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MAKING LEARNING MORE ENGAGING FOR PRIMARY LEVEL LEARNERS IN A TECHNOLOGY-ENHANCED LEARNING ENVIRONMENT

MA thesis

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Abstract

Making Learning More Engaging for Primary Level Learners in a Technology-Enhanced Learning Environment

The COVID-19 emergency distance learning situation has offered an opportunity to reform the way technology is used in the classroom. Active learning methods have been found to motivate and engage students with the learning content. The aim of this master's thesis is to find out how active learning methods are accepted by the young students and teachers in Estonia, focusing on the level of motivation and engagement with the material in a digital learning environment. A qualitative content analysis, with mixed research methods, was used to analyse the perceptions of young learners and their teachers about the use of technology and digital platforms. For research purposes, 3 teachers and 52 students were interviewed. The results indicate that young learners and teachers perceive technology as a positive alternative and found digital learning activities motivating and engaging. However, certain challenges need to be addressed by the teachers while designing learning activities for young learners in technology-enhanced environments. It is essential for the teachers to align the digital learning activities with active learning principles to maintain the students' motivation and engagement.

Keywords: active learning, young learner, technology-enhanced environment, motivation, engagement

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Chapter 1: Introduction

In 2019, the world was affected by the COVID-19 pandemic which also influenced the education system. According to the data provided by the UN Educational, Scientific and Cultural Organisation (UNESCO, 2020) the number of students affected by the closures is nearly 1.37 billion, meaning three out of four students saw the impact of the pandemic (Osman & Keevy, 2021). According to the JCR report, after the emergency distance learning experience, digital transformation has become a focal point of school life, meaning that schools maintain and develop hybrid learning capabilities over the whole year to make sure that they are well-prepared for distance learning when necessary (Mägi, 2021).

Consequently, the COVID-19 restrictions put to test the potential and quality of online learning. Schools demonstrated different levels of capabilities and it took time to map out the situation in Estonia (*Tagasivaade 2020. aastale*). Whilst teachers were better prepared to use a wide range of active learning techniques in the classroom, the situation was a lot different regarding online lessons. In-person classroom instruction has typically involved a range of active learning techniques - these include instructor-guided group work to develop and reinforce conceptual understanding, breakout sessions, debates, and participatory presentations. Distance learning eliminated many of these classroom activities (Carolan et al., 2020). Active learning methods have been found effective in teaching in a meaningful and motivating way (Spooner, 2015). Active learning methods can be defined as engaging students in the learning process through instructional techniques (Spooner, 2015). When looking for an encouraging and engaging way to teach, active learning can offer different ideas on how to support these approaches in the classroom as well as online. Primary level students enter school with high levels of motivation, but it tends to decrease over the course of study, meaning different learning methods help to keep the decrease percentage lower (Anh & Thoa, 2014).

Effectively, the situation in the educational world due to the COVID-19 impact has offered an opportunity to reform the way teachers perceive technology use in the classroom. Additionally, the need to support teachers in online teaching has been demonstrated in the rise in suggestions available for teachers on how to keep students engaged online, Haridus- ja Noorteamet has over 99 webinars available for teachers to advance their skills (*Haridus- Ja Noorteamet*, 2020-2022).

Indeed, there are studies investigating the effects of using technology in the classroom (Kastuhandani, 2014); others look at engagement and motivation using digital platforms in different countries such as Vietnam (Anh & Thoa, 2014). However, the current study explores the effects of implementing active learning methods in technology-enhanced environments in primary school students in Estonia. This thesis seeks to research primary level students' motivation and engagement whilst implementing active learning methods through technology. The study will adopt a qualitative content analysis, with mixed research methods. The choice of using this research method is that a qualitative interview helps to understand the perceptions and instant emotions regarding the learning material (Creswell, 2016).

This study aims to find out how active learning methods are accepted by young students and teachers, focusing on the level of motivation and engagement with the material in a digital learning environment. The current study focuses on the teachers' and learners' perceptions of the given experience as well as learners' level of motivation and engagement. The following research questions have been formulated for the current study:

1. What are primary school learners' and teachers' perceptions of active learning in a digital learning environment?
2. How do young learners' and their teachers' perceptions of the effects of active learning in a digital environment on their level of engagement and motivation compare?
3. What activities of digital learning content are perceived as the most motivating by primary school students?

A brief overview of the thesis is the following: theoretical background of active learning principles and how those apply to primary school learners, with the focus on the aspect of their engagement and motivation in the learning process. Chapter 2 focuses on the theoretical background and provides the definitions of the terms used throughout the study. Methods are discussed in chapter 3, where we will introduce the research design, intervention materials used for primary classes, sample, data collection, procedure and data analysis approaches used. Chapter 4 reports the results; the final Chapter 5 provides interpretation in the discussion chapter.

Chapter 2: Theoretical background

2.1 Active Learning Theory

The cognitive science theory states that people learn everything by constructing their own meaning and do not require external force. Therefore, the teachers only have an indirect effect on learning and the only way to know if and what the student is learning is through communication (Spooner, 2015, p. 27). When we talk about active learning then we usually mean something that is different from traditional learning methods. This chapter tries to answer the following questions:

- What is active learning about?
- What are the benefits of active learning methods?

Active learning can be described as an instructional approach that engages students in the learning process. It is defined as a teaching and learning approach that requires students to conduct meaningful learning, including hands-on activities, the use of outside resources, technology, and directions from the teacher. Higher results are achieved with the use of active learning strategies because of the use of varied ways the information is delivered to and received by the students (Spooner, 2015, p. 28). The main characteristics of active learning communication are live feedback and interaction with the learning content. During the learning engagement, the learner must be able to respond to the learnt material by answering prompt questions, discussing opinions, and completing some tasks. In a face-to-face classroom setting, this is done through a dialogue between the students or with the teacher. As for an online setting, the interaction, formative assessment, and feedback need to take place between the student and the computer or an online platform. In an online setting, the interactive lecture can also include discussions, pop quizzes, problem-solving opportunities and game-based activities that involve active learning on the part of the student (Montana State University, 2016).

There are several theories connected to active learning, but some main characteristics usually associated with active learning strategies used in classrooms include:

- Students are involved in more than just listening.
- Less emphasis is put on information transmission and more on the development of skills.
- Students use higher-order thinking strategies.
- Students are actively engaged in activities by reading, writing, and discussing.

- Students are encouraged to explore their own attitudes and values (Bonwell & Eison, 1991, p. 19).

Active learning can be any approach that makes students participate in the learning process actively and interact with the learning material, other students, teachers, different resources as well as technology to create their own understandings rather than just obtain information from an external source (Prince, 2013). The approach of active learning requires the students to conduct research both within and outside the classroom with the help of other students as well as different means of media and technology (Spooner, 2015). Therefore, to learn actively, students need to be actively involved with the learning content and think about what and how they are doing (Bonwell & Eison, 1991). Active learning is more effective mainly because of the various sources available that provide different perspectives and learning opportunities. Implementing active learning strategies increases students' interest and curiosity as well as creativity and critical thinking skills. It is believed that practising active learning strategies would lead to better attitudes and motivation as well as improve students' subject-specific skills (Prince, 2013, pp. 223-225).

The theory of active learning can be approached from multiple different perspectives. One approach could be defining it through the concepts of self-directed learning and independent learning (Van Hout-Wolters & Simons, 2000). According to this definition, self-directed learning involves a set of decisions that a student needs to make to be actively involved in the learning process. This coil includes planning their own time and learning objectives as well as activities or taking full responsibility for their own learning and reflecting on their success or failure. The other perspective of active learning could be defined as independent learning that is more connected with the learners' mental activity rather than their decision-making processes. The main factor of active learning, in this case, would be the amount of mental activity the students exercise while doing the learning engagements (Van Hout-Wolters & Simons, 2000, p 21-22). Another way to see active learning is through the concept of meaningful learning activities. According to Spooner (2015, p. 27), "Active learning is a method of instruction that launches students on the path of learning that compels them to do meaningful learning activities. In short, it compels students to take an active part in and think about what they are doing. Interactive learning is a process that allows students to experience learning situations first-hand while giving them reliable and trustworthy knowledge."

When we think about learning, then it is safe to say that any kind of learning requires student activity. However, active learning strategies enable the students to show a higher level

of autonomy, self-regulation, and practice different cognitive skills (Peko & Varga, 2013). In addition, active learning is more attractive and motivating to learners because they can make their own decisions and with that, take more ownership of their learning. Active learning enables the students to connect their prior knowledge to the topic learnt and follow their own interests while conducting independent research (Van Hout-Wolters & Simons, 2000). While engaging in active learning, the students must use critical and creative thinking skills to analyse the content, compare the information, discuss, and debate over perspectives etc. Engaging in all these activities enables the students to understand what they are learning at an in-depth level and ensures the long-lasting retention of information. The benefit of the use of active learning approaches is that the students become cognitively active and begin to see the learning as a challenge (Peko & Varga, 2013). In his book, Spooner (2015) lists several benefits of active learning:

- Students who are involved in active learning retain about 90 per cent of the information presented.
- Active learning engages students in their studies and increases their level of understanding because they are learning actively.
- Active learning results from effective instruction that uses strategies to motivate and teach the students at the same time.
- The learning becomes more enjoyable when students engage in new material and learn to process information as well as improve their knowledge through their own efforts.
- Active learning increases student understanding and retention of material.
- Students develop higher self-confidence and improve their social skills with the help of active participation (Spooner, 2015, 34).

