthful media contents together, for example, by taking and editing photos.
- Children are involved in retelling and sharing information, such as communicating about events in everyday life.

Pre-primary education

- Children examine how fictional and truthful media content is created and what the difference between them is. For example, they prepare stories or a report on everyday life.
- Information is presented with the help of media, for example, as recorded sound, a presentation of digital images or a video.

Grades 1–2

- The pupil creates a simple piece of media content which conveys information, such as a news image or a caption, under guidance.
- The pupil understands the different ways of producing factual and fictional media content through their own work, for example by trying out the green screen technique.
- The pupil creates a simple piece of media content in text form which relays information, such as a short online news article, under guidance.
- The pupil uses a media presentation, for example on a digital platform used by the class, under guidance to present and convey information they have found.

- The pupil presents information they have compiled through a simple piece of media content.

Own media production

Early childhood education

- Children are supported in creating a positive image of themselves as media producers. They are encouraged to create media content in a playful and experimental way. The products are appreciated.
- Children are encouraged to come up with their own initiatives within media production. They play games together based on events from TV series, games, videos and films. The children's different interests are acknowledged.

Pre-primary education

- Children are encouraged to playful and experimental production of media content. The group will work together to find ways for everyone to participate and gain positive experiences of media production.
- Media content familiar to children, such as characters from TV series, events from films or the course of events in games, are used as inspiration for creative expression.

Grades 1–2

- The pupil finds meaningful ways to produce media content and has the confidence to create media content independently and together with others.
- The pupil encourages their peers to engage in the methods of production they finds meaningful, while also respecting the freedom of choice and individual topics of interests in producing content.
- The pupil understands that issues related to the potential publication of media works should also be discussed with adults, especially the guardians, to protect the pupil's own rights and those of others.
- The pupil estimates what kind of consequences the publishing of a media content they have produced might have to them or to others.

Operating in media environments

Safety

Early childhood education

- Together, children discuss the right to protect one's privacy and body. Children are told that they must be asked for permission if photos are taken or videos recorded of them and presented.
- Children learn to use media safely: an adult needs to agree to their media use, and they are advised to always seek help from an adult.
- The fact that some types of media content are suitable for children while others are not is discussed with the children. Age restrictions and their intended protective effect is highlighted. The staff talk to the children and guardians about safe media use for children.

Pre-primary education

- Children discuss the importance of privacy protection. They are reminded of everyone's right to decide whether pictures of them can be taken and shared.
- Children are encouraged to discuss their media use with an adult, ask for help and turn to an adult if they are unsure about a situation.
- Children become familiar with the age restrictions indicated for media content and the purpose of age restrictions is discussed.

Grades 1–2

- The pupil knows why it is important to protect one's privacy and personal data when using media environments. The pupil is able to say what can and what should not be shared online. The pupil becomes aware of phishing and the fact that it is possible to get inappropriate or unlawful contact requests on the internet.
- The pupil is able to give examples of some risk factors in media environments, such as online scams or identity thefts. The pupil understands that it is possible to increase safety through one's own actions.
- The pupil knows what to do if they receive inappropriate messages or contact requests online from unknown people. The pupil knows they can to turn to a safe adult.
- The pupil recognises the age restrictions of video-based programmes and knows that applications and services, such as social media services, also have age restrictions. The pupil understands the purpose of age restrictions and respects them when using media content.
- The pupil understands the expectations and conflicts created by friendships with regard to compliance with age restrictions and reflect on their own actions from this point of view.

Responsible use of media

Early childhood education

- Children learn to use media devices responsibly.
- Children learn what copyright is: everyone has the right to decide how their work is used. They are shown how work should be treated: the child's name is written on his or her works, and permission for sharing the work is requested from the child. The children are aware of how copyright impacts their activities.

Pre-primary education

- Children discuss what kind of media devices they use themselves and how they are used responsibly.
- Good practices for using media devices and contents are drawn up together with the children.
- Copyright is discussed. The children understand that everyone has the right to have a say in how the content they have produced is handled.

Grades 1–2

- The pupil understands what are appropriate ways of using media devices and that their use can be agreed on in different situations.
- The pupil understands what kind messages it is appropriate to communicate and what kind of content to share. The pupil is aware that published pieces of content leave a trace and that content that has been published once may be spread further.

- The pupil understands that in media, they must try to act in a way that does not upset them or others. The pupil is able to give an example.
- The pupil is able to evaluate their own actions relating to media and their possible consequences for themselves and others. The pupil shows the necessary level of criticism towards the media behaviour of their peers.
- The pupil becomes familiar with copyright and understands why it is needed. The pupil knows that they cannot present content created by someone else as their own.
- The pupil knows the basic principles of copyrights and reflects on compliance with them as a media user.
- The pupil understands that some digital products in games, for example, may be subject to a charge and that there are different ways of getting players to commit to the game. The pupil understands that they must get their guardian's agreement to use content.

Wellbeing

Early childhood education

- Children are encouraged to use diverse methods of expression when telling about the experiences and feelings they have had when using media.
- Using functional methods, the media is examined as part of children's everyday life.

