Inland Norway University of Applied Sciences

Anna Ertsås

Master's Thesis

Virtual Reality in Education - Research on the Norwegian EFL Learner and Teacher Perspective of the Educational Value of Virtual Reality and Virtual Reality as an Approach for Facilitating Written Communication

Virtuell virkelighet i utdanning - forskning på det norske elev- og lærerperspektivet med engelsk som fremmedspråk angående den pedagogiske verdien av virtuell virkelighet, og virtuell virkelighet som tilnærming for å legge til rette for skriftlig kommunikasjon

MGLU 1-7 2018

2022/2023

Preface

I received an opportunity in my fourth year of studying to become a primary school teacher, which I had to seize. Technology-enhanced teaching and learning hold a great deal of focus at Inland Norway University of Applied Sciences. I was given the chance to facilitate a virtual reality (VR) programme created by the university. The purpose of the VR programme was to assist future teachers in practising a circumstance that they infrequently get to exercise before starting their actual teaching careers. This entailed practising having a development conversation with a parent and a learner in order to lessen the "practise shock". What captivated and fascinated me, despite the fact that this was only a constructed programme, was how everything felt so real. This was an incredible experience for me since, even though the situation and the circumstances were not genuine, my emotions were. I got to be in an authentic situation over and over again, which left me with boosted self-esteem, confidence, and motivation towards being able to cope with similar situations. It also fascinated me how these experiences opened up communication and discussion. I had an urge to communicate what I had just experienced. As a result of this experience, I now view VR as a fantastic learning tool to bring the "real" world into the classroom. I thought, "How wonderful would it not be for learners to explore the world without ever leaving the classroom?" I am not saying we should not take the teaching outside sometimes, because you should. One should use the local community and all it offers for all it is worth. However, occasionally the learners study Egyptian history or England, which cannot be explored on a simple field trip. This is where VR comes in handy. With all of this in mind, I began to play with the idea of writing my master's thesis about virtual reality, communication, and engagement. One year later, I am presenting the final product of a research project that I had a strong desire to conduct.

Hamar, May 2023
Anna Ertsås

Abstract

Title: Virtual Reality in Education - Research on the Norwegian EFL Learner and Teacher Perspective of the Educational Value of Virtual Reality and Virtual Reality as an Approach for Facilitating Written Communication.

Author: Anna Ertsås

Year: 2022/2023

Pages: 90 (excluding appendices)

In today's increasingly digital society, digital skills are essential for learners. They must be exposed to a variety of digital instruments in order to know how to use them for a variety of purposes and contexts. The education system in Norway must facilitate learning in these subject areas. This master's thesis combined virtual reality (VR) technology with two digital tools and writing skills to develop two teaching and learning sessions to investigate this research question: What is the Educational Value of Using Virtual Reality in EFL Teaching and Learning, and How Can an Authentic Virtual Reality Experience Facilitate Written Communication in the EFL Classroom in Norway? To provide insight into the components of this thesis, action research served as the primary method to collect data from the teacher perspective. To capture learner-based data, questionnaires and a focus group interview were used. The results from the various methodologies are discussed in light of pertinent theory and previous research.

The findings of this study indicate that VR brings something new and engaging to the classroom. VR has educational value, serving a wide range of possibilities and challenges that were addressed for two approaches to VR via their respective data acquisition techniques. Overall, the educational potential appears to be about how VR feels authentic, engaging, and meaningful, and it facilitates the learning and training of several skills. Lack of competencies, finances, cybersickness, and internal and external distractions were cited as obstacles for VR. The findings related to VR and whether or not it facilitated written communication concluded that for some, it facilitated and engaged writing, but not for all. Although the VR experiences alone were insufficient to motivate all learners to write, the task, which was intended to be authentic and meaningful, appeared to alter all learners' attitudes towards the written assignment. Briefly summarised, HMD VR scored higher than iPad VR; however,

the possibilities and challenges of each approach indicate similar value, and it all boils down to the fact that VR in general is engaging, promotes learning, and facilitates authentic experiences, and together with authentic and meaningful assignments facilitate written communication.

Norsk sammendrag

Tittel: Virtuell virkelighet i utdanning - forskning på det norske elev- og lærerperspektivet med engelsk som fremmedspråk angående den pedagogiske verdien av virtuell virkelighet, og virtuell virkelighet som tilnærming for å legge til rette for skriftlig kommunikasjon.

Forfatter: Anna Ertsås

År: 2022/2023

Antall sider: 90 (ikke medregnet vedlegg)

I dagens stadig mer digitale samfunn er digitale ferdigheter avgjørende for elever. De må eksponeres for en rekke digitale verktøy for å forstå hvordan de skal brukes til ulike formål og sammenhenger. Utdanningen i Norge skal legge til rette for læring innen disse fagområdene. Denne masteroppgaven kombinerte virtuell virkelighetsteknologi (VR) med to digitale verktøy og skriveferdigheter i arbeidet med å utvikle to undervisningsøkter som vektla å undersøke følgende forskningsspørsmål: Hva er den pedagogiske verdien av å bruke VR i undervisning og læring av engelsk som fremmedspråk (EFL), og hvordan kan en autentisk VR-opplevelse legge til rette for skriftlig kommunikasjon i EFL-klasserommet i Norge? For å gi innsikt i komponentene i denne oppgaven, fungerte aksjonsforskning som den primære metoden for å samle inn data for lærerperspektivet. For å fange opp elevbaserte data ble spørreskjemaer og fokusgruppeintervju benyttet. Resultatene fra de ulike metodikkene diskuteres i lys av relevant teori og tidligere forskning.

Funnene i denne studien indikerer at virtuell virkelighet bringer noe nytt og engasjerende til klasserommet. VR har pedagogisk verdi, og gir et bredt spekter av muligheter og utfordringer som ble adressert for begge tilnærmingene til VR via deres respektive datainnsamlingsteknikker. Totalt sett ser det pedagogiske potensialet ut til å handle om hvordan VR føles autentisk, engasjerende og meningsfylt, samtidig som det tilrettela for læring og trening av flere ferdigheter. Mangel på kompetanse, økonomi, cybersykdom og interne og eksterne distraksjoner ble nevnt som utfordringer med VR. Funnene knyttet til VR og hvorvidt det la til rette for skriftlig kommunikasjon, konkluderte med at det for noen la til rette for og engasjerte til skriving, men ikke for alle. Selv om VR erfaringene alene var utilstrekkelige til å motivere alle elever til å skrive, virket oppgaven, som hadde til hensikt å være autentisk og meningsfull, å endre alle elevers holdninger ovenfor den skriftlige oppgaven.

V

Kort oppsummert scoret HMD VR høyere enn iPad VR; mulighetene og utfordringene ved hver tilnærming indikerer imidlertid en nokså lik verdi, og det hele koker ned til at VR generelt er engasjerende, fremmer læring og autentiske opplevelser og sammen med autentiske og meningsfulle oppgaver legger det til rette for skriftlig kommunikasjon.

Table of Contents

1. Introduction

In this master's thesis, I investigate the potential educational value of an authentic virtual reality (VR; see Section 1.3.1 for a definition) experience that can serve to facilitate written communication in the English as a foreign language (EFL) classroom in Norway. Educational value was defined and limited in this thesis to refer to possibilities and challenges linked to the use of VR in education. This was studied using a variety of qualitative methodologies that brought forth both the learner perspective as well as my perspectives as the role of teacher and researcher through action research, questionnaires, and an interview (see Chapter 4). The topic and central aspects of the thesis are introduced in this chapter, along with how they relate to the teaching of English in Norwegian primary schools. In addition, the chapter covers the research questions of this thesis and the scope of the study. The chapter closes with an overview of the thesis' components.