2.1.1 Active learning strategies

There is a wide range of active learning strategies that are mainly focusing on students interacting with their peers or teachers face to face. In the context of strategies used to promote active learning, different activities that raise the interaction and active engagement with the learning materials are used in the classrooms. These strategies may include different questioning and discussion techniques, small-group or whole-class activities, reading and writing exercises, practical tasks etc (Spooner, 2015, p. 31). Some other strategies that promote active learning, are the use of visual media used in the learning process or problem-

solving strategies as well as assignments that extend across disciplines and provide the opportunity for the students to think about what they are doing (Bonwell & Eison, 1991, p.7). Promoting active learning in the classroom could be done with the use of demonstrations to stimulate students' curiosity and improve their conceptual understanding. In addition, visual reinforcements in the form of demonstration or other media are helpful to focus students' attention and reinforce the presented material. (Bonwell & Eison, 1991, pp. 28, 33). Students also experience higher motivation and learn best when they are asked to provide their personal opinions and insights into the materials with the help of different strategies and positive learning experiences. These strategies may include questioning, sharing what they already know about the topic, group collaboration and information-sharing etc (Bonwell & Eison, 1991, p. 34).

2.1.2 The Role of Teachers in Active Learning

The teacher has a significant role in directing the process of active learning. In the lessons, the teachers observe and direct the discussions and projects, not merely give out information. In addition, the teacher's role is to provide opportunities for cooperation and share the responsibilities for goal achievement. With this, the learner's motivation increases, and the learning is improved through critical thinking or problem-solving (Spooner, 2015, p.37). When the teacher takes up a passive role of a facilitator and only helps the students to understand the subject matter and develop their skills, they support the development of students' cognitive skills that enables them to become efficient thinkers and understand the learnt material on a deeper level (Spooner, 2015). To develop activities that deepen the understanding of the students, the teachers need to design them around important ideas that need to be learned and keep the learning outcomes in mind as well as promote thoughtful engagement (Prince, 2013).

2.1.3 Active Learning in a Technology Enhanced Setting

In contemporary classrooms, teachers are encouraged to use technology to enhance learning with variety. Technology can enhance learning in the classroom and promote active learning as it provides an engaging and interactive alternative to traditional approaches to teaching as well as addresses different learning preferences of the student. One benefit that the use of technology can bring regarding active learning in the classroom, is the shift away from teacher-centred instruction to more student-centred classrooms where the students take control over their learning by interacting with the digital content at their own pace

(Neokleous, 2019). However, the teachers need to consider certain key elements when planning lessons with the help of technology. Firstly, the use of technology needs to serve a clear purpose and objectives. The technology should enhance the learning and give extra value to the assignments. Secondly, the focus should be on increasing the students' motivation and engagement. The digital tools used should be not too complex for the students and user friendly to engage them (Neokleous, 2019). This means that whenever teachers decide to use technology as a tool to support active learning, they need to keep in mind the level of complexity of the digital tool and the learners' ability to use them. The tools used need to be straightforward and easy to navigate so that they do not take precedence over the learning activity.

According to Spooner (2015, p 35), "Almost any educational activity can become active by designing learning activities that increase student curiosity. Video and interactive computer learning will help involve students in additional pedagogical experiences." With this, we may say that the use of technology in today's classroom benefits the active learning techniques by adding variety to the learning process. The teachers can enhance learning with different media resources like visuals that convey the ideas and content more easily than just verbal interactions. Active learning requires students to learn from the activities in a more meaningful way and to think about what they are trying to do. Online activities can support active learning with additional opportunities (Spooner, 2015).

With the evolution of technology, the possibilities to provide opportunities for active learning has also grown. Different online platforms, websites, applications and add-ons have been developed that enable students to participate in active learning even when they are sitting at their devices individually. Among these can be different online games that enable students to compete against one another in a live quiz and get feedback about their knowledge as well as increased motivation and engagement when they are able to see the results of their peers. Some examples of interactive quiz platforms are Quizizz (https://quizizz.com/) or Kahoot (https://kahoot.com/). While learning new content, engaging with the material, and receiving formative feedback about the knowledge and understanding is also essential for students in order to be motivated and actively engaged in the learning process. To ensure deeper understanding and immediate feedback about the learnt content, it is possible to use different interactive activities during an online lesson that engages and motivates students to concentrate and pay attention as well as get confirmation and feedback about what they have learnt. Teachers can benefit from the use of multiple-choice or open-ended questions to get feedback about the students' understanding or misconceptions.

2.2 Motivation and Engagement

2.2.1 Learning Motivation

To begin with, Haig has written that motivation should be the focus, the goal in mind when designing materials for students, motivation can also be the starting point that leads to learning engagement (Haig, 2007). Motivation and learning engagement are intertwined, one can affect the other in either positive or negative ways. There is a growing body of research indicating that poor academic performance and negative behavioural outcomes are associated with problems of student engagement in the basic academic and social experiences of schooling (Barghaus et al., 2016). Learner motivation is the most important element that teachers need to consider in the teaching and learning process (Williams & Williams, 2011). Motivation has been accepted as one of the key factors contributing to the success of students' learning. Alas, motivation is not only a key factor for learning but also students' behaviour and overall academic experience. His means of motivation leads to furthering studies or lifelong learning.

Motivation can be extrinsic or intrinsic. Extrinsic motivation has been defined by Vansteenkiste et al. (2006) as the desire of people to take part in tasks to gain a different outcome from the goal of the activity (as cited in Theodotou, 2014). Whilst intrinsic motivation is an internal force that drives students to learn more for their own benefit. As cited in Theodotou (2014) Covington & Müeller (2001, p. 163) find that "intrinsic motivation has been defined variously as a tendency to engage in activities for their own sake, just for the pleasure derived in performing them or for the satisfaction of curiosity". Motivation is something that does not have to start and end with a specific task or activity, motivation can for the whole school time because it is a force and not correlated to the activities.

For primary-aged students, motivation plays an important role in engaging them in every classroom activity as well as affecting their learning outcomes (Anh & Thoa, 2014, p. 371). Already at the primary school level, students are either motivated by the material and engaging in the classroom or they can have a negative experience that affects their decisions for the rest of their lives. Primary school students generally enter school with high levels of internal motivation, and it tends to decrease as children progress through school afterwards (Anh & Thoa, 2014, p. 373). Teachers and study material play a big part in students' motivation and engagement in the classroom. For primary school students, teachers are someone they look up to and follow their lead. When it comes to the role of the teacher for students' motivation - the teacher's knowledge of the subject and the motivational level are

the important elements to motivate primary students which means that the teacher's attitude towards a certain topic affects students' motivation - this includes teacher's patience and ability to stay calm (Anh & Thoa, 2014, p. 377). Teachers need to be able to create a safe classroom for students to learn and make mistakes and learn from those mistakes again. Primary students should be encouraged with a positive atmosphere to take part in all activities and tasks during the lesson. Teachers need to make sure that students are engaged with the taught material (Anh & Thoa, 2014, p. 377). This brings us to the importance of engagement in the classroom, to keep the students engaged it has been mentioned to encourage students by offering them spontaneous and purposeful activities. This is one of the suggestions for teachers (Anh& Thoa, 2014). Teachers are responsible to teach their students as they see fit - offering relevant and engaging material.

2.2.2 Students' Engagement

Whilst motivation is a broader idea, engagement is more specific and concentrated on the task/activity (Haig, 2007). Students' learning engagement is a big factor in their academic achievements and feeling good about their studies.

According to Haig (2007, p. 1), "The theory of engagement defines engaged learning with reference to two aspects: (1) the activities that involve active cognitive processes and (2) the students that are intrinsically motivated to learn due to the meaningful nature of the learning environment and activities"

This means student engagement is affected by the tasks and activities given to the student, hence it is crucial for the teacher to use or create material that will spark active engagement within the student. Students' cognitive and emotional energy to succeed or finish a task has been found to correlate with academic achievement, satisfaction, a sense of belonging and persistence, hence students' active involvement and engagement support a positive educational experience (Halverson & Graham, 2019). Hence, learner engagement is the cognitive and emotional force students must complete their daily tasks and activities. All academic work agrees that the crucial part of learning engagement is not that it affects the students' experience, it also affects their educational outcomes, academic achievements, and journeys. If a student loses interest in engaging in lessons since the early years of school, their educational journey might be cut shorter than it could. Learning engagement can also be defined as an indicator of successful classroom instruction and valued as an outcome of school-improvement activities (Yang et al., 2018). Therefore, educators are responsible for the success of their students to a certain extent.

To keep the primary students engaged, teachers should not be using just one method of teaching, rather they should focus on mixing methods in the classroom. Learning does not come easy for every student, and they could lose their motivation quickly, realising other students are ahead (Windham, 2005). Furthermore, Windham (2005) recommends that to engage learners in learning, a new educational curriculum and activity must include – "Interaction, Exploration, Relevancy, Multimedia and Instruction" (Taylor & Parsons, 2014, p. 7). This means that students actively take part in tasks and offer their own personal solutions, and opinions which leads to more discussion and engagement. Very important is to use level-appropriate instructions and to make sure the task is selected considering the learner's prior knowledge. This does not mean that students should not have challenging problem-solving tasks, on the contrary, this means that there are topics that are easier to explain through problem-solving, whilst other levels and topics need more explanation/instruction. To maintain students' engagement in the classroom, Forde (2017) came up with five steps: (1) Identify and acknowledge different learning styles (preferences), (2) Set clear learning goals and objectives, (3) Encourage collaboration, (4) Provide timely feedback, (5) Nurture curious minds. According to Forde (2017), educators should be offered more training on different learning styles and methods. Teachers should be able to set clear goals that the students are aware of, this is also a chance to write the goals down together and encourage collaboration in the classroom to agree on goals and objectives for the class. Teachers should encourage collaboration with different tasks and activities and make sure to provide feedback in different ways. For primary students it is important to get feedback imminently, otherwise, they might not think about it themselves. The last point Forde makes is to nurture curious minds - this is the part where tasks and activities should challenge the students enough to keep them interested.