Pre-primary education

- The use of media contents is also examined as social activity and shared media experiences are discussed.
- The media in the children's life and time management with regard media is discussed.

Grades 1–2

- The pupil recognises what in their own media use provides joy and what causes unhappiness. The pupil learns to take into account their own wellbeing when choosing media content.
- With guidance, the pupil examines their own use of media in the daily life. The pupil understands that media use must be controlled so that it will not take time away from other important things such as physical activity and sleep.
- The pupil is able to reflect on their media habits and describe some methods for sensible regulation of their media use.

Good interaction

Early childhood education

- The child is guided to friendliness and taking others into consideration in everyday situations. Children are guided in noticing the impact of their words, gestures and actions on others.
- Children learn and verbalise communication and themes related to it. Everyday communication situations are observed together. Communication is practised in play, for example.

Pre-primary education

- Children discuss and practise identifying what bullying and harassment mean and practice solving conflicts in a constructive manner.

- Children try communicating with the help of different kinds of media devices. The children are involved in everyday communication through media.

Grades 1–2

- The pupil is able to identify their feelings and regulate them in communication situations in media environments.
- The pupil understands the reciprocal nature of communication in media environments: one's own communication influences the communication, feelings and actions of others.
- The pupil knows what online bullying, such as excluding from groups, spreading images and information without permission or spreading unfounded rumours of others, is like. The pupil knows that online bullying is not allowed and knows what to do when encountering bullying.
- The pupil develops their ability to put themselves into the position of another when producing and interpreting media messages. The pupil also aims at positive and constructive interaction in media environments.
- The pupil is able to use media devices for communication.
- The pupil understands that different methods of communication belong to different situations and environments, such as school and free time, and that the methods of communication can be agreed together.
- The pupil is able to select communication methods suitable for different contexts.

Programming Competence

Computational thinking

Logical thinking and processing of information

Early childhood education

- Learning environments are designed so that children can practise the thinking skills required in programming in their play: classification, comparing and putting into order. Regularities and repeated things are also observed with the children.

Pre-primary education

- The children are allowed to experiment with and produce functions which are repeated regularly, such as rhythms, in a playful way. They also contemplate cause and effect. Together, the children verbalise and explain the choices they have made.
- Children are guided in classifying, comparing and putting things into order based on specific criteria, such as shape, size or colour.

Grades 1–2

- The pupil is able to arrange and compare things based on different criteria, such as similarity of shape. The pupil can recognise logical operations, such as "and", "or", "no".
- The pupil is able to use concepts and concrete tools to talk about their choices and observations.

Solving and modelling of problems

Early childhood education

- Children are encouraged to wonder and pose questions about the phenomena and issues around them and look for answers and solutions to them themselves. Children name and explain phenomena together.

Pre-primary education

- Children are encouraged to explore and structure everyday phenomena and reflect on questions related to them. They practise describing and explaining observations and reflect on their own solutions.

Grades 1–2

- The pupil is able to break a problem related to a familiar everyday problem into smaller parts, and to look for and experiment with different solutions to solve it. The pupil is able to explain the solutions they have used.

Activities, concepts and basic structures of programming

Early childhood education

- Children learn to follow instructions by playing or carrying out functional tasks. The instructions may be physical, visual, verbal or based on sounds.

Pre-primary education

- Children familiarise themselves with the concept of algorithm by examining different instructions and ways to give instructions. They try giving and following instructions playfully.

Grades 1–2

- The pupil is able to create step-by-step instructions using simple commands and a loop. The pupil identifies error situations caused by the instructions and tries out solutions to rectify them.

Inquiry-based work and production

Co-creation processes

Early childhood education

- Children are encouraged to shared exploration and experimenting with technology. They learn to tell about their thoughts and observations and practise acting in different roles.

Pre-primary education

- Children are guided in solving problems and assignments by reflecting and experimenting together. Children practise presenting their ideas to others and divide tasks to implement a joint project.

Grades 1–2

- The pupil can present their ideas, listen to others and try out solutions in a group, as well as take turns in the different roles in teamwork related to programming.

Creative production

Early childhood education

- Children's experiences related to technology are broadened by examining the operating principles of everyday machines and devices. They invent and build devices of their own and produce creative solutions, and present these to others.
- Children play different games and explore their properties together. Familiar play and existing games are modified with the children by inventing new rules, tasks or ways to proceed.

Pre-primary education

- By searching for information from different sources, the children familiarise themselves with devices that take advantage of robotics. They plan and build devices and robots of their own from different materials and describe their purpose and operating principles to others.
- Functional and narrative environments using gameful elements such as rules, counting points and time limits are designed and implemented with the children. Children generate ideas for game characters of their own.

Grades 1–2

- The pupil is able to build models of different things according to instructions while creatively carrying out their own ideas. The pupil presents and shares his or her ideas with others.
- The pupil is able to work on a digital product containing a narrative or elements of gaming using animation or simple programming under guidance or in collaboration with others.

Programming as a tool for learning

Early childhood education

- The thinking and cooperation skills required in programming are practised broadly in all activities and different areas of learning: children wonder about, familiarise themselves with, experiment with and gain experiences of technology and use of technology.