Virtual reality technology and how well it supports authentic learning are sources of inspiration for educational researchers, including myself. This is why I wanted to delve deeper into this topic and investigate what potential VR offers in terms of authenticity towards written communication in the EFL classroom from the perspective of what learners actually think, feel, and express, while also conveying the teacher and researcher perspective. The technological revolution and the digitalisation of society have developed tremendously in recent decades (Selwyn, 2022). As a result of this, "most aspects of education are beginning to be reimagined in a technological light" (Selwyn, 2022, p. 2). Nowadays, people use technology and digital tools in their everyday lives to communicate, find information, and organise their lives. These developments "clearly have implications of how learning takes place, how knowledge is created and how people expect to be taught" (Selwyn, 2022, p. 2). Selwyn (2022) points to a number of advantages of implementing technologies in education. In particular, digital technology facilitates participation for all because it enables schools to operate outside the classroom, making learning more flexible and accessible, "allowing people to learn on an 'Any Place, Any Pace' basis" (Selwyn, 2022, p. 28). However, there has been growing criticism that schools are stuck in a bygone era compared to the adoption of technology in other sectors of today's digitally driven society (Selwyn, 2022). Simultaneously, VR as a digital learning tool is a relatively new phenomenon that has emerged increasingly in language learning research over the past two decades (Lin & Lan, 2015; Lan, 2020). Despite the rising number of studies in the area, there are still several unexplored options (Barrett et al., 2020; Lan, 2020). Lan (2020) provides suggestions for

future study and mentions, among other topics, the need for research on K–12[1] students in addition to what has been studied the most, namely university students. Furthermore, he emphasises the significance of familiarising teachers with the technology and available VR resources, as well as providing them with hands-on experience and familiarity with the devices and the advantages and potential drawbacks that this may present. Additionally, it is urgently requested that teachers be included in such a study in order to accommodate and emphasise their perspectives and how to adopt pedagogical approaches in teaching using a digital tool such as VR (Lin & Lan, 2015). In order to provide such a teacher perspective, I implemented action research developed from communicative language teaching (CLT) and the TPACK framework (see Chapter 2 for more elaboration). Therefore, action research was this research's main method, complimented by questionnaires and an interview (see Chapter 4). Consequently, the purpose of this master's thesis is to use VR with digital tools and authentic texts in teaching and learning directed towards learners in primary school, addressing the potential possibilities and challenges together with the learners and emphasising both the learner and teacher perspectives.

In addition to VR as a digital tool in the English subject, this thesis more specifically focuses on two central elements of the Norwegian core curriculum, namely digital skills and writing skills (Ministry of Education and Research, 2017), and the broad sense of texts emphasised in the English subject curriculum (Norwegian Directorate for Education and Training, 2019; see Section 1.1.3 for a definition). Given the central position of English in the globalised world, the English subject holds a central role in fostering the learning of communication skills using digital tools (Brevik et al., 2020). "[K]nowing how to use online tools and services for learning a new language is of crucial importance" (Godwin-Jones, 2016). Moreover, it is important to practise these skills in an authentic context rather than something abstract (Farley, 2016). Learning that is situated in a realistic context will help promote learning and is crucial for some in order to transfer the learning from one setting to another (Nelson & Erlandson, 2012). Also, Godwin-Jones (2016, p. 6) claims that "using the power of the internet to have students directly experience real-world conversations with other L2 speakers (…) can be as eye-opening an experience for some students as a trip abroad".

Why, then, should Norwegian EFL learners be exposed to texts using digital tools that provide virtual reality? Research shows that VR with digital tool is motivating, helps facilitate learning, enhances EFL listening, and promotes language acquisition (Bahari, 2021; Tai & Chen, 2021; Makransky et al., 2020; Stanger-Johannessen & Fjørtoft, 2021). Furthermore, research also shows that learning in

---

[1] Kindergarten through grade 12 (K-12)

authentic contexts is associated with better language learning, increased motivation, inspiration, understanding, and reflection (Shadiev et al., 2019). Therefore, I wanted to investigate the authentic elements of VR and how these affect written communication from the teacher perspective and the learners' point of view. However, there is a dearth of research on the pedagogical value of VR in education (Stanger-Johannessen & Fjørtoft, 2021), particularly in primary and secondary schools (Lan, 2020). Additionally, there is no research on VR in Norwegian primary schools with an emphasis on EFL.

1.1 Justifications, Purpose of Research and Terminology

As mentioned, this thesis sought to investigate the EFL learner and teacher perspectives on two approaches to VR, and how VR can serve as a starting point to facilitate written communication. The reason for including the learners' voices is because it is an explicit focus in the core curriculum to "provide the pupils with the opportunity to participate" (Ministry of Education and Research, 2017, p. 9), and children have the right to be heard, especially in cases concerning them (United Nations, 1989, p. 13). This is important in teaching and learning in order to engage and motivate learners for both subjects of interest and subjects of less interest. Learners must learn how to use digital technologies for purposes beyond just entertainment and social media as they grow up in a digital society in constant change (Ministry of Education and Training, 2017; Selwyn, 2022). As a result, the renewal of the Knowledge Promotion places a strong emphasis on participation and the development of digital skills among learners.

1.1.1 Digital Skills

The purpose of this study is to investigate the potential possibilities and challenges of how two approaches to VR, providing digital texts that represent authenticity, can facilitate written communication from both the learner and teacher perspectives. Digital skills are emphasised in the Knowledge Promotion of 2020, with an explicit focus within each subject (Norwegian Directorate for Education and Training, 2019). Digital skills "include developing digital judgement by acquiring knowledge and good strategies for online use" (Ministry of Education and Training, 2017, p. 3, own translation). In other words, digital skills directly relate to how we employ digital tools for different purposes and our level of proficiency with them. Hence, employing digital tools for learning while maintaining critical awareness and hopefully providing transferable value to the world outside the classroom is an important prerequisite for participating in today's society (Ministry of Education and

Training, 2017). In other words, we "need to make students aware of issues using online media that go beyond technical know-how" (Godwin-Jones, 2016, p. 5), including ethical and legal concerns, fairness, and access.

There are several reasons why I chose to use digital tools in this thesis. Firstly, "[d]igital literacy has a prominent place in the Norwegian curriculum and politicians have typically been enthusiastic about introducing digital tools in schools" (Hoem & Iversen, 2020, p. 156). In the English subject curriculum, obtaining digital competence is emphasised as one of the basic skills. The ability to use digital tools and resources to enhance language learning, interact in authentic situations, and discover pertinent information are all examples of what digital skills in English emphasise. This calls for reflective and critical behaviour in digital English expression and interpersonal communication. English language digital skill development moves from language exploration to social interaction, text creation, and knowledge acquisition through gathering, examining, and critically evaluating information gathered from various English language sources (Norwegian Directorate for Education and Training, 2019). In addition, the competence aims focus on acquiring digital knowledge through the use of digital tools in language learning, written communication, and interaction. One of the competence aims after year 7, that I have chosen to focus on in the lesson plan (see Section 4.2), states that the learners are expected to master "use[ing] digital resources […] in language learning, text creation and interaction" (Norwegian Directorate for Education and Training, 2019, p. 7). In addition to being emphasised in the curriculum, Ørevik (2020) reflects upon the wide range of possibilities digital tools may provide in education and English teaching and learning. Digital tools can offer a different way to adapt teaching than traditionally seen (Ørevik, 2020). Interactivity, variety, options, and opportunities may all be provided by digital tools; easy access to multimodality can help scaffold, benefit, support, and adapt reading and production of texts in English; and tasks can be directly connected to one learner's learning needs and interests where "algorithms […] provide increasingly demanding tasks for the learner" (Ørevik, 2020, p. 175), which again can help scaffold, support, and adapt tasks directly in the learning situation without any extra workload or planning.

1.1.2 Writing Skills

The ability to write is the main basic skill on which this thesis focuses. As we live in a text-based society where we constantly write for different purposes, the relevance of obtaining writing skills is crucial (Lund & Villanueva, 2020). Therefore, writing skills are a basic skill that should be worked on and trained in all subjects in school. Writing in the English subject has both a communicative purpose to facilitate the learners' abilities to express themselves through various texts in an

understandable and appropriate manner and a language acquisition purpose, where the learners are expected to use writing to learn English effectively (Norwegian Directorate for Education and Training, 2019; Lund & Villanueva, 2020). Being able to create meaning and convey ideas and opinions in a clear and appropriate manner when encountering different types of texts is a complex skill that needs to be trained in school (Norwegian Directorate for Education and Training, 2019). Hence, they need to be exposed to and have the opportunity to explore and interact with such texts, for instance, authentic, practical, and meaningful texts (Norwegian Directorate for Education and Training, 2019). In connection with an authentic, meaningful writing assignment, virtual reality experiences such as the ones presented in this thesis will enable students to practise writing texts that are authentic, practical, and meaningful and have transferable value to real-life writing situations.