2.2.3 Using Technology to Engage Students

Contemporary education means that educators should also focus on the level of learning engagement whilst using technology. Students have changed over generations which means education needs to adapt to the new goals and needs to help students learn to learn. As mentioned before by Wyndham, multimedia has a part in the engaged classroom. Using technology in the classroom provides a means to support learning engagement for students on different levels. As mentioned before, creative use of ICT in the classroom can promote inclusion and reflect cultural and linguistic diversity, learners can present and share their work which has positive motivational effects and raises self-esteem (Kastuhandani, 2014). This

means that the use of technology can raise learning engagement and help students perceive the material through a familiar setting considering students spend more time online than ever. Most students nowadays are accustomed to using phones/computers at home, even primary class students can use their phones in the classroom. This does not mean that teachers should use digital platforms for every lesson or lose the traditional approaches completely from their lessons, technology is one part of creating motivating material (Windham, 2005).

However, teachers should keep in mind whilst choosing their technological tools that the length, language level and visuals are suitable for the grade (Phillips, 2013, p. 218). They also need to make sure the activities are simple enough for the children to understand what is expected of them and the task should be achievable but at the same time stimulating (Kastuhandani, 2014, p. 2). There are a lot of suggestions for teachers whilst creating content online and it can seem overwhelming.

2.3 Technology and Young Learners

The burning question for a lot of today's educators might be how to adopt an active learning approach in an online setting of distance learning or with the use of technology in the classroom. Technology can be used to encourage independent learning as well as develop their creative and thinking skills as the children need to make decisions about the ways they need to approach the information presented in the learning activity. According to Kastuhandani (2014), the use of technology in the classroom can promote inclusion and the development of different study skills. With the help of technology, the learners can present and share their work in a more interactive way that has a positive motivational impact on the learners as well as raises their self-esteem. The combination of spoken, written, visual and picture support enables the students to engage more in the curriculum and learning activities because they appeal to students with different learning styles and therefore promote deeper understanding

When making the decision of using technology in the primary school classroom, we need to consider the fact that the younger the students in the classroom, the more holistic learners they are (Kastuhandani, 2014). Young learners are often not self-conscious, they are usually highly motivated to do any of the activities the teacher has prepared for them.

Because young learners are different from adults in their ability to perceive and process information, it is important to keep in mind some key characteristics when designing digital learning activities for young learners:

- Computer-based or online activities should be simple enough for the students to understand the expectations.
- The interactive task should not exceed their abilities: it needs to be achievable but still challenging and provide the feeling of satisfaction with their work.
- The activities should be mainly orally set up. The younger the children, the fewer written activities should be used (Kastuhandani, 2014, 2).

Keeping all these characteristics in mind, the teacher is able to create digital learning activities that engage the students actively in the learning process without exceeding their digital competencies.

Chapter 3: Methods

The goal of this research is to find out how active learning methods are accepted by young students and teachers, focusing on the level of motivation and engagement with the material in a digital learning environment. For this purpose, a study exposing learners to digital active learning interventions was planned and conducted. In the first subsection below, our research design is described in more detail. The following chapter 3.2 presents the information about the sample and details the informed consent. Chapter 3.3 offers an overview of all the materials prepared and used for the study intervention. The data collection and analysis chapter (3.4) present information on the data collection tools, procedure and analysis.

3.1 Research Design

In this research, a mixed-methods approach was used to analyse the effect of the intervention. As we were interested in participants' motivation and engagement - a qualitative content analysis was chosen for analysing the data. 'Qualitative research has been found to help researchers access the thoughts and feelings of research participants, which can enable the development of an understanding of the meaning that people ascribe to their experiences' (Sutton & Austin, 2015) which means that qualitative data offers an insight to the students' and teachers' thoughts on the intervention. For assessing the most popular activities among the students, the quantitative method was used. Interviews allow us to get an understanding of the participants' perception of the activities which will give us a clearer view of the students' engagement and motivation with the study material (Creswell, 2016). As mentioned before, to have the best engagement-centred classroom, Forde (2017) suggests 5 steps that our study will follow (Forde, 2017):

(1) Identify and acknowledge different learning styles (preferences),
(2) Set clear learning goals and objectives,
(3) Encourage collaboration,
(4) Provide timely feedback,
(5) Nurture curious minds

For our intervention, we tried to follow these steps to create an engaging learning experience. Firstly, we decided to make sure that students who prefer visual learning had the visuals to look at, however, we used videos that students listened to for those who prefer learning by hearing. The intervention material had an assignment for each video or new information the students' learned, to make sure that there is active engagement for the students who prefer

'doing'. Secondly, we set the goal of teaching the 3rd grade about Estonia and how the country is ruled, the lesson plan was closely connected to the 3rd-grade programme of the school. Thirdly, we encouraged online collaboration with collaborative boards and competitive quizzes. We tried to make sure that students were given feedback on each activity to see whether they answered correctly. Lastly, the material was created to be engaging even for students who have been born in Estonia and might know more than international students.

3.2 Sample

The research focused on investigating the level of engagement and motivation of primary school students while completing technology-based activities that are aligned with active learning methods. Therefore, the students from grade 3 were selected as the sample for this study. The sample included altogether 52 participants, out of which 20 were boys and 32 were girls. All students were between the ages of 8 and 10. As the sample included Estonian classes and one international class in one grade level, the ethnic background of the students was also slightly different. Out of the whole sample, 39 students were Estonian and 13 belonged to the international class with English as their language of instruction and represented different nationalities. All students belonging to the sample had prior experience in using technology and participating in online learning in their lessons and during home learning periods. At school, they all had access to a computer lab, portable laptops, and tablet computers which they were using on a regular basis. They also had internet and computer access at home.

There were two main factors that influenced the decision of sample selection. Firstly, this grade level was chosen because of the need to receive feedback from the students about their experience during the learning activities they were participating in. Grade 3 students are still in the primary level of the school but already old enough to give feedback and talk about their experiences. Secondly, the planned intervention was meant to be on the topic of governments and introduce the Republic of Estonia which was closely related to the unit of inquiry the third-grade students were conducting at the time of the intervention. Combining the topic of the intervention and the unit the students were studying enabled us to provide meaningful context to the learning experience of the students.

In addition to the students, the three homeroom teachers of each class were also asked to participate in the study for giving their perceptions of the activities and the students' motivation and engagement. The teachers included in the research were of different profiles. Two teachers were with working experience for over ten years and one teacher had three

years of teaching experience. Their age groups ranged between 30 and 46. All teachers were experienced in using digital tools and devices in the lessons on a regular basis because they all had smartboards in their classrooms as well as access to laptops and tablet computers.

3.2.1 Informed Consent

As the students were all minors, their parents were informed about the intervention and the activities with the request to discuss the matter with their children and to give written consent to allow the participation of their child in the learning activities as well as the follow-up interview. The informed consent form was sent to all the families through the school's learning management system - Stuudium which has a built-in option for gathering consent. The parents were able to give their a) full consent to participate in all activities; b) partial consent to only participating in the learning activity but not the interview, or c) refuse to allow their children to participate. Out of 65 parents, only one parent declined their child's participation in the interview, but all families gave their consent for participating in the learning activities. The homeroom teachers of the classes were also introduced to the content of the intervention and their consent was received orally.

3.3 Materials

To carry out the research, different interactive online learning platforms were studied, and a set of interactive digital learning activities were created with the aim of designing lessons that support the active learning principles in a technology-enhanced setting.

For designing the learning engagements, internationally recognized interactive online learning platforms were researched – EdPuzzle, PearDeck and Nearpod. All these platforms come with their own advantages and disadvantages but share a common characteristic - they all support active learning and engagement with the online learning material.

The first step of the intervention was to identify online platforms that would enable the students to engage with the learning contents and practise active learning strategies in an online environment. To achieve this, the following platforms were studied:

- **EdPuzzle** - a platform for creating interactive videos
- **PearDeck** - an add-on for creative interactive PowerPoint or Google Slides presentations
- **Nearpod** - a platform for creating interactive lessons with various learning engagements

- **Sisuloome** - an Estonian platform that enables the creation of interactive learning activities with the use of the H5P framework

EdPuzzle (https://edpuzzle.com/) is an online platform that enables the teachers to create their own interactive learning videos both by recording and uploading one's own video as well as importing a pre-made video directly from YouTube. The free version enables the teachers to save up to 20 pre-made interactive videos. EdPuzzle also integrates with Google Classroom and enables the teacher to receive feedback about the students' progress. The disadvantage of the platform would be that it is possible to create only one type of learning activity - an interactive video with multiple-choice or open-ended questions.

PearDeck (https://www.peardeck.com/) is an add-on that can be used with both Microsoft PowerPoint and Google Slides. The aim of the add-on is to make slide presentations interactive by inserting different questions, assignments, and feedback elements for students. The students can interact with the information presented, share their knowledge as well as give and receive instant feedback about their progress. The teacher has a separate dashboard to monitor student participation and overview the progress of the learners in real-time. PearDeck assignments and tasks are designed with active learning techniques in mind to directly engage the students in the learning process with the help of interactive discussions and activities. The teacher can choose whether to conduct the interactive lesson as a live teacher-paced lesson or as an asynchronous student-paced lesson. In addition, the teacher can issue a real-time formative assessment to the students with the help of the prompts designed into the templates. PearDeck also promotes the students' social and emotional needs with specific templates that can be used during the lesson. Through various active learning strategies, the students can practice their critical thinking and problem-solving skills to make learning deeper and more meaningful (*Pear Deck Logic Model*, n.d.).