Pre-primary education

- Children gain experience of creative activity and expression through technology and carry out playful tasks by using different models and instructions, as well as equipment and devices controlled with commands.

Grades 1–2

- The pupil is able to process the content of different subjects by using operating practices and tools related to programming playfully and through experimentation.

Practical skills

Early childhood education

- Children observe how instructions are given in different situations.

Pre-primary education

- Children experiment with giving commands, where possible using a device or application that can be programmed.

Grades 1–2

- The pupil is able to steer a programmable device or an individual character in an application or online task.

Programmed environments and operating in them

Programmed technology in different areas of life

Early childhood education

- The children observe the role of technology in everyday life. They name digital devices in the nearby environment and examine how these work. They reflect on how devices or digital services benefit or help people.

Pre-primary education

- Children are guided in identifying and naming objects, devices and digital services that are controlled by a computer in their everyday environment. The group discusses and examines what these objects, devices and services do and why.

Grades 1–2

- The pupil can identify and name computer-operated devices and services they have encountered, and familiarise themselves with robotics. The pupil can describe what the devices are used for and how they work.

Impacts of programmed technology in everyday life

Early childhood education

- The children examine ways in which a person's activities can be monitored with technology. Practical examples, such as motion detectors, map applications, children's attendance trackers, barcode scanners or QR codes, are identified in the nearby environment. Children discuss how the devices or applications collect information related to activities.

Pre-primary education

- The reasons why different devices and applications are used to collect information on people's activities are discussed with the children. Media contents familiar to children and the environments in which they follow them are also discussed. The reasons for different contents being recommended to the user for example in streaming services are discussed together.

Grades 1–2

- The pupil reflects on what kind of data digital environments are collecting about their activities, and how programming is connected to data collection.
- The pupil understands that the collected data is stored, and can give at least one example of what kind of purposes their data can be used for.

Digital Competence

Practical skills and personal production

Basic technical skills

Early childhood education

- …the staff ensure that the devices intended for advancing digital competence are used appropriately. If necessary, the staff inform the ECEC provider of any shortcomings in the learning environment.
- …the staff familiarise children with the ICT devices in the learning environment. Children learn that technology is a natural part of the learning environment.
- …the staff set an example of appropriate use of technology in everyday life.
- …children learn to use hardware and devices safely and carefully.
- …children explore and wonder about technology found in everyday environments.
- …the staff participate in staff training related to promoting digital competence where possible.
- …the staff know where to get support for using digital environments and ask for it when needed.
- …the staff discuss the possibility of using the children's personal equipment and devices with the guardians.
- …children's toys and their operating principles are explored with the children.
- …children learn to switch on and off a mobile device. Children learn how to charge a device.
- …children practise using the features and functionalities of a mobile device.
- …children learn to name devices and recognise the most common symbols.
- …children discuss what the internet is. Children learn what a browser is and what browsing means.
- …children examine and try out different keyboards. The children practise different ways of controlling a device with the staff.

Pre-primary education

- …children observe and familiarise themselves with everyday technology.
- …children discuss the role of technology in their lives.
- …children learn vocabulary related to the principles of usage and operating principles.
- …children learn to prepare and follow simple instructions for digital services.
- …children learn keyboard skills and the basics of keyboard use as well as familiarise themselves with using a mouse.

Grades 1–2

- …observes and understands the impacts of technology on everyday life.
- …is able to handle hardware, peripheral devices and supplies carefully. The pupil knows what to do if a device is broken or goes missing.
- …with guidance, knows how to connect a device to a wireless network.
- …is able to sign into a device and environments using his or her user ID and password.
- …is familiar with the basic functionalities of the devices used.
- …knows how to print documents if necessary.

- …understands the concepts and symbols related to key functions of the digital environments he or she uses.
- …understands what the internet is, what a browser is and what browsing means. The pupil is able to use a browser.
- …is able to tell the difference between an operating system and a program/application.
- …knows how to follow simple instructions when operating in digital environments. The pupil is able to explain what he or she is doing.
- …knows how to use different ways of controlling a device and entering text.
- The pupil is able to resolve general fault situations in devices.
- The pupil understands device settings and is able to change them appropriately.
- The pupil is able to download and enable permitted applications.
- The pupil identifies some variables and measurement units related to technology.

Operating in different environments

Early childhood education

- …the staff are familiar with and use digital services relevant to the child's early childhood education and care and pre-primary education appropriately.
- …digital environments are actively used in pedagogical documentation.
- …digital environments are used as part of support for development and learning.
- …digital environments are used with a multi-sensory approach in the learning environment.
- …children are familiarised with applications through exploration and play and through the themes of the learning areas.
- …the staff play and examine the logic of games with the children. The staff modify familiar games and come up with new ones with the children.
- …the staff use the gameful elements of digital environments.

Pre-primary education

- …applications are used diversely and their main operating principles are observed.