In this thesis, the learners are expected to conduct a written assignment after completing a VR experience. In other words, the learners are to interact in an authentic situation and use this experience to express themselves in writing. This is closely linked to what is emphasised in the English subject curriculum about communication as

> [t]he pupils shall employ suitable strategies to communicate, both orally and in writing, in different situations and by using different types of media and sources. The pupils shall experience, use and explore the language from the very start. The teaching shall give the pupils the opportunity to express themselves and interact in authentic and practical situations. Norwegian Directorate for Education and Training, 2019, p. 2

The written assignments will be presented in Section 4.2.

1.1.3 Texts in a Wide Sense

As mentioned, this thesis combined digital skills with writing skills, as this offers a valuble combination when working with texts in English. The English subject curriculum defines texts in a broad sense, stating that

> texts can be spoken and written, printed and digital, graphic and artistic, formal and informal, fictional and factual, contemporary and historical. The texts can contain writing, pictures, audio, drawings, graphs, numbers and other forms of expression that are combined to enhance and present a message. Norwegian Directorate for Education and Training, 2019, p. 3

Despite the fact that the VR experiences used in this study are not conventional texts to which learners are regularly exposed, this broad definition of the term "texts" encompasses it. Hence, the terms "VR experience" or "VR text" refer to the same materials used in this thesis. Also, according to Cope and Kalantzis (2009, p. 12), the world "is full of complex technical and social architectures that we need to be able to read", so in order for learners to learn the English language, they must be exposed to, gain knowledge of, experience, reflect on, and critically evaluate various types of texts in the language (Norwegian Directorate for Education and Training, 2019). The teacher's position is crucial in this situation. Teachers "need to become masterful users of these new meaning-making tools, applying the metalanguage they and their learners need alike in order to understand their affordances" (Cope & Kalantzis, 2009, p. 12), in order to expose learners to a variety of texts using a variety of digital technologies. The teacher perspective in this thesis will be presented as a dual role between teacher and researcher through action research (see Section 4.3). Consequently, the purpose of this master's thesis is to use two VR approaches with digital tools and authentic texts in EFL teaching and learning linked to written communication and directed towards learners in primary school, addressing the potential possibilities and challenges and emphasising both the learner and teacher perspectives.

1.2 Research Question

As mentioned in Section 1, the purpose of this thesis is to shed light on the possibilities and challenges VR, as two approaches with digital tools providing digital authentic experiences, may have on teaching and learning EFL, specifically written communication. Hence, it was crucial to formulate a research question that would allow for the investigation of common characteristics in VR teaching and learning and its components. Thus, the main research question for this study is:

What is the Educational Value of Using Virtual Reality in EFL Teaching and Learning, and How Can an Authentic Virtual Reality Experience Facilitate Written Communication in the EFL Classroom in Norway?

This research question is comprised of several units; to break it down, it concerns Norwegian EFL learners and a teacher, approaches to virtual reality with digital tools, digital authentic texts, and written communication. To investigate the main research question from different angles, I included some subordinate questions. These are: "What are the educational possibilities and challenges of head-mounted display VR (HDM VR) and iPad VR in terms of teaching and learning?" to help educators create and provide learners with more engaging and effective learning experiences,

facilitate communication, and prepare learners for the future, "How can interpretation with an authentic VR experience facilitate written communication?" and "How are learners influenced by HMD VR versus iPad VR?" to identify their preferred experience in terms of learning and user experience. Additionally, after conducting the pilot study for this thesis (see Section 4.1.2), I formulated a hypothesis based on the results of the pilot study, which states: "Authentic experiences and meaningful assignments, engage learners and facilitate learning and writing".

1.3 Defining Terminology

In this thesis, I use HDM VR and iPad VR to address their educational value in EFL teaching and learning written communication. Hence, I have searched for definitions of terms related to my thesis in current theory and earlier research, including different approaches to virtual reality and their related characteristics, in order to define HMD VR and iPad VR. Additionally, English as a foreign language (EFL) is an established term in Norway, which will be used throughout this thesis to describe Norwegian learners of English. Note that there is an ongoing discussion about the term's appropriateness in Norway (see Rindal, 2020 for a discussion). In this section, I provide the definitions of VR that are utilised throughout the thesis, together with their parts and necessary context.

1.3.1 What is Virtual Reality?

Virtual reality (VR) is a computer-generated simulation of a three-dimensional (3D) image or environment that can be interacted with in a seemingly real or physical way. "The ability to be transported to other places, to be fully immersed in experiences, and to feel like you're really there — present — opens up previously unimagined ways to interact and communicate" (Parisi, 2016, p. 1). The goal of VR is to create an immersive experience that provides a feeling of presence in a virtual environment, blurring the line between the real and the virtual. In other words, the goal is "to convince you that you are somewhere else" (Parisi, 2016, p. 2). It accomplishes this by deceiving the human brain, in particular the areas of the brain that are responsible for motion perception and the visual cortex (Parisi, 2016). This illusion can be created in several different ways. For this thesis, I will be looking at two different approaches of creating this illusion. The first way of doing this is by using a head-mounted display (HMD), also referred to as a VR headset. In this thesis, I will use the term head-mounted display virtual reality (HMD VR) to refer to VR headsets. "[T]hese displays use a combination of multiple images, realistic optical distortion, and special lenses to produce a stereo

image that our eyes interpret as having three-dimensional depth" (Parisi, 2016, p. 3). This research used standalone HMD VR headsets, meaning that they are wireless. A VR headset as a digital tool was employed to watch a 360° video, in which the user could control the perspective by looking around as if they were physically present in the environment. The other way of creating such an illusion used in this thesis is what Parisi (2016) refers to as desktop and mobile platforms. "This includes the computer hardware, operating systems, software to interface to the devices, frameworks and engines that run applications, and software tools for building them" (Parisi, 2016, p. 3). Relevant for this thesis were the aspects that are linked to the iPad as a mobile device used for immersive VR experiences. This experience is delivered through an accessible and portable iPad and created with the function of a 360° video as the key feature that creates the immersive VR experience. The term I chose to stay consistent with in this thesis to describe this concept was iPad VR. What this means is that the user can view a 360° video on the iPad screen and control the perspective of the video by moving the device or tapping the screen. This provides an immersive experience by allowing the user to look in all directions and feel as if they are actually inside the virtual environment. The term VR is used as a collective designation for HMD VR and iPad VR. Overall, I want to investigate the potentials of VR in EFL teaching and learning and how this might offer new ways to facilitate written communication through playing with and exploring digital texts.

1.4 The Structure of the Dissertation

The current chapter has introduced the topic and presented the research questions relevant to the research. Further, Chapter 2 outlines the theoretical foundation for this thesis. Previous research that is pertinent to this subject is presented in Chapter 3. All methodology-related topics are covered in Chapter 4, including the research design, participant sample, pilot study, data generating methods, and the outline of the data analysis. The chapter also discusses the trustworthiness and limitations of the study, as well as ethical considerations in the research. The findings and results of the research are presented and discussed in Chapter 5 in relation to the theory and prior research. Finally, I provide concluding remarks in Chapter 6.

2. Theoretical Framework

This chapter presents the theoretical framework of this thesis. The concepts of authentic learning, digital tools, texts, and written communication are defined and discussed, subsumed under the pedagogy of CLT (see Section 2.1) and the TPACK framework (see Section 2.2). As teachers, we need to consider "the key issue of how technology use can support, enhance, and even redefine learning" in order to fully understand digital education (Selwyn, 2022, p. 71). In education today, digital technology is used to support learning either as a learning tool on its own or as a way to access information. In this section, I will define CLT, which is incorporated into the presentation of the TPACK framework, which considers how and why technology can be used in relation to content and pedagogy to facilitate effective learning in educational institutions such as primary schools. The TPACK framework functioned as a basis when planning, conducting, and assessing the teaching and learning sessions (see Section 4.2).