Nearpod (https://nearpod.com/) is an online learning platform that enables teachers to create or import a PowerPoint presentation and turn it into an interactive lesson by adding over 20 different interactive questions or activities to tie everything together as one active online learning experience. Among the interactive assignments, the teacher can choose to add open-ended or multiple-choice questions to videos, share understandings on a collaborating board, create online polls or quizzes, add game-based activities of matching and memory as well as virtual reality tours and other engaging learning activities. With the help of these activities, the students can receive immediate feedback about their understanding and the teacher can get an insight into their progress through a live review or progress report. The

platform enables teachers to conduct synchronous teacher-paced or asynchronous student-paced lessons to support in-person, distance and hybrid learning needs (Nearpod, n.d.).

The educational community of Estonia has also launched an online platform to support the creation of active online learning engagements - **Sisuloome** (https://sisuloome.e-koolikott.ee/). This platform is created by the Estonian Education and Youth Board (HARNO) and is aimed to support teachers around Estonia who wish to create interactive learning activities with the help of the H5P application. The website is accessible with the educational identification of Estonia (HarID) and is free to use for all teachers of Estonia that have registered themselves to use HarID. Sisuloome brings together all possibilities of creating interactive H5P content and a place to host the created materials - e-koolikott. With the help of Sisuloome and H5P, the teachers can create about 50 different types of rich interactive content including interactive videos, crosswords, quizzes, timelines, games and more (Joubel, n.d.). These interactive learning engagements can be shared with students or embedded into any other online learning platform like PearDeck or Nearpod.

After researching about different online platforms available, PearDeck, Nearpod and Sisuloome (e-koolikott) were chosen for the creation of interactive learning engagements. The main advantages of these platforms are that they offer a wide range of interactive learning activities that provide the students with the necessary interaction with the content as well as feedback about their progress. All these platforms are slightly different but integrate with and complement one another well. For example, the tasks created in the platform Sisuloome can be integrated into the online lessons created with the help of Nearpod and Peardeck.

The learning materials were created by the authors from scratch keeping in mind that the activities should be engaging and motivating to the students and include learning activities that incorporate active learning principles. The learning activities that were created were the following:

- **Interactive animation videos** that included pop-up questions (both open-ended and closed) to be completed while watching the video. This type of activity enables the students to interact with the learnt material and recall information provided in the video by answering the questions right away.
- **Collaborative board activities** to share their understanding and opinions with one another. The collaboration board activity enables the students to communicate with one another through the online environment by posting their opinions and reading classmates' posts to expand their understanding and create a shared learning experience.

- **Matching memory activity** to provide a game-based learning opportunity. Matching activities bring in a sense of gamification and enable the students to learn in a more interactive way. Essential information is displayed in the cards that students need to match based on what they have previously learned as well as provide additional information to be learnt during the activity.
- **Quiz trivia** to recall learnt information in a game-based activity. The quiz trivia game mode also adds a sense of gamification to the learning experience with the possibility to create a personal avatar and compete against classmates in real-time.
- **Ordering activity** for recalling learnt information and testing one's understanding. With the help of this learning engagement, the students can review the material by physically reordering the sentences and using the knowledge obtained in the online learning material.

In addition to the interactive learning platforms, we also used the platform **Animaker** (https://www.animaker.com/) to create animated cartoons that provided the students with the learning content and information for their lessons. With the help of Animaker, four animated cartoons were created that introduced different topics that were covered during the session:

- Estonia's Journey to Freedom[1]
- Democracy in Estonia[2]
- How Estonian Government Works[3]
- Making the Law[4]

[1] https://www.youtube.com/watch?v=23vwu_ieRXw

[2] https://www.youtube.com/watch?v=CuGHJJ6dzMw

[3] https://www.youtube.com/watch?v=oU3EkZjfM1U

[4] https://www.youtube.com/watch?v=Hp2aLGCAino

3.4 Data Collection and Analysis

The data collection section of the paper describes the data collection tools (chapter 3.4.1) used for our research study and procedures (chapter 3.4.2) that were used to get the information for the research. Subsection 3.4.3 offers an overview of how data was analysed.

3.4.1 Data Collection Tools

Data was collected through feedback questionnaires and interviews. Questionnaires (Appendix 1) helped us find out the necessary information for the second research question - to find out what activities of digital learning content are perceived as the most motivating by primary school students. Students graded their activities on a scale of 1 to 5, with 1 being the least interesting and 5 being the most interesting. This data could be translated into the activities perceived as the most motivating and engaging to answer research question 3. Interviews (Appendix 2 and 3) offered us data for research questions 1 and 2. We found out more about how students and teachers found digital learning environments engaging, how their perceptions compare and what challenges can be associated with active learning for young learners in a digital learning environment. We asked teachers 5 questions (Appendix 2).

1. Compared to a regular online lesson (when you have been in distance learning and working at the computer), what was different?
2. But when you compare this lesson to a regular classroom lesson, what was different then?

The First 2 questions offered an overview of the teachers' perception on using technology in the classroom overall and how they perceived the activities when students used technology.

3. Did the students seem more or less motivated to complete the tasks compared to the usual classroom lesson? Why? Why not?
4. What motivates/engages your students the most during an online activity?

The following 2 questions focused on the students' level of motivation and engagement.

5. Where/When would you use this type of learning engagement in your lessons?

The last question gave us an insight into teachers' perception of the study material and activities.

Students were asked 9 questions (Appendix 3).

1. How do you feel about using technology in the lessons (tablets, laptops, computers, smartboards)?
2. Compared to a regular online lesson (when you have been in distance learning and working at the computer), what was different?
3. But when you compare this lesson to a regular classroom lesson, what was different then?

The First 3 questions focused on the use of technology in the classroom and the students' experience and perceptions of learning online or in the classroom.

4. Did you feel more or less motivated to complete the tasks compared to the usual classroom lesson? Why? Why not?
5. Would you like to do similar lessons again? Why or why not?

The next 2 questions focused on the students' level of engagement and motivation.

6. What did you find the most enjoyable/ or motivating? Why?
7. What did you find the most difficult to do on your own? Why?

Questions 6 and 7 focused on the students' perceptions of the activities they had completed.

8. What motivates/engages you the most during an online activity?
9. Would you be willing to do these types of activities at home on your own?

The last set of questions focused again on the learning material and the level of motivation and engagement.

3.4.2 Data Collection Procedure

All students that were chosen for the study participated in lessons under the topic of "The Republic of Estonia" where they learned about the country, they have been living in. The topic was chosen because it was relevant to the students for their current unit of inquiry as well as for the general time frame of the intervention in February, the month of the Independence Day of the Republic of Estonia. As the sample included both Estonian-speaking and English-speaking students then two different sets of learning engagements were designed to meet the language needs of the participants. During the lessons, the students engaged in the learning activities designed with the use of the online platforms PearDeck[5] and Nearpod[6]. To make the learning environment as natural as possible for the students, we decided that their

[5] PearDeck activity: https://lingid.ee/peardeck
[6] Nearpod activity: https://lingid.ee/nearpod

own homeroom teachers were to conduct the lessons with the interactive learning activity. The responsibility of the teachers was to provide support and assistance to the students throughout the learning session. The homeroom teachers were also asked to give their feedback during an interview to reflect on their observations of the learning activities and student engagement and motivation during the lesson.

The intervention was originally planned as student-paced lessons conducted in the classroom. Because of the existing Covid-19 situation at that time, one of the classes was sent to self-isolation and therefore needed to conduct a distance learning lesson at home. The other two classes had their lessons in the classroom but conducted the learning activities asynchronously in a student-paced mode. The classes that were at school were handed out tablet computers and headphones to participate in the lesson. Students at home needed to use their own preferred devices which could include a PC, laptop or tablet computer. This meant that out of the whole sample, 26 students needed to have the lesson as a distance learning engagement and 39 students participated in the lesson in the classroom.

After the interactive online lessons, the students were asked to complete a questionnaire assessing all the learning activities according to their preferences. To follow the lessons, the students were divided into groups of 5 and interviewed in the groups by the research authors. Data was collected via semi-structured focus group interviews (Appendix 2 and 3) that support our goal to analyse our participants' emotions and immediate reactions to understand them better (Fontana & Frey, 2000). Two types of interviews happened - face-to-face at the school and online interviews over Zoom. The interviews ranged in length from 15-20 minutes. The questions were asked to guide the participants to express their opinion, alas they were allowed to share their emotions/opinions outside the question asked and keep the discussion going. Interview questions included finding out about students' perceptions of the use of technology, the intervention material, their engagement, and motivation level. After all three lessons were completed, the homeroom teachers of all classes also participated in the interview sharing their perceptions about the students' experience, motivation, and engagements as well as their own preferences regarding using online content in the learning process. The interview questions for the teachers were set up similar to the ones designed for the students and are available in Appendix 2.

3.4.3 Data Analysis

Data provided is classified under qualitative data except for questionnaire results. Questionnaire results were analysed with Excel statistics which gave us an overview of how

students graded each activity. Overall results showed us the most popular and least popular activities for young learners in our intervention, this was visualised in the form of a graph that is used in the Results chapter.