Grades 1–2

- …is familiar with the digital environments used in the school and knows how to sign into them. The pupil knows how to use digital services in a way that is sufficient for the grade he or she is in.
- …with guidance, is able to transfer and process information between digital environments.
- …with guidance, is able to use digital services to receive and hand in assignments.
- …with guidance, is able to use systems (external to the teaching environment) that are used locally and contain information that is important from the point of view of the pupil's school work.
- …is able to open and exit applications and move between them.
- …with guidance, is able to assign rights in digital services.
- …practices perceiving the progress in his or her learning with the help of a feature in a digital service.
- The pupil knows how to download applications he or she finds interesting from the app store.
- The pupil understands what it means when an application requests rights.

Production

Early childhood education

- …children's developing writing and reading skills are supported with digital environments.
- …digital environments are used in playing with language.
- …children play games that encourage them to produce their own content.
- …children film, record on video and modify content using simple functionalities.
- …complete photography and video projects.
- …digital environments are used in story crafting.
- …children make personal and shared digital books underpinned by a broad definition of text.
- …children practise playful reading and writing.
- …children produce playful animations.
- …children draw up simple diagrams.

Pre-primary education

- …children produce and interpret messages in digital environments.
- …process photos and videos diversely through play and exploration.
- …children produce texts in accordance with the broad definition of text.

Grades 1–2

- …is able to work independently and together with others in the school's digital environments.
- …practises finding saved content.
- …masters basic file processing skills: saving, copying, transferring and deleting.
- …takes photos, records videos and sound and carries out simple editing.
- …uses a camera and other easy applications to make and record observations.
- …practises producing text in a digital service (multimodal texts).
- …produces content using speech.
- …knows how to edit text: activation of text, selection of font size and type.
- …with guidance, knows how to produce a work that contains text, sound, images and video image.
- …is able to produce and interpret simple tables and diagrams.
- …practises commenting on content produced by others.
- The pupil knows how to use a touch screen pen appropriately.
- …is familiar with different digital services intended for personal production and knows how to use them. The pupil is interested in editing images, videos and sound, and produces content independently.

Responsible and safe use of ICT

Responsible use of media

Early childhood education

- …the staff discuss the use of digital environments and the operating practices with guardians.

- …the staff inform the guardians about the processing of personal data in early childhood education and care (including in Varda) following instructions issued by the ECEC provider.
- …the staff take care of privacy protection when publishing pictures and works produced by the children.
- …the staff agree on taking and publishing pictures and publishing the children's products with the guardians.
- …the digital services used are discussed with children in the context of pedagogical documentation.
- …the child is asked for permission before his or her pictures and products are published. Children learn that permission is required to take a photo and publish it.
- …the staff ensure that all guardians have access to information in digital environments. A difference is made between official and informal communication.
- …children familiarise themselves with children's digital world and its current phenomena.
- …children are only offered content suitable for their age and level of development.

Pre-primary education

- …the staff inform the guardians about the processing of personal data in pre-primary education (including in Koski) following instructions issued by the pre-primary education provider.
- …copyrights and the fact that permission is always required to use content produced by someone else are discussed.
- …safe digital services are used to support interaction.
- …sustainable technology use and the fact that the renewal and use of technology consume natural resources are discussed with the children.

Grades 1–2

- …learns to operate responsibly and complies with the rules.
- …understands that it is good manners to ask a person's permission before he or she is photographed. The pupil understands that the image cannot be published without permission.
- …familiarises himself or herself with the principles of copyrights and understands what they mean in practice.
- …understands what author, piece of work, right and copyright mean.
- …practises searching for and using material.
- …children practise using interactive digital services in a safe environment.
- …with guidance, is able to evaluate the reliability of information and information sources.
- …practises recognising commercial content in a multimedia environment.
- The pupil sets an example to encourage others to act responsibly.

Safety

Early childhood education

- …the staff are familiar with data protection and information security instructions and comply with them.
- …the staff respect the child's privacy in digital environments.
- …the staff know what non-disclosure for personal safety reasons means and are able to explain to families how data subject to an order of non-closure are processed following instructions issued by the ECEC provider.

- …special attention is paid to security in familiarisation with digital services.
- …children are encouraged to tell someone about their experiences in digital services.
- …children's initiatives concerning the digital world are taken onboard and discussed.
- …children practise their developing critical literacy.
- …age limits and their significance are discussed with the children, and they are familiarised with the symbols that provide guidance.

Pre-primary education

- …children are familiarised with operating safely in digital services. Children learn the basic principles of safe action.
- …children learn what to do if they encounter a problem in a digital service.
- …passwords and usernames and the reason why they must not be shared are discussed with the children.
- …the nature and reliability of information found online is discussed and evaluated with the children.

Grades 1–2

- …learns how to operate safely in digital services. The pupil knows what to do when he or she needs help.
- …uses the digital environments provided by the school following instructions.
- …familiarises himself or herself with the privacy settings of applications and understands their importance.
- …is able to report any security-related experiences he or she has had in digital services.
- …understands the concept of a user account. The pupil understands the importance of usernames and passwords in everyday life.
- …understands that a password expires and must be changed. The pupil is familiar with the characteristics of a strong password.
- …knows the practices of using any devices in shared use.
- …understands the nature of information found online. The pupil understands that anyone can produce online content.
- …is familiar with age limits. The pupil understands the purpose of age limits and observes them.
- The pupil is familiar with and uses different methods of identification.