2.1 Communicative Language Teaching

Communicative Language Teaching (CLT) is an approach to teaching foreign or second languages that puts the focus on the learner and emphasises the use of the target language for communication (Savignon, 2002; Rindal, 2020). It "refers to both processes and goals in classroom learning" (Savignon, 2002, p. 1), and emphasises the development of communicative competence, which refers to the ability to use the target language effectively and appropriately in real-life situations (Norwegian Directorate for Education and Training, 2019; Lund & Villanueva, 2020). Given the emphasis on writing in this thesis, I will be applying the CLT approach to that mode of expression. CLT places a strong emphasis on real-life, task-based activities and encourages learners to use the language they are learning in meaningful and functional ways. Instead of being only concerned with linguistic precision, the emphasis is on the interchange of ideas and information. The goal is to create a communicative environment where learners can practise the language they are learning and develop their ability to use it for real-life purposes (Savignon, 2002). Therefore, the learners are given writing tasks that reflect the kinds of written communication they encounter in their everyday lives (see Section 4.3.1). Through such practise and experience in an increasingly diverse variety of communicative contexts and events, learners gradually increase their communication competence, which includes grammatical competence, discourse competence, sociocultural competence, and strategic competence (Savignon, 2002). This aspect of CLT is referred to as authentic learning when

incorporated in the TPACK framework (see Section 2.2). Additionally, CLT has had a considerable impact on the English subject curriculum in Norway, as we historically transitioned from an emphasis on "the ideal English" to a focus on being able to communicate in an understandable way (Rindal, 2020). In developing the teaching plans for this thesis, I have kept this understanding of CLT in mind.

2.2 The TPACK Framework

Research about educational technology is mainly based on case studies due to the "rapid pace at which technology evolves, where every new tool provides new opportunities for use within education" (Herring, et al., 2016, p. 2). Technological Pedagogical Content Knowledge, currently referred to as TPACK, was introduced in 2006 by Mishra and Koehler as a framework for understanding the integration of technology, pedagogy, and content knowledge in education (Mishra & Koehler, 2006; Angeli et al., 2016). The TPACK framework is fostered in schools, not by disciplines like sociology, psychology, or cognitive science. While this respects the boundaries of teacher education, teacher professional development, and technology integration, it does not imply that psychological, sociological, or cognitive principles and ideas do not contribute to our understanding of teacher knowledge. Rather, it means that they are incorporated into or subsumed under this framework (Mishra & Koehler, 2006; Herring et al., 2016). The TPACK model emphasises the importance of teachers having a deep understanding of how technology, pedagogy, and content knowledge intersect and interact with one another. Teachers who are skilled at integrating these factors are able to create engaging and effective learning experiences (Mishra & Koehler, 2006).

The most common representation of the TPACK framework is "using a Venn diagram with three overlapping circles, each depicting a distinct form of teacher knowledge" (Angeli et al., 2016, p. 15). The model shows how these different areas of knowledge, which will be covered below, overlap. The first form of teacher knowledge is technological knowledge (TK), which represents the "T" in TPACK. "The affordances of a technology need to be recognized and considered useful by teachers" (Voogt et al., 2016, p. 36). This implies that teachers must actively shape the learning environment through the use of technology (Voogt et al., 2016). This includes understanding how to use digital technologies (Angeli et al. 2016), and in this case, it means that the teacher needs to hold a certain degree of knowledge and competence about HMD VR and iPad VR as digital tools for use in education in order to use them effectively for learning. Voogt et al. (2016) argue that teachers must have an in-depth comprehension of the affordances of specific technologies in order to assist learners in learning a specific topic or skill using technology. In order to assess and choose the digital tools

and materials used in this thesis, I followed guidelines provided by Hoem and Iversen (2020; see Section 4.6.2).

The "P" in TPACK stands for pedagogical knowledge (PK) and refers to an understanding of the procedures, methods, and techniques used in teaching and learning (Angeli et al., 2016). For this study, I have chosen to focus on an aspect of CLT known as situated learning in combination with training writing skills. Situated learning refers to "learning that takes place within a context that looks and acts like the situation in which the thing being learned will actually be used in the real world" (Nelson & Erlandson, 2012, p. 63). Another term that is closely linked to situated learning is authentic learning. Farley uses the term authentic learning when describing the concept of learning by doing things in a way that is as similar to real life as possible (Farley, 2016). I will continue to use the term "authentic learning" to describe this concept. All learning is somehow situated in a context, and authentic learning theorists emphasise the context as an important factor in learning, whereby the context can either hinder or help learning to happen.

> If there is a good match between the thing being learned and the context in which it is learned, that match will help promote learning. If the match is not good, it will be harder to transfer the thing being learned in one setting and/or through activities unmatched to the target setting into the context in which it might actually be used. Nelson & Erlandson, 2012, p. 63

In other words, the learners benefit when interacting with tangible learning contexts rather than trying to transfer abstract knowledge (Farley, 2016). According to Lebow & Wager (1994) traditional classroom assignments often lack the contextual characteristics that support transfer from the school setting to the outside world. In other words, the classroom setting, is often not matched with what is being taught (Lebow & Wager, 1994; Herrington et al., 2004). "To truly ensure authentic learning is achieved in these environments — or any environment — it is necessary to fully consider all that authentic learning entails" (Farley, 2016, p. 131). Reeves et al. (2002) designed a checklist for teachers with characteristics of what is considered authentic activities. The checklist consists of 10 numbered points, which summarise that authentic activities are complex, ill-defined, collaborative, cross-curricular, relevant to the real world, open for a variety of perspectives, provide reflection, are integrated with real-world assessment, are open to a diversity of outcomes, and culminate in the creation of a whole product (Reeves et al., 2002). Luckily, nowadays a lot of teachers are moving from a more traditional way of teaching towards a more authentic approach because it "enable[s] students to interact with the learning environment, and to learn, apply and practise newly acquired skills" (Herrington et al., 2004, p. 3). For this research project, the learners practised writing skills after they had interacted with the authentic VR experience. As, the pedagogy of CLT focuses on

11

authenticity (the P in TPACK), the content of the tasks is designed to facilitate authenticity and the practise of writing skills. This is closely linked to content knowledge, which is the last aspect of the framework.

This last aspect, the "C" in TPACK, is referred to as content knowledge (CK), which is "knowledge about the actual subject matter that is intended to be learned or taught" (Angeli et al., 2016, p. 15). The topic taught through the VR texts is part of the content that the teacher is required to have knowledge about for session planning, delivery, and evaluation. The VR texts, in combination with written communication, hold the main focus and are the subjects taught and learned within the scope of this thesis. We are regularly exposed to written texts in our everyday lives, both at school and in our spare time (Lund & Villanueva, 2020). Due to this high rate of exposure, writing occupies a central position in the renewal of the Norwegian curriculum, with emphasis in the core curriculum, basic skills, and all subject curricula (Ministry of Education and Research, 2017; Norwegian Directorate for Education and Training, 2019; see Section 1.1.2). As for English, there is a great focus on writing as a skill and the need for writing competence. This entails being able to express yourself, understand, plan, formulate, and communicate in several different ways for several different purposes. It is also emphasised that the learners should be given meaningful tasks where they can express themselves in practise-oriented and authentic situations (Norwegian Directorate for Education and Training, 2019), which the tasks and the VR texts provide with travel as the topic.