The interviews were conducted with groups of students right after their lessons and with the teachers after the intervention had been completed for all classes. The interviews were recorded and then transcribed by one of the authors and a professional transcription company. The transcriptions were shared on Google Docs between the authors. We went through the interview transcriptions and coloured information accordingly. For example, interview questions were coloured yellow. Answers that reflected a positive approach, e.g. "I love technology because it is helping you, it always assists you. It's like an assistant always with you.", were highlighted with the colour blue. Challenges mentioned such as "So for me it [using technology in the classroom] is very nice, but there are a lot of problems with the internet and stuff like that." were highlighted with red. After the first revision, we translated the main ideas from the interviews into English for our code tree on Miro (Appendix 4).

According to the highlighted comments mentioned, a code tree was created on the platform Miro, based on the most occurring themes and words in the interviews as well as the results from the questionnaire. We decided on the focus areas of the results and agreed on the subsections as well. The main themes are: (1) the students' and teachers' perception of the engagement of active learning methods in digital learning environments - divided into subsections of students' perception of using technology in the classroom, students' and teachers' perceptions of learning materials and the challenges associated with active learning in a digital environment for young learners; (2) how do teachers' and young learners' perceptions compare when it comes to interactive active learning activities in digital environments, (3) which activities were perceived as the most motivating by the students.

Following the code tree, we agreed on, we divided the subsections of the results and both of the authors created a document of questions and answers that gave us information about our section. At this point, we decided to translate the Estonian quotes for our English thesis for each of our subsections. The results have been analysed from the interviews and questionnaire answers. Interview quotations are presented as examples to complement the findings and the quotations are followed by the code for learner's quotes (L1) or teacher's quote (T1). Interview questions provide data for Research Questions number 1 and 3, whilst questionnaire results have given an insight into Research Question number 2.

Chapter 4: Results

This study aims to find out how active learning methods are accepted by the young students and teachers, focusing on the level of motivation and engagement with the material in a digital learning environment. The study identified the factors most affecting the perception of engagement and motivation positively as well as negatively and provided a comparison of learner and teacher perceptions. This chapter is divided into three parts according to the RQs: (1) the students' and teachers 'perception of active learning in digital learning environments, (2) the students' and teachers' perceptions of the effect of active learning in digital environments, and (3) activities that were perceived as the most motivating by the students.

4.1 Primary School Learners' and Teachers' Perceptions of Active Learning in Digital Learning Environment

4.1.1 Students' and Teachers' Perceptions of Technology

The study results confirmed that most students get excited about the use of technology in the classroom as it can be a good change to a traditional classroom. From the interviews, it can be interpreted that their experience using technology is mostly positive and offers a supportive and engaging learning experience. Students call technology use '*fun*' and find that technology in the classroom helps them with searching for learning resources or accessing study materials. The students believed that they are lucky to have been born at a time when digital tools can be used in the classroom. Students find technology to be a great alternative to notebooks and textbooks. According to one student, technology can be of big help: "I love technology because it is helping you, it always assists you. It's like an assistant always with you." (L1)

Other students gave similar remarks. To them, digital tools help to get feedback and answers quickly and seamlessly to Maths and Science tasks. Thus, making learning relatively easy and interesting. The students enjoy the instant feedback on their tests and see what they know and do not know. Technology is seen by the learners as the *'assistant'* or *'help'* rather than the main learning tool for the 3rd-grade classroom.

The teachers also agree that the use of technology is a great alternative to a regular lesson, but the activities need to be carefully planned and the teacher needs to be able to control what is going on in the classroom. A teacher said: "The use of technology needs to be

carefully thought out and you need to be very capable to oversee what is going on [in the classroom].” (T2)

One of the factors that were brought up by the teachers and the main influencer of the students’ perception of technology was their prior experience with the digital devices. For example, the international students had fewer challenges in using the tablet computers than the Estonian classes because they are used to using different devices more often in their lessons. According to the teacher (T3): “It depends more on the students. Our students have used [digital devices] more than your students, therefore they are very used to it.” The teachers of the Estonian classes admitted that the children did not feel as comfortable with the tablet computers as with the PC and would have preferred using the computer lab instead of portable devices.

The first reaction after the intervention involved positive as well as negative feelings. A big positive side to using technology is independent study - students are more motivated to learn at their own pace and not have to wait for other students to finish. Yet, students find it necessary to be surrounded by their peers and be able to interact with each other about the material as well as ask for help from the teacher. Students found that guidance in the classroom was necessary to help them engage with the material. One of the students reports: “When you are using the pad, then you don’t have to wait for others, you can follow your own tempo as fast as you can.” (L2)

Another student adds:

At school, you have the teacher who will explain everything, at home your mum-dad might not know anything of the subject, for example, to ask how you need to do something [...] school is better as you have the company of a teacher. (L3)

4.1.2 Students’ and Teachers’ Perceptions of Learning Materials

In terms of pedagogical potentials and challenges those digital platforms bring to the classroom, here's what one student said:

So, I feel very ‘meh’ [expressing a lack of interest or enthusiasm] about it [using technology in the classroom], because sometimes the websites are very good for learning, sometimes the websites are very bad. Sometimes if you don’t type exactly [the answer] what they want it will immediately say you are wrong. (L4)

Some students believe that technology can help if it is the right website, however, the traditional approach of using a workbook or a notebook helps them understand better. The websites and platforms also led to the discussion that the learning content must be visually

engaging and attractive. When the content is too long and visually too small or boring, it can make you lose focus and get bored in the classroom. According to one of the students: ”The digital learning environment is new and interesting, for some it could be more motivating [than the traditional approach] but you can only doodle in the notebook.” (L5) Students do enjoy having the freedom of writing personal notes, not as the computer would expect students to type.

The teachers admitted that the learning materials were informative and would probably be useful in several ways in future lessons. They perceived that the students participated actively in the learning materials but admitted that they were too long to be completed in one session. With young learners, it is important to add variety and movement breaks to the lessons to keep them active and engaged in the learning materials. One teacher said: “When you teach yourself, you intuitively pick up when the time is right for an activity break or change of activities to concentrate the attention.” (T3) Her colleague agreed that: “The kids get distracted relatively quickly. They are able to complete short fragments [of activities] but this [lesson] was too long for them.” (T1)

The teachers also agreed that the digital activities should be complemented with hands-on activities or summative writing tasks to revise the information just learnt and summarise the most important facts that should be remembered. This is reflected in one of the teacher's comments:

As there are many children to whom handwriting information is important then there could be something they can keep or what they need to do after completing the tasks. /- - - / A few questions that should be answered in writing after the activities. (T2)

4.1.3 Students’ and Teachers’ Perceived Challenges of Learning a Digital Environment

Although the students and teachers found the learning activities engaging and interesting, it was mentioned on several occasions during the interviews that the digital environment makes it more difficult to focus and concentrate as there may be different factors influencing it. Students can feel the difference between being focused on the material in a regular class or on the computer. The teachers also said that, in case of longer and more challenging activities, some students tend to get distracted and “*wander off*” from the activity. One of the students shared: ”In a regular classroom lesson, I am fully engaged [in the activities] and my thoughts don’t wander off but when I am at the computer then my thoughts are all over the place.” (L6)

The teachers' perceptions of possible challenges with using technology and digital learning platforms in a lesson resembled the students' opinions to a great extent. In addition, the students' confidence, and motivation to engage in a digital learning activity depends on the learner's prior experience and skills regarding the use of digital tools. Students who are more confident in using technology are more likely to engage with new platforms. For some students, the activities that decreased engagement and motivation were the ones that either included activities that were accompanied by longer videos or were difficult to complete because of technical issues - the text being too small, not fitting on the screen or registering only correct answers. According to one student:

This came where you needed to drag the things up in the box had the boxes so low at the bottom of the page that it was difficult to drag, and it didn't allow the boxes to be dragged in the wrong places. (L7)

Interactive videos were also sometimes perceived as less motivating because of two main reasons. The students did not prefer long videos and felt that they decreased their motivation. In addition, some students stated that the videos would have been more engaging when a real-life person would talk instead of an animated character. The students also voiced the opinion that they would prefer explanations and direct instruction from their own teacher because it makes it more motivating and easier to understand. Some students also admitted that the level of motivation was high at the beginning of the lesson because of the exciting activities but decreased over time because they became more tired.

One of the students expressed:

During the first lesson, I was more motivated and in the second less motivated than in the regular lesson. Because in the first lesson it was exciting to do them, more exciting because I was doing them for the first time. And in the second lesson, I became tired and less motivated. (L8)

The other challenge that the teachers brought out regarding online learning material, included the time factor of creating interactive digital learning activities. They all agreed that, in order to create a digital activity that engages the students actively in the learning process and helps to maintain their motivation, is relatively time-consuming and therefore, teachers may opt out of these possibilities. During the interviews, teachers asked the authors how long did it take to create the material used for the intervention and they found it time-consuming, however, one of the teachers shared: "It might take a long time to prepare the material but it is something you can use every year." (T3)

In addition, what came out during the interviews was that the students' motivation is greatly influenced by immediate feedback. In a regular lesson, it is easier for a student to receive immediate oral feedback or read the body language of the teacher to find out if he/she has done well or is on the right track. It is important to use the right learning materials for digital environments that guide students with immediate feedback. When completing assignments on a digital platform, the students cannot use the social aspect as much and need to rely on other indicators that confirm their right actions. During the interviews, a number of students expressed the need to receive more emotional feedback from the digital environment confirming their success. To keep the motivation and engagement high, the students wanted to receive feedback not only about their correct answers but also motivational feedback, such as saying "Well done!", "Great job!".