Ergonomics

Early childhood education

- …the content offered to the children is of a high quality from the point of view of both user-centredness and pedagogy.
- …digital environments that encourage physical activity are favoured.
- …devices and digital environments that are suitable for children are used with the children.
- …the staff ensure that the hardware and devices are available to the children in a way that encourages them to use them in playing and learning.
- …the child's attention is drawn to taking breaks while working and to good working postures.
- …children stretch, exercise and take physical activity often and regularly.
- …children learn to pay attention to the quality and volume of sound.

- …children learn to pay attention to lighting and the brightness of the display and to adjust them.
- …children gather experiences of sustained work in digital environments.

Pre-primary education

- …practises using digital environments that increase physical activity.

Grades 1–2

- …practises using digital environments that increase physical activity.
- …practises taking breaks while working and having physical activity breaks.
- …practises healthy working postures.
- …knows how to adjust his or her workstation correctly to the extent that this is possible.
- …practises working in a goal-oriented manner in digital environments.
- …knows how to adjust the brightness, resolution and colour of the display and the volume.
- …finds out about suitable lighting.
- The pupil knows how to select the best tool and place for working from the point of view of ergonomics.
- The pupil is interested in technology that encourages physical activity.

Information management and inquiry -based and creative work

Information management

Early childhood education

- …children familiarise themselves with information searches by finding information on children's interests as well as topical themes and phenomena.
- …children familiarise themselves with the basic use of a browser and conduct image and sound searches.
- …children discuss the reliability of information based on a broad concept of text.
- …children practise critical evaluation of information.
- …gamefully and playfully, children make classifications and groupings in digital services.
- …children and the staff reflect on what problems could be solved by means of technology and how. Children learn to describe how a problem could be solved.
- …attention is paid to comprehensiveness of expression when presenting information. Methods suitable for children are used when presenting information: verbally, visually and physically.

Pre-primary education

- …children practise the basic use of a browser.
- …children practise using appropriate search words.
- …connections between matters are created, verbalised and made visible.
- …in connection with classifications, children familiarise themselves with concept maps and learn to create them digitally together.

Grades 1–2

- …knows how to use a search engine appropriately. The pupil knows how to use image and sound searches.

- …knows how to create simple search words.
- …with guidance, is able to search for information on topical issues and phenomena.
- …with guidance, is able to evaluate the reliability of information.
- …knows how to make observations based on different sources of information in his or her everyday life.
- …knows how to use digital environments to record and present observations.
- …with guidance, knows how to structure information in a concept map.
- …practises explaining in his or her own words the information he or she has searched for.
- …produces short multimodal texts based on the information searched for.
- …learns to use the concepts needed in information management.
- The pupil independently searches for information on issues and phenomena he or she is interested in.

Inquiry-based and creative work

Early childhood education

- …children are encouraged to formulate questions to which they will together seek answers by using digital services.
- …children familiarise themselves with everyday technology, different research tools and research methods with the staff.
- …children use technology and digital environments for research. They are used in making observations and in structuring and understanding information.
- …playful and gameful working methods are used.
- …children's initiatives are taken onboard and advanced using the possibilities provided by digital environments.
- …opportunities to experiment with creative production in digital environments are provided for the children, underpinned by a broad definition of text.
- …the child's individual ways of expressing himself or herself using digital environments are supported. Children are encouraged in versatile experimentation and expression.
- …children create and build new things together. Collaborative creative projects with digital elements are conducted with the children.
- …on children's initiative, topical content that they are interested in is created in digital services.
- …children use images and videos diversely.

Pre-primary education

- …children carry out longer-term research projects in which technology and digital environments are used together with the staff.
- …the role of research in solving problems is reflected on in the light of the children's research projects.
- …children use different applications diversely.
- Children are encouraged to put their ideas into practice using easy applications.
- …children's imagination is fed and the opportunities provided by digital environments are played with.

Grades 1–2

- …is able to conduct small studies he or she is interested in by using technology.

- …is able to make observations at school and in the nearby environment using digital research tools.
- The pupil is interested in technology related to conducting research.
- …with guidance, is able to suggest producing content of his or her own in digital environments.
- …is able to put his or her ideas into practice alone and together with others in digital environments.
- …osaa ohjatusti hyödyntää digitaalisia ympäristöjä oman ajattelunsa näkyväksi tekemiseen.
- …with guidance, is able to express himself or herself by combining images, videos, sound, text or animation.
- …experiments with, invents, builds and creates new things using digital environments.
- The pupil is able to digitise the physical products of creative work.
- The pupil finds new ways to express himself or herself using digitalisation diversely.
- The pupil inspires other pupils to engage in creative work in digital environments.