Further, these areas of knowledge can, should, and will interact with one another. The interaction of TK and PK is known as technological pedagogical knowledge (TPK). This is about how the technology of VR interacts with the pedagogy of authentic learning and writing skills (Angeli et al., 2016). Virtual reality can be linked to authentic learning as it "provide[s] an environment in which to explore emerging pedagogies, or allow[s] the investigation of issues that might be too arduous, dangerous or expensive in real life" (Farley, 2016, p. 128). The technology of VR can be used to allow more pedagogical activities and replicate experiences from outside the classroom within the classroom (Farley, 2016; Selwyn, 2022). Therefore, educational researchers are inspired to use virtual reality as it offers a great way to practise authentic learning (Nelson & Erlandson, 2012; Farley, 2016). Nelson and Erlandson (2012) state several factors that are important for the virtual reality world to support authentic learning but highlight realistic or authentic situations and graphics as the most important ones. When entering this virtual world, the users, in this case, the learners, need to feel like they are really interacting and actively participating in the action. Virtual reality technology has the potential to offer exactly that by providing realistic graphics and the opportunity to explore (Nelson & Erlandson, 2012). Farley (2016) emphasises another factor for VR to support authentic learning,

namely stimulation. By stimulating the different senses, it is more likely to arouse authentic emotions, which are recognised as a factor facilitating authentic learning (Smith, 1987, as sited in Farley, 2016, p. 138). However, VR is not necessarily educational, as it was not designed for educational purposes. Nonetheless, the intersection of PK and TK may contribute to the educational value of VR, but this value depends on the teacher's ability to facilitate learning through the use of the tool. In this thesis, VR is connected to authentic learning because both the VR texts and the written assignments seek to offer the learners a practical, meaningful, and real-life task.

Another combination is the interaction between PK and CK, also known as pedagogical content knowledge (PCK). The relationship between pedagogy and content is in focus (Angeli et al., 2016). As mentioned above, there is a connection between the pedagogy of authentic learning, written communication, and the VR experiences in this thesis. Lund and Villanueva (2020) have created a guide for teachers on how to motivate learners to write. One of the key concepts they put forward is *meaningfulness*. This entails giving the learners written tasks and activities that are meaningful, relevant, and authentic. These factors are also emphasised in the CLT approach (Savignon, 2002; see Section 2.1). It is also important to take into account the learners' level of language development and interests. The purpose of the writing task should be presented and understood, and the same goes for assessment criteria (Lund & Villanueva, 2020). "Ideally, a teacher should aim at creating writing situations that are as authentic as possible, where students write in English to communicate with other people" (Lund & Villanueva, 2020, p. 134). This is what was aimed for in this study's written tasks, where the learners were to communicate digitally to a self-chosen or set audience about their recent experience.

The interaction between TK and CK gives technological content knowledge (TCK; Angeli et al., 2016). In other words, the relationship between, in this case, the VR headsets and iPads, the VR experiences, and written communication. Looking at the broad definition of texts (Norwegian Directorate for Education and Training, 2019; see Section 1.1.3), the technological tools and materials used for the VR experiences offer digital, spoken texts presented as a 360˚ video. In addition, the learners are to write different types of texts about the experience. Another key concept in Lund and Villanueva's (2020) guide to teachers on how to motivate learners to write is *variety*. Variety is key to exposing the learners to the different ways and purposes of text creation (Lund & Villanueva, 2020), and variety is also a way to differentiate learning and motivate learners (Munden & Myhre, 2020). Also, *making the most of texts* is important when wanting to motivate writing. According to Lund and Villanueva (2020), this is about using the texts that the learners produce for all they are

worth by using them in several different settings and really praising their work (Lund & Villanueva, 2020). Making the most of the texts the learners produce is important. However, making the most of texts can also involve exposing learners to a variety of texts in a wide sense (Norwegian Directorate for Education and Training, 2019; see Section 1.1.3), such as through a VR experience. The Norwegian Directorate for Education and Training (2019) emphasises the importance of exposure to a variety of texts when describing how to work with texts in English. Such a variety of text exposure is associated with language learning and cultural and social awareness (Norwegian Directorate for Education and Training, 2019). VR can help meet curriculum standards by approaching new types of texts. When technology and content interact, this curricular value is present.

Finally, technological pedagogical content knowledge (TPACK) is the interaction of all three mentioned above: PCK, TCK, and TPK (Angeli et al., 2016, p. 15). The parts of TPACK and their interactions are integrated into this research, as this project aims to research the learner and teacher perspective on the educational possibilities and challenges of using an authentic virtual reality experience as a starting point for written communication. As the TPACK model focuses on the teachers understanding of the intersections between technology, pedagogy, and content knowledge (Mishra & Koehler, 2006), I used this framework when planning, conducting, and assessing the teaching and learning sessions used in this research. "Effective use of technology in teaching and learning, however, hinges on teachers' ability to develop knowledge and skills required to match digital tools with content and pedagogy. This knowledge (…) has been used to conceptualize effective teaching with technology" (Mouza, 2016, p. 169). TPACK is then "regarded as the contextualised and situated synthesis of teacher knowledge about teaching specific content through the use of educational technologies that best embody and support it in ways that optimally engage students of diverse needs and preferences in learning" (Angeli et al., 2016, p. 16). In other words, a teacher needs technological, pedagogical, and content knowledge in interaction with one another to provide acceptable teaching.

2.3 Summary

The pedagogy of CLT and the theoretical framework, TPACK, are presented in this chapter. The various aspects of the pedagogy and framework were first defined. The CLT pedagogy was also incorporated into the PK of the TPACK framework. In addition, the intersection and interaction between technology, pedagogy, and content knowledge were presented and discussed in relation to the materials, concepts, and approaches used in this thesis. The combination of CLT and TPACK

served as a guide when planning, conducting, and assessing the teaching and learning sessions to assure acceptable teaching that facilitated learning (see Section 4.2).

3. Review of Previous Research

The focus in this chapter is on previous research that can, in different ways, be related to this thesis' topics. I will start by providing an overview of the relevant previous research in Section 3.1 and go more in-depth by examining these studies in Section 3.2.

3.1 Overview of Relevant Previous Research

Non-immersive technology in education, also known as desktop-based virtual reality, such as computers, tablets, etc., has been researched for decades (Merchant et al., 2014). However, these findings cannot be generalised to also apply to immersive 3D VR. In this section, I present and examine previous research that is relevant for this thesis in order to contextualise and frame my study in the research field.

The focus of this section is limited to the subject of virtual reality linked to authentic experiences, communication, and engagement. I started searching with a narrow approach closely linked to my research question. However, there is a dearth of research on the pedagogical value of VR in education (Stanger-Johannessen & Fjørtoft, 2021), particularly in primary and secondary schools (Lan, 2020). Therefore, I had to work from a broader perspective, setting some criteria for what was relevant and interesting to my research. I started as narrowly as I felt possible with the criteria: virtual reality, primary school, EFL, and Norway. After only finding one relevant study linked to primary school education in Norway, I had to expand my search outside of Norway in order to find relevant studies of VR in education. In order to get an overview, I looked at Bahari (2021), who reviewed 75 studies on VR associated with teaching language skills. This systematic review provided me with several relevant sources to investigate further. To the extent that they are relevant, a few of these studies are included. In addition, I discovered two relatively recent studies, one by Papin and Kaplan-Rakowski (2022) that is more pertinent to my thesis than any other research I have come across, and the other by Makransky et al. (2021). Both of these studies compare immersive VR with desktop-based VR. Further, I will present two studies, both done at the university level, whereas one also included the teacher perspective (McGovern et al., 2019; Papin & Kaplan-Rakowski, 2022). Moreover, Tai and Chen (2021) did a study on year 7 Taiwanese EFL learners. They looked at how immersive VR versus desktop-based VR affected listening comprehension. Lastly, in this section, I chose to include a study by Shadiev et al. (2019), who studied language learning in familiar and authentic contexts.

3.2 Examining Previous Research

The number of previous works of relevance to my topic was quite limited in Norway. However, Stranger-Johannessen and Fjørtoft (2021) have done a study investigating how teachers in Norwegian classrooms manage to implement VR in teaching. They attempted to identify all schools in Norway where they use VR, which yielded 18 different schools, whereas nine teachers agreed to be interviewed, ranging from primary to lower and upper secondary schools. Two out of nine teachers represented primary schools. The results of this study showed that most of the teachers personally initiated using VR in school; VR was used in almost all subjects, including English; and most schools did not hold class sets of VR headsets (Stranger-Johannessen & Fjørtoft, 2021). This research addressed the possibilities and challenges of VR in education. The possibilities were that VR as a tool can help facilitate learning by providing information in new ways, and VR can be more motivating even though the emphasis is not entertainment. Additionally, VR may enable learners to practise self-regulation as there are several stimuli in an experience, and learners need to hold a certain degree of self-regulation when a school does not have a class set of VR headsets and some learners do other tasks while the teacher focuses on the learners using HDM VR. The teachers also emphasised the possibility of VR providing value within subjects and cross-curricular work by focusing on core elements to facilitate deep learning (Stranger-Johannessen & Fjørtoft, 2021).