Also, a lot of students mentioned that using screens too often is bad for your eyesight. Recently, they have been using computers more often due to distance learning that started during the pandemic. Students are more used to using technology for education, but they also prefer using tools in the classroom rather than independently at home. A couple of students mentioned technical issues as a big challenge they have with using technology in the classroom. During distance learning, they realised their internet was not reliable or some computer programme did not work properly. Here is what one of the students said: "So for me, it [using technology in the classroom] is very nice, but there are a lot of problems with the internet and stuff like that." (L9)

The teachers agreed with the students admitting that it is essential for the primary students to have someone present that can assist them with technical challenges that may occur during the activity.

4.2 Comparison of Students' and Teachers' Perceptions of the Effects of Active Learning in a Digital Environment

Based on the interviews, we may conclude that the overall perceptions of the teachers and students are quite similar in regard to the use of digital learning materials. Both, the teachers and students agree that using technology in the classroom is a good alternative to a traditional classroom setting but it should not be over-exploited. Two of the teachers find technology as a positive change for the students, however, one of the teachers said that if it was up to her, she would never use technology in her classroom. The teacher explains: "At the moment there is

too much computer usage for students, especially due to distance learning, they need some time away from technology." (T1)

Other teachers agree that distance learning increased time on the computer, but still vocalise the point that in the normal classroom setting, technology can be a good substitute for traditional learning and bring some excitement to the students. This answer was very similar to what students were saying and they could also feel that now the intensity of technology use is bigger than usual.

The teachers believe that using technology is always more motivating than traditional methods, if not used too often. One teacher voices her concern that the students do not take the material serious enough and another teacher offers her a solution of asking them to write answers in their notebooks or having 3 revision questions at the end, that they have to write with a pen on a paper so they would remember by writing it through. Students agreed with this view as there was also mention of not being able to doodle on the corner of a laptop whilst you can in your notebook. Some of the students also agreed that they concentrate on the material more when they read a book and they lose their focus whilst working on the computer. One of the students mentioned:

When you work with a book [and other things] you tend to think along and you think that now you want to read, now I want to write and do things but on the digital tools you just click buttons and you go with it, rather than think. (L10)

Motivation depended on the student, as the material was long and some students got tired, however, the quizzes and games were motivating and refreshing. Teachers agree that elements of games in the material are motivating and exciting for students. One of the teachers explained: "Right away when a game appears, not just a reading and writing activity, the motivation [of students] increases and they begin engaging in activities as well as get more excited." (T2)

The new material seems more engaging whilst using technology in a balanced way. The activities the students said to be the most motivating and engaging included gamified activities and quizzes that included colourful layouts and competitive elements. A number of other students also agreed that creating the avatars and competing against each other added extra motivation to the learning experience. According to one of the students: "That quiz, in the end, was fun to complete because you were able to go shopping and create an avatar in addition to interesting questions and colourful text." (L11)

Overall, teachers found their students very engaged with the material. One of the teachers said that she could see from her students' eyes that they were following everything

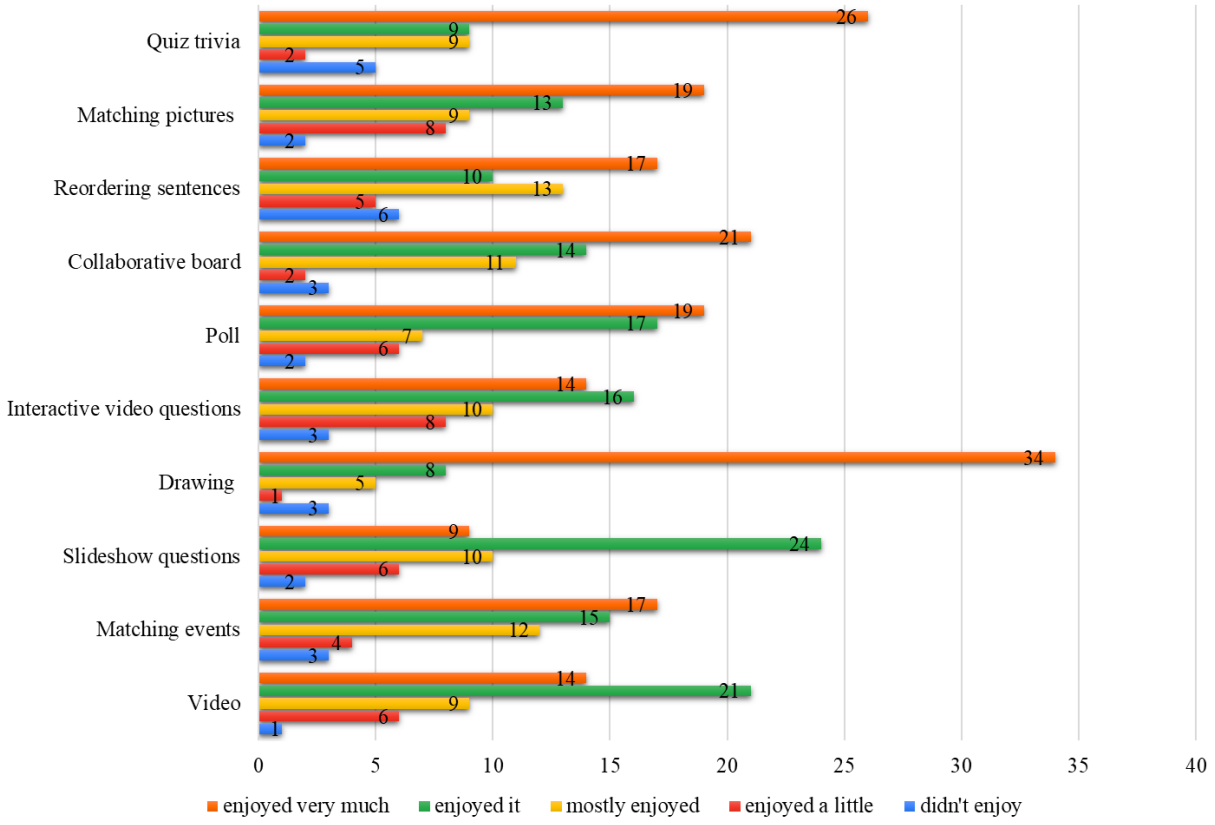
attentively and by the silence of the classroom, everyone was engaged enough with the material to not bother others. The teachers and students both agree that the created learning material was engaging, however, it was too long for completing in one session. It was agreed that the learning materials should be shorter in length to maintain the students' engagement throughout the whole process. Teachers also pointed out that it was positive that the students studied independently while still surrounded by their peers and supported by the teacher: "The material was great, it was very informative and the fact that you had little snaps in between where the student had to answer something (etc), helped with the focus." (T2)

When the teachers were asked when they could use the platforms introduced in their lessons, they answered that they could be used for introduction as well as revision. They also discussed that it could be adapted to different topics and subjects. Students agreed that now that they know the platforms they could use them as homework, however, they would prefer using them in the classroom rather than distance learning. Whilst teachers would use the tools for independent learning online. One teacher explained: "I could definitely use it for distance learning. In my perspective, the material would make my lessons easier and now that they know the platforms, it would mean fewer technical questions and more independent study." (T3)

4.3 Activities Perceived as the Most Motivating by Students

After completing the interactive lesson, the students assessed all learning activities based on their personal preferences. The results reflected the activities that were perceived as more engaging and motivating to complete for the students and which they did not enjoy as much. Based on the results in Figure 1, the most liked activities included drawing on a screen, playing the quiz trivia and sharing one's ideas on the collaborative board. A higher mount of top votes was also given to the matching and poll activities. The common characteristic of these activities is that they all imitate the situation of a real-life classroom where the students receive immediate feedback about their progress or find out about their classmates' opinions as well as have a possibility to compete against one another or use the gamification elements like creating and using avatars. The most liked activities enabled the students to interact with their peers through the platform as well as compete or play a game.

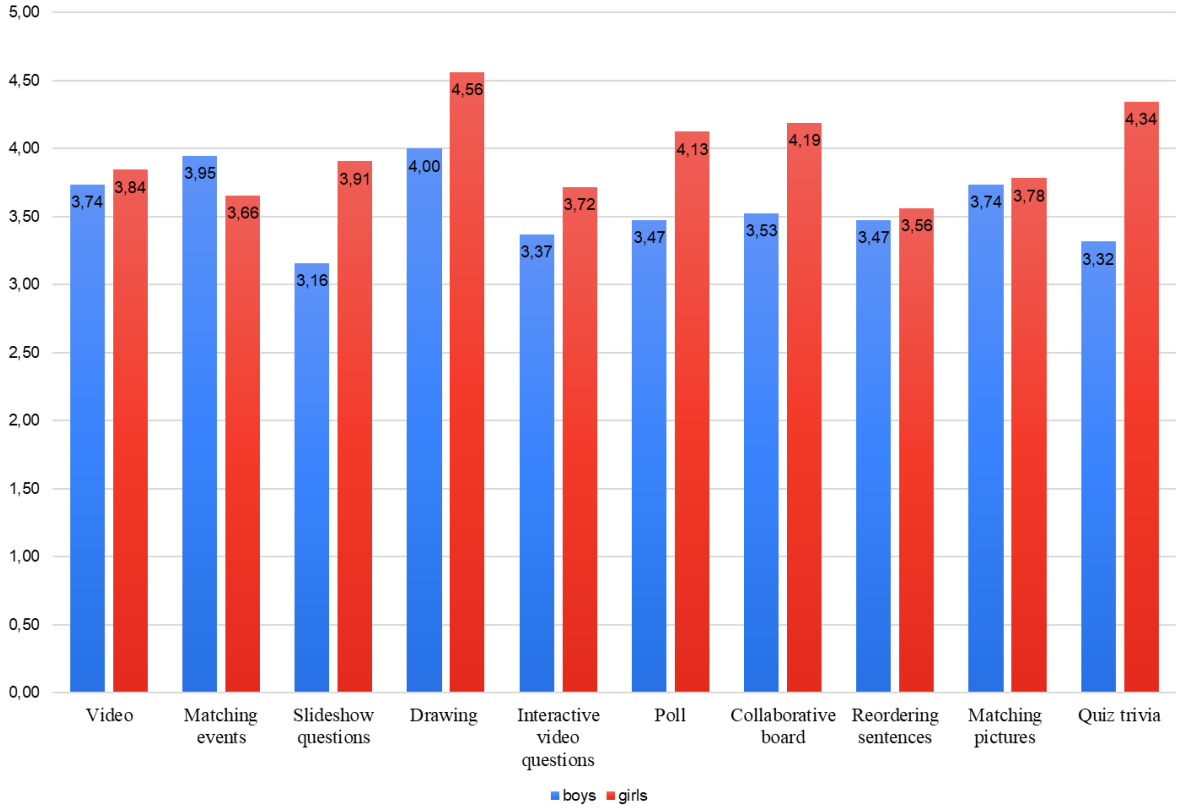
Figure 1: Students preferences for digital learning acivities