Interaction

Collaboration and participation

Early childhood education

- …children practise communal modes of working.
- …digital opportunities are used for creating an environment in which everyone can shine as allowed by their development, age and capabilities.
- …special attention is paid to emotional and interaction skills in collaborative digital work.
- …children use the possibilities of digitalisation to immerse themselves in fictive roles, fairytales and stories.
- …the staff use digital services for keeping in touch with the guardians, strengthening interaction.
- …restricted collaborative services are used appropriately. Children practise producing their own content, using the digital environment available for them.
- …children are given opportunities to interact in individual and optional ways.
- …children learn to identify emojis.
- …a positive attitude to digital interactive services is maintained.
- …any problems encountered in digital services are solved together.
- …children practise socioemotional skills. Children practise acting in ways that can help prevent bullying.
- …children's confidence in their possibilities of exerting influence is built up by using digital services.
- …digital environments are used to make children's ideas and interests visible.
- …children participate actively in designing, implementing and evaluating play and learning in which digital environments are used.
- …diverse opportunities for participation and involvement are ensured for each child.
- …children gather experiences of how they can become involved in the community through digital services.

Pre-primary education

- …children practise contacting people and interacting in digital services.

- …children learn about appropriate use of emojis.
- …children learn about good practices in digital services.
- …children familiarise themselves with digital services that promote participation.

Grades 1–2

- …knows how to use digital services in an age-appropriate manner.
- …with guidance, is able to participate in discussions in digital services.
- …recognises and is able to use emojis that promote interaction.
- …knows how to make and receive a video call and to send and respond to a voice mail. The pupil is able to use other simple messaging functionalities.
- …understands what an email is and practices sending and receiving emails.
- …is able to report on his or her experiences of digital services.
- …respects others and takes them into consideration when operating in digital services. The pupil practises positive interaction when communicating and strives to prevent bullying.
- …with guidance, is able to resolve conflict situations that may arise in digital services.
- …with guidance, is able to use a digital service that promotes participation.
- The pupil encourages a sense of community among other pupils.

Appendix 5. Themed interview outline

Interviewee's background information

Which school or municipality are you from?

Are you a digitutor or otherwise involved with the digital curriculum?

Digital Citizenship

Are you aware of the New Literacy Skills development program?

Has your school / municipality incorporated digital skills into the core curriculum?

If yes, which material or platform are you using?

If no, what is the reason it hasn't been implemented yet?

A Digital Citizenship Course

Would your school / municipality be interested in using a digital course available inside NäppisTaituri platform?

What would be the main requirements for the course?

Appendix 6. Survey questionnaire

Uudet lukutaidot -kehittämisohjelman tavoitteena on vahvistaa lasten ja nuorten medialukutaitoja, tieto- ja viestintäteknologisia (tvt) taitoja sekä ohjelmoinnin osaamista varhaiskasvatuksessa sekä esi- ja perusopetuksessa. Uudet lukutaidot -kehittämisohjelma on osa opetus- ja kulttuuriministeriön laajempaa Oikeus oppia -kehittämisohjelmaa (2020–2022).

Kehittämisohjelmassa on laadittu osaamisen kuvaukset edistämään yhdenvertaisuuden toteutumista lasten ja nuorten digitaalisten taitojen ja osaamisen opetuksessa kautta maan.

Kuvaukset on johdettu tukimateriaaliksi varhaiskasvatussuunnitelman ja opetussuunnitelmien perusteista. Ne eivät ole velvoittavia vaan niiden tarkoitus on tukea opettajien työtä varhaiskasvatus- ja opetussuunnitelmien toteuttamisessa ja niitä voi käyttää apuna paikallisten opetussuunnitelmien kehittämisessä.

https://uudetlukutaidot.fi/

TVT-opetussuunnitelmalla tässä kyselyssä tarkoitetaan systemaattisesti suunniteltua oppimispolkua, joka sisältää myös eri luokka-asteille omat tavoitteet. TVT-opetussuunnitelman käytyään oppilailla on samanveroiset digitaidot.

1. Onko kuntaanne laadittu TVT-opetussuunnitelma tai onko sellainen suunnitteilla?

   ☐ Käytössä   ☐ Suunnitteilla   ☐ TVT-opetussuunnitelmaa ei vielä ole

2. Miten TVT-opetussuunnitelma saatetaan kouluissanne käytäntöön (Digipassi, opettajan opas, materiaalipankki)?

3. Miten opettajat suhtautuvat TVT-taitojen opettamiseen? Mikä on heille haasteellista?

4. Minkälaista materiaalia käytätte digitaitojen opetukseen?

5. Kirjataanko digitaitojen suoritukset?

   ☐ Kyllä   ☐ Ei   ☐ Suunnitteilla

6. Miten ja minne digitaitojen suoritukset kirjataan?

7. Miten Uudet lukutaidot -hanke on vaikuttanut tai tulee vaikuttamaan digitaitojen opettamiseen?

Typing Master Finland Oy on kehittämässä kouluille digioppimisen palvelua. DigiTaituri sisältää digitaalista, vuorovaikutteista ja ajan tasalla olevaa oppimateriaalia, jonka keskiössä ovat uudet lukutaidot (https://uudetlukutaidot.fi): Medialukutaidot, TVT-taidot sekä ohjelmointi.

Palvelun kehittämisprojektissa kartoitamme tällä hetkellä asiakastarvetta. Koska palvelu on suunnattu kouluille, sen kehittäminen tullaan tekemään yhteistyössä koulujen ja kuntien kanssa, jotta voimme varmistaa, että palvelu vastaa mahdollisimman hyvin tarpeitanne.