Challenges addressed by Stranger-Johannessen and Fjørtoft (2021) were related to technical and ethical challenges with secure networks, the school's firewalls and privacy, funding, as VR headsets are expensive, incomplete class sets of VR headsets, and the teacher's lack of digital competence. In addition to these challenges, they conclude in their article that "[t]here is need for more research on didactical approaches and the pedagogical value of using VR in (…) classrooms" (Stranger-Johannessen & Fjørtoft, 2021, p. 147). My research seeks to contribute to filling parts of this research gap.

Even though the benefits are many, there are also challenges connected to the use of digital tools in school that educators need to address and critically assess. One of the challenges Ørevik (2020) addresses is that because of all the possibilities of using laptops and tablets, one can easily be distracted by materials not relevant to the lesson. The challenge is therefore to be able to properly search the internet and critically assess what is relevant, accurate, and reliable. This requires a certain level of critical awareness by the teacher and the learners when selecting materials (Ørevik, 2020; Selwyn, 2022). Additionally, a lot of the materials that exist are not made explicitly and solely with

the purpose of being educational (Selwyn, 2022). Therefore, it can be challenging for the teacher to analyse and assess the educational value of the different digital tools and resources. Another challenge is that reading on a digital screen is substantially more complex in terms of navigation than reading on paper (Ørevik, 2020). Therefore, it is important to use both "printed and digitally mediated texts [that] complement each other according to their affordances for learning" (Ørevik, 2020, p. 178). In addition, writing in English can also be a challenge. Digital text production entails several challenges, such as learners directly copying text from a website. As for the teachers, the planning and choosing of digital tools are usually not theoretically driven but rather empirically grounded. In other words, teachers seldom consider learning theories, instead relying on personal experience (Selwyn, 2022).

Searching for previous research on the topic outside of Norway yielded more results. Firstly, Bahari (2021) conducted a systematic review of 75 studies done on VR in education. In order to "find out the strengths and weaknesses of teaching language skills by the use of VR environment technology" (Bahari, 2021, pp. 1-2), Bahari (2021) reviewed studies done over a decade, published between 2010 and 2020. Improvements in productive skills, increased motivation, engaged cognitive processes, enriched input, exposure to interaction and cooperation, improvement in intercultural sensitivity, and facilitation of deep learning are some of the affordances Bahari (2021) highlights from the systematic review. Garrido-Iñigo & Rodríguez-Moreno (2015, p. 467) also emphasise positive attitudes of using VR linked to motivation when describing that "[t]he student had felt as a participant in something new and was eager to comment on it; the learner, far from being worried about speaking a foreign language or doing it well or badly, felt as a member of a small group with which a different link had been established". Further, they state that: "As we have seen, what motivates the students now is what has always motivated them: to feel that they actively participate in the activities" (Garrido-Iñigo & Rodríguez-Moreno, 2015, p. 468). Garrido-Iñigo and Rodríguez-Moreno (2015) consider this to be virtual worlds' greatest contribution to education, regardless of the subject. In a study examining the effect of student engagement in video-based VR in Chinese elementary schools, Sun et al. (2018) reported that a VR environment stimulates learners' sense of cooperation, optimises and strengthens linguistic expression, develops better understanding and communication, and improves learners' speaking proficiency. In other words, "VR reportedly improves language learning" (Bahari, 2021, p. 3).

However, "[d]espite the aforementioned affordances reported over the past two decades, the shortage of research elaborating on a variety of limitations remains as a challenge ahead of VR environment researchers" (Bahari, 2021, p. 3). The first challenge addressed is the insufficient research in the field,

followed by the issue of lacking evidence for the pedagogical and educational merits. Bahari (2021, p. 3) cites Scrivner et al. (2019) when presenting another issue concerning the "variety of scope of usage of each VR technology used for learning language skills". Further, he states that it "calls upon further research to improve our understanding of the tested and reported efficacy of VR pedagogical programs" (Bahari, 2021, p. 3). Although "the new generations of students are enthusiastic to embrace the latest technologies" (McGovern et al., 2019, p. 495), implementation of VR in education can be challenging due to both the learners' and teachers' lack of competencies about the hardware and software required by VR technology. Additionally, Rienties et al. (2020) note that due to a lack of thorough information on the potentials and restrictions of VR, teachers and learners hold a sceptical attitude regarding the usefulness of a VR context in the acquisition of linguistic competence. Lin and Lan (2015) are concerned about the lack of articles that examine teachers' perspectives and roles in teaching in a virtual learning environment (VLE). They emphasise that

> little is known from empirical research about how instructors' role change in a VR classroom, teachers' decision-making on how to integrate pedagogical activities into VLEs by utilising the strengths of VR, and how to motivate teachers to adopt and continue using VLEs when teaching (e.g., the method of teacher preparation). Lin & Lan, 2015, p. 495

Godwin-Jones (2016) and McGovern et al. (2019) emphasise the significance of the teacher's role in this process. Teachers "need to plan carefully so that VR integration occurs as gradually and smoothly as possible" (McGovern et al., 2019, p. 495), and "[u]nless the teacher has a good understanding of the affordances of a given tool or service, how can its use be reasonably assessed?" (Godwin-Jones, 2016, p. 7). Based on these points, I chose to include the teacher perspective through action research in this thesis in order to explore theoretical frameworks that integrate pedagogical aspects into the VLE (see Section 4.3).

It is evident from the results of these studies that adopting VR in education has advantages. The issues mentioned relate to too little research, which again affects the educational and pedagogical value, effectiveness, and attitudes of scepticism towards VR programmes. "The ability to find connections between studies is particularly important in the field of educational technology, where new technologies often lead to studies that appear to be new and specific to the affordances of particular tools and technologies" (Herring et al., 2016, pp. 3–4). The results from the review of international studies mentioned in Bahari (2021) compared to the Norwegian study by Stranger-Johannessen & Fjørtoft (2021) showed several similarities and differences. The similarities in the positive sides of VR are that it promotes learning in different ways and in different subjects; reportedly, VR increases

motivation; and it facilitates cross-curricular work and deep learning (Bahari, 2021; Stranger-Johannessen & Fjørtoft, 2021). The positive effects on VR that are only identified in one of the articles are self-regulation (Stranger-Johannessen & Fjørtoft, 2021), and VR providing enriched input (Bahari, 2021). The negative sides that these studies agree upon are mainly the lack of research in the field. However, both studies identify more challenges individually, such as the technical competence needed, ethical considerations, and expenses (Stranger-Johannessen & Fjørtoft, 2021). Bahari (2021), on the other hand, identified challenges linked to teachers and the need for more research on the pedagogical aspect from teachers' perspectives, as well as scepticism towards VR in education. It is clear that additional studies are required to establish the pedagogical and educational value of VR programmes, evaluate their effectiveness, and enlighten teachers and learners so that their attitudes are based on evidence and knowledge. In this thesis, I aim to contribute to filling a part of the research gap based on some of the factors described above. I aim to contribute to researching the topic of VR in education not by measuring efficacy but rather by emphasising the learner and teacher perspectives. I want to put a focus on the role of the teacher, as this is little investigated, and also emphasise the learners' points of view, as children have the right to be heard and participation is an explicit focus in the core curriculum (United Nations, 1989, p. 13; Ministry of Education and Research, 2017).