From these results, it is possible to conclude that the learning activities were enjoyable and motivating for the students. Students mostly rated the activities with scores of 3-5 but there were a few students that rated some activities with the lowest score. The activities that received the highest number of lowest scores (1-2) were reordering sentences, watching a video, and answering the questions on a video. During the interviews, it came out that these activities were relatively long or technically difficult to complete for the students. From the results of the questionnaire, we can conclude that the students mostly enjoyed the learning activities, and their preferences were scattered between all of the activities. This means that different students found different tasks motivating and there was an interesting activity for every student to complete. There were no activities that received only top scores as well as no activities that were not enjoyed at all.

Based on the comparison of the average scores of boys and girls (Figure 2), it is visible that the activities are highly rated by both boys and girls. The average scores of most learning activities are similar. The biggest difference comes out in drawing, quiz trivia, collaborative board, and poll activities that the girls favour slightly more than boys. The only activity that the boys favoured more than girls, was matching the historical events to the dates.

Figure 2: Comparison of boys' and girls' favourites



Chapter 5: Discussion

The aim of this master's thesis is to find out how active learning methods are accepted by young students and teachers in Estonia, focusing on the level of motivation and engagement with the material in a digital learning environment. Based on the research questions, in this chapter, we discuss the findings of the primary school learners' perceptions of active learning methods in the digital environment and the effects of active learning on their motivation and engagement. Below, the results of the students' and the teachers' perceptions are discussed and compared. In addition, the challenges that are associated with learning in a digital environment are revealed through the interviews.

5.1 Students' and Teachers' Perception of Technology

Primary school students find the active learning methods engaging and motivating also in the digital environments. However, they prefer the digital learning engagements to be more of a fun alternative rather than a norm for the lessons. As mentioned by Kastuhandani (2014), technology use in the classroom can solve challenges that teachers are facing, however technology use should be integrated with the study material meaningfully, not used only for the sake of technology itself. The current study confirmed that primary school students prefer interaction with real people over virtual communication. According to the teachers and students that participated in the study, this is mainly influenced by the children's need to receive immediate feedback and emotional recognition while engaging in active learning activities. When young learners are engaging with activities on digital platforms, they may lack the feeling of emotional recognition and feedback they need to maintain focus. With that, doing longer and more challenging digital activities may result in students getting distracted and less motivated. As mentioned by Forde (2017), timely feedback and the possibility to collaborate are important when creating a learning activity. This can be challenging in a digital environment, however, with the right tools and lesson set-up, teachers can provide an interactive experience with the help of digital learning activities that sustain the students' motivation and engagement by ensuring the feeling of collaboration and interaction.

5.2 Challenges Young Learners and Teachers Face with Learning in a Digital Environment

However, with primary school students, there are some possible challenges the students may face that need to be considered by the teachers while creating digital learning activities. The findings of the present research are in alignment with previous studies (Kastuhandani, 2014) stating that primary students need to be encouraged with a positive atmosphere to take part in all activities and tasks during the lesson both face-to-face and digital learning contexts. Teachers need to make sure that students are engaged with the taught material (Anh & Thoa, 2014). Therefore, in addition to creating engaging learning material, it is important that the teacher is present for the students during digital student-paced activities to support the motivation and engagement of the students. The role of the teacher in a lesson with digital learning engagements is to assist with the technical issues and provide guidance to the students when needed. Live interaction and support from the teacher increase the students' confidence and motivation to complete the digital learning activities. Based on the insights gained from the interviews, we can conclude that the primary students prefer the learning material to be presented by a physical person rather than a digital text or a cartoon character. The length of a specific learning activity or the whole experience also plays a significant role in the level of motivation and engagement of the students. The interviews with the students revealed that the reasons for not preferring some activities were the technical difficulties or lengthy assignments. The longer and the more complex the assignment was, the least preferred it turned out to be. Longer educational videos and more complex activities raise the cognitive load of the students and with that, lower their motivation to engage with the material. In addition, as students mentioned, being on the computer too much can hurt their eyes. This means that, while creating digital learning material, the teachers need to be mindful of the length and complexity of the assignment.

5.3 Comparison of Students' and Teachers' Perceptions of the Effects of Active Learning in Digital Environment

Overall, the feedback on the digital learning activities among young learners and their teachers was positive. The Primary school students found the activities delivered in digital format engaging and rated them highly. There were no strong preferences towards any of the learning activities. However, the aspects of the activities that were brought out as more

motivating and engaging, included interactive communication with the digital environment or with peers as well as the element of gamification and competition. In addition, the activities that proved to be easier to understand and were visually more appealing were also among the favourites of the students. This result supports the theoretical background that states the need for digital activities to be simple enough for the children to understand what is expected of them as well as achievable but stimulating at the same time (Kastuhandani, 2014). In addition, the language level and visuals need to be age-appropriate (Phillips, 2013). From this, it can be concluded that the digital learning engagements are perceived as more motivating by the students when they include gamified elements such as creating avatars and competing against peers. In addition, the digital learning engagements need to be visually appealing including colours, pictures as well as clear and understandable text.

All in all, students and teachers alike agreed that the digital learning activities promoted active engagement in the learning process as well as students' motivation to complete the tasks. Both groups found the material useful and could see it being used in the future for different occasions but not as the main learning or teaching tool.

5.4 Activities Perceived as the Most Motivating by Students

The current study also revealed the characteristics of the activities that influence the level of motivation and engagement of students when they complete them in digital learning environments. The results from the questionnaires and interviews with students confirmed that their perception of the level of motivation and engagement is raised when the activities enable them to interact with the digital content and receive immediate feedback about their progress throughout the session as mentioned by Kastuhandani (2014) and Forde (2017). They also like to be an active part of the learning process rather than watch a video. This trend was visible in the activities the students chose as their favourites in the questionnaire. Student motivation and engagement are higher in collaborative activities (collaboration board) and personal interaction with the digital material (quiz trivia). The students also value the possibility to share their opinions through the digital environment the same way as in face-to-face interaction.

The other factor that influences the students' motivation and engagement is the design of the digital learning activities that follow the active learning principles. The students perceive digital learning activities as more engaging when they are designed to be visually appealing and easy to understand as well as with interactive features that enable students to

interact with the learning material. The use of technology and interactive digital learning activities makes it easier for the teachers to shift away from teacher-centred instruction to more student-centred classrooms where the students take control over their learning by interacting with the digital content at their own pace (Neokleous, 2019). The given finding is in line with the research of Neokleous (2019), confirming that the self-paced digital learning material offers the students the possibility to participate actively in the learning process as well as take control over their learning by proceeding at their own pace without having to wait for the other students or worry that they are left behind, and with that, creating a positive learning atmosphere and considering the students' individual needs. With the use of digital platforms, the students can take ownership of their learning and progress without depending on their teacher or classmates. This result is also supported by the theory that active learning can also make students participate in the learning process and interact with the physical and digital learning material, other students, teachers, and different resources to create their own understandings rather than just obtain information from an external source (Prince, 2013).

Chapter 6: Conclusion

Primary school students enter school with high levels of motivation and natural curiosity which tends to decrease over the course of the study. Therefore, the teachers need to implement a variety learning methods and tools to sustain primary level students' engagement with the learning material, as the negative or positive experiences affect their future academic journey. To maintain high motivation and engagement, using active learning methods in both face-to-face and digital learning activities can be particularly important for younger learners.

To best implement technology into the learning process, so it would benefit the primary school students, the teachers need to be able to find digital tools that provide engaging and motivational learning experiences for students in the primary grades, aligned with the active learning methods. In the contemporary classroom, technology plays an important role in the learning process. Often the teachers are not aware of what aspects to consider or challenges to address when using digital learning activities with young learners. To address this issue, teachers are able to use available resources that support active learning with the help of digital tools.

The current study and intervention revealed that digital learning activities can support active learning as well as maintain the young learners' motivation and engagement. The perceptions of students' and teachers' align regarding the use of digital tools in the classroom.

The research showed that the digital activities used with young learners should be short and straightforward, as well as include the elements of interaction and gamification to maintain a high level of motivation and engagement of the primary school students in Estonia. The current research reveals the tendency of students' and teachers' perceptions in 3rd grade and further research is needed to prove the fact.