8. Minkälaisia toiveita teillä on DigiTaituri -palvelulle?
9. Mitä pulmianne DigiTaituri voisi olla ratkaisemassa?
10. Minkälainen tarve kunnassanne olisi DigiTaituri -palvelulle? (Skaala 1-10; 1 ei ollenkaan, 10 erittäin suuri)
11. Muita huomioita
12. Rooli
    ☐ Opettaja ☐ Rehtori ☐ Digitutor ☐ TVT-vastaava ☐ Muu (mikä?)
13. Kunta

Appendix 7. Test package instructions

Test packages

- Age group: K-1
  - learner can't necessarily read long passages of text
- 2 x 20–30 min lessons on topics below
- Powerpoint-presentation showing the lesson progression and content
  - the final lesson may include text, graphics, videos, and different gamified activities
  - description of the videos and activities is enough for the presentation
- 150 € compensation, Typing Master Finland Oy holds the rights to the material and can use the ideas later
- Please attach an informal application and tell us more about yourself, your background and experience and how would you be of help in this project
- Return the test packages to Sini Taskinen (sini.taskinen@typingmaster.com) by 6.3.2022

Topics:

1. Use software applications to create an authentic product

- What is a word processing application, and what can you do with it
  - Associated standards:
    - Recognize a program to use for word processing

2. Learn the fundamentals of digital citizenship and appropriate use of digital media.

- Username and password, and why you shouldn't share your password to anyone
  - Associated standards:
    - Understand safety rules when using a computing device.

3. Explore hardware (i.e., physical components) and software of computing systems.

- Identify different computer components
  - Associated standards:
    - Use appropriate terminology in naming and identifying hardware (eg. monitor, keyboard, mouse earbuds, headphones, printer)
    - Learn to handle computing devices with proper care (eg. do not place food or drink near a computer of tablet; hold tablets or laptops with both hands when transporting them)

4. Exhibit responsibility when using connected computing devices

- Logging in to devices and platforms
  - Associated standards:
    - Demonstrate how to log in and log out from a connected computing device.
    - Recognize the importance of logging out from a connected computing device.

5. Discover that computing devices and the internet enable us to connect with other people, places, information, and idea

- Identify ways to connect with other people
  - Associated standards:
    - Identify ways to connect with other people (e.g., direct message, voice talk, email, video chat).

6. Explore software

- How to use a web browser
  - Associated standards:
    - Use appropriate terminology in naming and identifying software (e.g., web
    - browser, application).

References:

https://typetastic.com/digitalcitizenship/story.html

A very rough demo made with Storyline 360 to demonstrate what kinds of activities we can do with it.

Common Sense

Widely used, very high-quality digital citizenship material that's available free of charge for schools

Keyboarding Without Tears

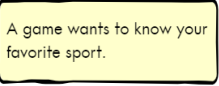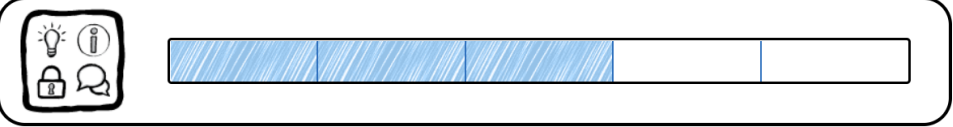**Question 4: Stop the Strange**

Reach each story. Drag and drop each story under STOP or GO.

STOP

GO

You are on a website and something strange pops up.

A game wants to know your favorite sport.

Drag & Drop -types of activities used to test how the students have understood the lesson

Appendix 8. Game play

<p style="text-align:center">DigiSmart Kingdom/Space/Empire/Metropolis</p>

<p style="text-align:center">Gameplay</p>

Please note that all names are temporary and can be changed. Feel free to comment and suggest.

1. The story world and the storyline

DigiSmart Kingdom/Space/Empire/Metropolis (choose the best one, or any other suggestions) is made up of 5 islands. Each island has distinctive landmarks, each landmark represents one lesson. After checking out each landmark, one coloured token is awarded. Each island has a specific colour.

Key Area	Island Name	Landmarks	Lesson	Token Colour
Key 1 Digital Literacy	DigiSafe Island	Castle of Secrets	Password and online privacy	Green
		Castle of Privacy	The right to online privacy	
		Castle of Kindness	Online etiquette	
			Cyberbullying	
*This island starts with a character having trouble and others are trying to solve the problem together. They visit the castles, complete the tasks and earn 3 green tokens in total. **Castle of secrets:** Evil hacker is in the Castle trying to get into a room of passwords. Dr.Glee is giving instructions to help DigiCat locking all the doors and making strong passwords to fight away the evil hacker. **Castle of privacy:** DigiCat needs to decide what to post on his online profile. DigiCat needs to decide if Creepy Paw can share his photos on social media or not.				