Similar to this thesis, Papin and Kaplan-Rakowski (2022) have done a study about the potential of VR in second language learning. However, while I focus on written communication and VR using 360° videos with VR headsets and portable iPads for primary school learners, Papin and Kaplan-Rakowski (2022) focused on vocabulary learning using 360° pictures with VR headsets and a desktop monitor with university students. They compared this to using 360° pictures with a VR headset with 360° pictures using a desktop monitor. Additionally, they had a control group that used a standard two-dimensional (2D) picture viewed on a desktop monitor. Furthermore, they collected data from two post-tests, one receptive and one productive. The results from the productive post-test revealed no difference in recalling vocabulary across the three different learning tools. The receptive post-test results, on the other hand, showed that the vocabulary learning score was significantly higher when learning with 360° pictures on a desktop monitor compared with 360° pictures on a VR headset and 2D pictures (Papin & Kaplan-Rakowski, 2022). This is consistent with other obtained results about immersive VR, as it "may lead to cognitive overload due to the rich stimuli of the environment" (Papin & Kaplan-Rakowski, 2022, p. 20), whereas desktop-based VR "seems to provide L2 learners with the right amount of immersion and embodied learning, making it more effective than HiVR or traditional 2D pictures"[2] (Papin & Kaplan-Rakowski, 2022, p. 20). While other results on the topic

---

[2] HiVR refers to high-immersion VR

have more or less been mainly positive towards using IVR for a better learning effect (Bahari, 2021; Stranger-Johannessen & Fjørtoft, 2021; Sun et al., 2018), these results are contradictory as they present a different picture where IVR can be overwhelming and distracting (Papin & Kaplan-Rakowski, 2022). It will be interesting to see if these results are transferable to another aspect of language learning, namely written communication, and with a younger set of participants. According to Papin and Kaplan-Rakowski (2022, p. 6), there are no studies comparing the effectiveness of immersive VR versus desktop-based VR "for any language aspects". In this thesis, although I am not measuring effectiveness, I aim to investigate the possibilities and challenges of using VR for written communication in the English.

Furthermore, outside Norway, a VR application named Mondly was studied by Tai and Chen (2021). Mondly is an animated programme where you can practise different real-life communication situations. Tai and Chen (2021) looked at how immersive VR affected Taiwanese EFL learners' listening comprehension. 72 participants in year 7 were studied. In the research, one set of participants practised through Mondly VR while the other served as a control group and watched video clips. According to the findings, the Mondly VR users had significantly better listening comprehension and retention than the video viewers. The study also revealed that the participants preferred VR over video clips for engaging and enhancing EFL listening (Tai & Chen, 2021).

In two trials with high school students, Makransky et al. (2020) compared the use of immersive virtual reality (IVR) in education to a video for teaching scientific knowledge. Even though the study focuses on science and high school students, I find the results quite fascinating and pertinent. I can compare the results for science with my results for EFL to see if they are applicable and hold transfer value. In light of these findings, it can be said that "[a]cross both experiments, the IVR groups reported significantly higher perceived enjoyment and presence than the video group" (Makransky et al., 2020, p. 719). Results from a post-knowledge test, however, revealed that there was no discernible difference between the IVR and video groups in one trial. In the other trial, "students who learned in the video condition scored significantly better than those who learned in the IVR condition" (Makransky et al., 2020, p. 730). In other words, this study demonstrates that employing IVR has a considerable positive impact on motivation and enjoyment but little to no positive impact on learning outcomes, including declarative information (Makransky et al., 2020).

Lastly, I want to include a study by Shadiev et al. (2019) on mobile-assisted language learning (MALL), which concentrated on language learning in familiar and authentic contexts. Even though

this study does not focus on VR, it focuses on the aspect of using a digital tool, for instance, an iPad, and I chose to include it because of its pedagogical benefits and conclusions regarding authentic language learning. The researchers reviewed several articles, journals, studies, and other works on the subject. Participants in the examined research and studies ranged widely in education level, from elementary school to university, as well as adult learners and teachers. Shadiev et al. (2019) developed a number of recommendations for using MALL in teaching and learning. I decided to solely focus on the outcomes concerning the pedagogical approaches. The results revealed task-based learning to be the most common strategy. Less frequently employed were other methods such as communicative language teaching, self-directed learning, storytelling, game-based learning, total physical response, and inquiry-based learning. The findings showed that local communities were employed as a starting point for communication in teaching and learning with MALL. "Familiar, authentic environments provided various opportunities for language learning, i.e. *daily encounters* (n=22), *real communication* (n=2) and first-hand *experience*(n=1)" (Shadiev et al., 2019, p. 715). The results also demonstrated that learning in authentic settings allowed participants to better learn the language, was associated with increased motivation, engagement, and inspiration, and enabled the participants to immerse themselves in the different situations. "Familiar environments promoted collaboration, memorisation and understanding of learning materials and student reflection and provided contexts for authentic assessment of learning within the tasks" (Shadiev et al., 2019, p. 715). Very few issues were identified related to language learning in a familiar context. Cognitive load, distractions, insufficient competence, prohibition, and an unidentified location were the few issues that were mentioned (Shadiev et al., 2019). In Sections 5.2, 5.3, and 5.4, these results regarding authentic language learning will be discussed with my results in this thesis.

3.3 Summary

In this chapter, I started to outline an overview of the previous research that is central to this thesis. Then, I presented and elaborated on the research related to VR in education and introduced a study concerning authentic learning. I included one study from Norway as well as several studies done abroad. This was needed in order to find relevant research with perspectives that can and will be discussed in relation to this research's results on how VR can serve as a starting point to facilitate written communication in the EFL classroom in Norway based on the learner and teacher perspective.

4.   Methodology and Materials

The research is based on a qualitative research strategy in order to answer the research question of this thesis, "What is the Educational Value of Using Virtual Reality in EFL Teaching and Learning, and How Can an Authentic Virtual Reality Experience Facilitate Written Communication in the EFL Classroom in Norway?" using a combination of methods to generate data. In this thesis, action research functioned as the main method, complemented by questionnaires and an interview. Questionnaires and interview guides, as well as a teaching plan for action research, were developed. Action research was conducted as I planned, delivered, and assessed the teaching plans in my dual roles of teacher and researcher. Action research contributed mostly to the teacher perspective but also complemented the learner perspective. One of the questionnaires was used to choose the research sample, while the others were post-experience questionnaires used to collect information about the learners' expressed thoughts, feelings, and viewpoints about the experiences. The interview was intended to collect more detailed information about the experiences with VR, which could provide deeper insight and thick descriptions. The structure of this chapter starts by outlining the design of the research in Section 4.1, followed by Section 4.2, which presents the teaching plans used in this research project. Sections 4.3, 4.4, and 4.5 will present the three methods used in this thesis, namely action research, questionnaires, and interview. Further, Section 4.6 will provide information about the materials that functioned as learning tools used in this thesis, such as iPads and HMD VR headsets, as well as a software programme called YouTube VR. Section 4.7 covers the trustworthiness of the research, and Section 4.8 presents the method of data analysis. The limitations of the research are highlighted in Section 4.9, and Section 4.10 discusses ethical considerations and issues related to the research project. Finally, Section 4.11 summarises the chapter as a whole.

4.1 The Design of the Research

For this master's thesis, I decided to employ a combination of methodologies to gain a better understanding of the role virtual reality can play in the English subject from both the learner and teacher perspective. The research question is addressed using a combination of action research, questionnaires, and an interview. Interviews and action research are methods considered to be qualitative. "[Q]ualitative research is generally employed to support a researcher in generating a deep and nuanced understanding of a given phenomenon" (Lester et al., 2020, p. 95). While questionnaires are commonly associated with quantitative research methodologies (Clark et al., 2021), the purpose

of this research is not to provide an overview of the field as a whole in a quantitative sense but rather to get insights from all the participants in the action research. As a result, I get the opportunity to reach all the participants at a surface level with questionnaires while still getting rich data from interviews. Johannessen et al. (2018) define qualitative data as experiences described with words, whereas quantitative data is described with numbers. Based on this definition, I will refer to the results from the questionnaire as quantitative and the data from action research and the interview as qualitative to distinguish between the different data collection methods, as the results of the questionnaire will be presented as numbers and the results from the action research and interview will be presented with words.