The current study has its limitations; thus, its results must be interpreted with caution. Firstly, the students selected came from the same school and therefore had a similar background and possible set of digital skills. In addition, the sample size for the study was rather small in the case of teachers. The study only included students from grade 3 and their three homeroom teachers, which also made the results less varied than with a larger sample. Additionally, the study consisted of several learning sessions and did not have longitudinal nature to better investigate the effects of the intervention. The study also looked at the effects of the adopted intervention at the participant's perceptions level, which can be rather subjective.

The possibilities of further research could include a wider range of variables to collect more differentiated data that would help to further extend the scope of the research and make

the collected data more nuanced. The research could be extended by introducing moderating variables such as different age groups, and IT competence or analysing learning outcomes that the students had after the intervention. The reports of the activities could be analysed to see how the knowledge from the material was acquired by the students. Further studies might reveal the difference in perceived motivation and engagement between the students from different age groups. In addition, it would be possible to study whether students with different levels of digital skills perceive the digital learning engagements the same way. The practical implication of the study to education is integrating technology in a meaningful way in the classroom.

To conclude, the COVID-19 pandemic created an opportunity to advance using technology in and outside the classroom with an educational focus. As a result of emergency online teaching, it has been concluded that technology-enhanced instruction is possible at all levels of education, and even though it has challenges, as long as the obstacles are accounted for, and relevant approaches adopted, it can enhance the learning process even for the younger learners.

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Author's Declaration

We hereby declare that we have written this thesis in collaboration with shared responsibilities and that all contributions of other authors and supporters have been referenced. The thesis has been written in accordance with the requirements for graduation theses of the Institute of Education of the University of Tartu and is in compliance with good academic practices. To create this thesis, a shared *Google Drive* folder was used where we collected all necessary material, articles, and research. The draft of the theoretical part of the thesis was written during collaborative sessions and later continued asynchronously whilst keeping in contact throughout the process. We collaboratively discussed the issues and main thesis research questions. The intervention material was created collaboratively by sharing responsibilities and both authors were present when the intervention took place. The interviews were transcribed by a professional transcription company, which was followed by coding the results together. The results and the discussion were written together.

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/*Signed digitally*/	/*Signed digitally*/

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APPENDICES

APPENDIX 1 – Students' Questionnaire

How did you enjoy the following activities?

Grade activities from 1 to 5

(1 - I did not enjoy this at all😖, 2 - I enjoyed it a little bit, 3 - I mostly enjoyed it, 4 - I enjoyed it, 5 - I enjoyed it very much😀).

I am a…

A. Boy
B. Girl

Grade the learning activities. Circle the correct number.

Watching videos

😖1 2 3 4 5 😀

Connecting dates and events

😖1 2 3 4 5 😀

Answering questions during the slideshow

😖1 2 3 4 5 😀

Drawing on the screen

😖1 2 3 4 5 😀

Answering questions based on the video

😖1 2 3 4 5 😀

Sharing your opinion

😖1 2 3 4 5 😀

Posting post-its on the board

😖1 2 3 4 5 😀

Matching pictures and names

😖1 2 3 4 5 😀

Reordering sentences

😖1 2 3 4 5 😀

Quiz trivia questions

😖1 2 3 4 5 😀

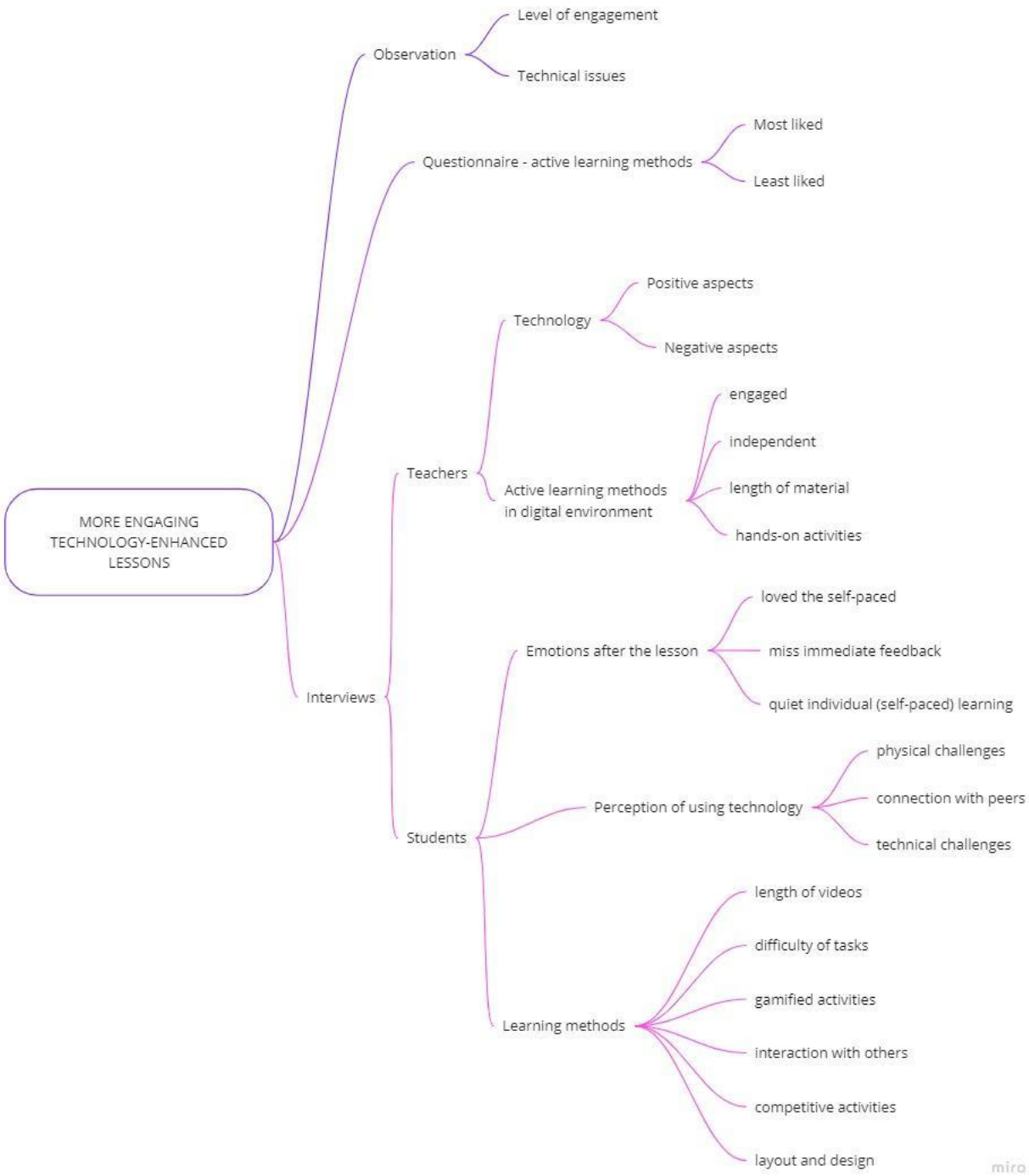
APPENDIX 2 – Teachers' Interview Questions

1.	Compared to a regular online lesson (when you have been in distance learning and working at the computer), what was different?	Võrreldes tavalise tunniga arvutis (kui oled pidanud olema distantsõppel), mis oli sel korral teistmoodi?
2.	But when you compare this lesson to a regular classroom lesson, what was different then?	Kuid kui sa võrdled seda tundi tavalise klassis toimuva tunniga, mis oli siis erinev?
3.	Did the students seem more or less motivated to complete the tasks compared to the usual classroom lesson? Why? Why not?	Kas õpilased tundusid olevat tavalise klassitunniga võrreldes rohkem või vähem motiveeritud ülesannete täitmiseks? Miks? Miks mitte?
4.	What motivates/engages your students the most during an online activity?	Mis motiveerib/köidab sinu õpilasi kõige rohkem online-tundide tegevuste ajal?
5.	Where/When would you use this type of learning engagement in your lessons?	Kus/millal kasutaksid sellist õppetegevust oma tundides?

APPENDIX 3 – Students' Interview Questions

1.	How do you feel about using technology in the lessons (tablets, laptops, computers, smartboards)?	Mida sa arvad digivahendite kasutamisest koolitunnis (tahvlid, sülearvutid, lauaarvutid, nutitahvlid?
2.	Compared to a regular online lesson (when you have been in distance learning and working at the computer), what was different?	Võrreldes tavalise tunniga arvutis (kui oled pidanud olema distantsõppel), mis oli sel korral teistmoodi?
3.	But when you compare this lesson to a regular classroom lesson, what was different then?	Kuid kui sa võrdled seda tundi tavalise klassis toimuva tunniga, mis oli siis erinev?
4.	Did you feel more or less motivated to complete the tasks compared to the usual classroom lesson? Why? Why not?	Kas olid tavalise klassitunniga võrreldes rohkem või vähem motiveeritud ülesannete täitmiseks? Miks? Miks mitte?
5.	Would you like to do similar lessons again? Why or why not?	Kas sulle meeldiks sarnases tunnis veel osaleda? Miks? Miks mitte?
6.	What did you ding the most enjoyable/ or motivating? Why?	Milline tegevus oli kõige põnevam/lõbusam? Miks?
7.	What did you like the most difficult to do on your own? Why?	Milline tegevus oli kõige keerulisem? Miks?
8.	What motivates/engages you the most during an online activity?	Mis motiveerib/köidab sind kõige rohkem online-tundide tegevuste ajal?
9.	Would you be willing to do these types of activities at home on your own?	Kas sa oleksid nõus neid ülesandeid kodus üksi tegema?

APPENDIX 4 – Code Tree



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