Castle of Kindness: A character got upset by unfriendly comments from social media. Other characters are cheering it up by collecting and giving it positive messages.				
Key 2 Computing System	DigiWare	Hard Rock Forest	Hardware of computer	Red
		Soft cloud Forest	Software of computer	
		Handy Forest	Troubleshooting	

This island starts with some characters wanting to have a complete set of computers to bring to school for learning, they try to collect different parts of the computers and bring them together.

Hard Rock Forest: Different parts of the computer is hidden in the forest, the characters need to find them out, and place them together in suitable connection for it to function.

Soft cloud forest: Some software is hidden in the cloud forest, the characters need to find them out, download them to their computer and match them with suitable purposes.

Handy forest: With the computer set up and software downloaded, the characters encounter different issues when using it. They work together to find out the solutions.

Key 3 Networks and Internet	DigiNet Island	Sea of Internet	What is internet	Blue
		Sea of Search	Internet address, browsers	

			and search engines	
		Sea of Truth	How to search info and fake info	
		Sea of Connection	Communication	

The characters start in the sea, they need to collect swimming rings to survive in the sea and eventually arrive at the island. Characters collect swimming rings when they complete some tasks. A blue token is awarded after each sea.

Key 4 Data and Analysis	DigiData Island	Palace of Data#1	Types of data	Purple
		Palace of Data#2	Data storage and retrieval	
		Palace of Data#3	Display data in various format	

The characters start with finding the Palace of data is in a mess! Characters try to sort out different types of data, categorize them into different storage system. The order of the palace is restored after the characters have worked on the tasks.

Some guests from around the world are going to visit the Palaces of Data. The characters will try to display the data in a nice way for the visitors. A purple token is awarded after visiting each palace.

Key 5 Impact of Computing	DigiFuture Island	Mount of Future	Technology before, now and in the future	Orange
		Mount of Tech	Communication in person VS through technology	

The island has a clock. A character starts with playing with the clock, and accidentally triggers the time travel magic. The character turns the clock backward and travel back to different era to see the development of technology and communication in an older time. By completing the tasks, the character will turn the clock forward and move along the timeline to now and future. An orange token is awarded after visiting each Mount.

Beginning of each visit:

"Welcome to DigiSmart Kingdom/Space/Empire/Metropolis! Explore the 5 magical islands where you will gain strengths to become a digitally smart kid."

Sample beginning of each island:

"You now arrive at DigiSafe island. You will gain a green token after visiting each castle. These tokens will help you level up your digital protection strength. "

2. The characters

5 cats with different characters (can also be any other animals, feel free to suggest):

1. **Evil hacker:** who is fed on secrets and disinformation, with more secrets and disinformation it gets, the more power and energy it gets.
2. **Marshmallow:** who is very absent-minded, sometimes mess things up, but with a kind heart, always a supportive friend
3. **Creepy Paw:** who is strong at sensing dangers, with a detective mind, yet, needs a lot of sleep
4. **Dr. Glee:** who is knowledgeable and confident, always on time, but lack of patience
5. **Little Furry:** who is tidy and neat, extremely hates disorganization and mess, always helpful when friends are in need.
6. **DigiCat:** adventurous, friendly traveler, has a mobile phone and learning to use it properly (main character who travel around all the islands)

Reference: Octalysis gamification framework (driving forces for engagement and motivation)

-Status Points
-Badges (Achievement Symbols)
-Fixed Action Rewards (Earned Lunch)
-Leaderboard
-Progress Bar
-Quest Lists
-Dessert Oasis
-High Five
-Crowning
-Anticipation Parade
-Aura Effect
-Step-by-Step Overlay Tutorial
-Boss Fights

-Exchangeable Points
-Virtual Goods
-Build from Scratch
-Alfred Effect
-Collection Sets
-Avatar
-Protector Quest
-Pet Companion
-Observer Attachment

-Appointment Dynamics
-Magnetic Caps
-Dangling
-Prize Pacing
-Bootleg Quest
-Last Mile Drive
-Count Down Timer
-Torture Breaks
-Moats
-The Big Burn

-Narrative
-Elitism
-Humanity Hero
-Revealed Heart

-Sunk Cost Prison
-Progress Loss
-Rightful Heritage
-Evanescence Opportunity

-Beginners Luck
-Free Lunch
-Cap Switcher
-Co-creationist

-Status Quo Sloth
-Streaking
-Evil Egg
-FOMO Punch

-Milestone Unlocks
-Real-Time Control
-Chain Combos
-Dynamic Feedback
-Boosters
-Blank Fills
-Plant Pickers
-Poison Pickers
-Attribute Web Chart
-Double Edged Sword

-Friending
-Social Treasure/Gifting
-SeeSaw Bump
-Group Quests
-Trophy Shelf
-Brag Button
-Water Cooler
-Conformity Anchors
-Mentorship
-Social Prod

-Glowing Choice
-MiniQuests
-Visual Storytelling
-Easter Eggs
-Random Rewards
-Obvious Wonder
-Rolling Rewards
-Evolved UI
-Sudden Rewards
-Oracle Effect

1 Epic Meaning
2 Accomplishment
3 Empowerment
4 Ownership
5 Social Influence
6 Scarcity
7 Unpredictability
8 Avoidance

Octalysis

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