The selection of multiple methods is motivated by the ability to investigate the research topic from various perspectives and provide so-called "thick descriptions", as well as to reach more participants to ensure trustworthiness (see Section 4.7). In addition, I would like to see the results of the various methodologies compared to one another in order to "obtain knowledge about the issue of the study, which is broader than the single approach provided" (Flick, 2018, p. 27), and to mutually validate the results of all methods (Flick, 2018). By combining a quantitative and qualitative approach, all participants' perspectives were allowed and valued, and a small selection were given the opportunity to provide a more in-depth account of their opinions, thoughts, and attitudes. This strategy helped validate the findings and compensate for the limitations of focusing exclusively on one type of method, as qualitative methods can support quantitative methods and vice versa (Clark et al., 2021; Flick, 2018).

The research project is based on action research, with questionnaires and an interview conducted either during or immediately following the teaching and learning sessions. When conducting action research with the learners, I serve as both the teacher and the researcher (see Section 4.3). The learners who consented to participate completed a pre-participatory questionnaire. The results of this questionnaire were used to select a sample based on predetermined criteria related to the respondents' prior knowledge and experiences with VR as a digital tool (see Section 4.1.1 for a detailed description). Due to the limited number of VR headsets available, only eight out of 17 were chosen to participate in the study. As a part of the action research, the learners were divided into two groups: those experiencing iPad VR and those experiencing HMD VR. They spent approximately 15 minutes exploring the chosen 360˚ video using either HMD VR or iPad VR. Immediately following this, the learners completed a second questionnaire to map their initial reactions to and impressions of the course material and accompanying tools. Their thoughts, feelings, and experiences were in focus, as

was their engagement for further work. After a short break, they had 45 minutes to finish the written assignment. This briefly describes the two teaching and learning sessions included in this thesis. However, after the second and last session, four learners participated in a focus group interview (see Section 4.5). The four learners selected for the interview were chosen at random. In the interview, the learners elaborated on aspects relevant to the HMD VR and iPad VR experiences. From the teacher perspective, notes were taken of the planning process, observations and interactions during the implementation, and evaluation of the teaching and learning sessions. All parts of the research project will be outlined in detail below (see Section 4.3.1).

4.1.1 Participants and Sampling

For this thesis, I sampled participants from a seventh-grade class (aged 12–13), which I am quite familiar with from being a substitute teacher. My study's initial strategy to sample participants was a questionnaire designed to collect information about the learners' familiarity and competence with digital technology in general and virtual reality in particular (see Section 4.4.1). I considered it essential that the learners have some level of digital proficiency. Hence, the need for VR competence in particular was not necessary. The pre-defined criteria for the desired selection of the sample were eight participants who self-reported an acceptable level of digital competence, of whom four had prior experience with VR and four had no prior experience with VR. There were more than eight candidates for these criteria; therefore, two boys and two girls from each category were selected at random. Due to a limited number of VR headsets, I could not have more than eight learners participate in the research. Because of this, a predetermined selection procedure was used to decide which learners were invited to participate in the following phase of the study. After selecting the sample of learners, I conducted two teaching and learning sessions as part of the action research.

4.1.2 Pilot Project

In order to develop, prepare, and improve the main research project, it was essential to include a pilot project. A pilot project is "a small scale methodological test conducted to prepare for a main study and is intended to ensure that methods or ideas would work in practice" (Kim, 2010, p. 191). "This testing is important to establish the content validity of scores on an instrument; to provide an initial evaluation of the internal consistency of the items; and to improve questions, format, and instructions" (Creswell & Creswell, 2018, p. 154). The purpose of this pilot project was to test and collect information about what works and where there is room for improvement. Focus areas for this pilot project concerned estimating time, addressing ambiguities and uncertainties, developing a hypothesis

based on initial results, and getting familiar with unexpected and sudden issues. This allowed me to determine if the project performed as planned and intended and if I obtained information pertinent to the research question.

Results from the pilot project provided insight into all focus areas. The first focus area regarding time provided an estimation of time spent on various aspects of the project, such as distributing questionnaires, conducting the interview, the VR experiences, and the written tasks. The pilot project also revealed ambiguities and uncertainties related to the different research instruments. Particularly the questionnaires and interview, where smaller issues related to formulations and ambiguity were noted, evaluated, and adjusted to improve and prepare the main research project. In addition, a brief analysis of the questionnaires and interview results was conducted to determine whether the information gathered could contribute to answering the research question and developing a hypothesis. The participants' responses in the pilot questionnaires and interview indicated that the HMD VR experience felt more authentic than the iPad VR experience; they were both inspired to write about the experience, with HMD VR scoring slightly higher on inspiration to write. In terms of their perceptions of learning, they both felt that their learning outcome increased, with the HMD VR receiving slightly higher ratings. These results are the background for my hypothesis stating that "authentic experiences and meaningful assignments engage learners and facilitate learning and writing" (see Section 1.2). On the basis of the collected data, questions that were evidently irrelevant were eliminated, while questions that were relevant or had relevance-related uncertainty were retained for future relevance determination in the actual research project. Another step was taken to ensure that the texts included in the introduction of the lessons were appropriate for the learners' age and level. One of the pilot participants, a seventh grader, read the lesson materials and underlined any unfamiliar or difficult words. As there were only a couple of highlighted words, I presume that the text is appropriate for seventh-grade learners, with the possibility of facilitation and guidance from me, the teacher researcher.

Lastly, a few unpredicted issues related to the VR approaches and materials were addressed. First, when the participants tested the VR experiences, commercials and advertisements appeared both at the beginning of the experience and unexpectedly during the video. This presented a challenge for the research purposes of the experience because it could be distracting and interfere with the data. Therefore, YouTube Premium was purchased for the research project period. The second issue was specific to the iPad VR experience. Due to the use of a "school-iPad", the YouTube application was not installed, preventing the possibility of viewing 360˚ videos in motion. It was possible to move

360˚ in the video by using a control on the screen. However, when this issue was discovered, the YouTube application was installed, which resolved the issue. Therefore, only iPads with the YouTube application installed were used for the research project, allowing learners to choose whether to move the iPad to look around or use the controller on the screen. Lastly, during the iPad VR experience, one participant reported feeling dizzy. Instead of standing, the participant sat down, which appeared to alleviate the dizziness (see Section 4.10 for a discussion about cybersickness).

4.2 Teaching Plans

The teaching plans in this thesis are based on the pedagogy of CLT (Savignon, 2002; see Section 2.1), and the TPACK framework (Mishra & Koehler, 2006; see Section 2.2). The emphasis on teaching and learning in authentic contexts is illustrated by two distinct approaches to VR and written assignments. The teaching plans have been developed based on three competence aims after year 7 in the English subject curriculum: "use digital resources (…) in language learning, text creation and interaction", "listen to and understand words and expressions in adapted and authentic texts" and "read and present content from various types of texts" (Norwegian Directorate for Education and Training, 2019, p. 7). Briefly summarised, the teaching plan should enable learners to interact in an authentic context and employ this to express themselves through writing. The learning objective is to increase and practise the learners' communicative competence in meaningful and authentic contexts.

With this as a basis, the TPACK framework functioned as a guide in planning, conducting, and assessing the teaching and learning sessions. Working with the TPACK framework involved identifying how the relationships between technology, pedagogy, and content knowledge intersect and interact with one another in order to design effective learning experiences for the learners (Mishra & Koehler, 2006). Therefore, I started systematically identifying what technologies, pedagogy, and content to include in teaching. The idea of implementing the technology of VR was already present, but I had to consider which tools could be used with VR. In order to engage the learners, enhance their learning, and facilitate my teaching (Mishra & Koehler, 2006), I decided to include two different technological tools to provide VR: VR headsets and iPads. Further, it was considered what pedagogy and content VR could naturally interact with to facilitate learning. Reality, authenticity, and meaningfulness were terms that came to mind when considering VR. This led to the emergence of the topic of travel, which, in combination with written assignments, became the lesson's content. In addition, a pedagogy was selected that, like the technology and content, sought to enhance meaningfulness and authenticity. CLT, with an emphasis on the aspect of authentic learning (Farley,

2016), was considered a suitable pedagogy. I desired to examine this pedagogy in relation to written communication in particular, as meaningfulness and variety inspire writing (Lund & Villanueva, 2020). To intersect and interact with content, pedagogy, and technology, it was necessary to consider all aspects of the three. Therefore, the digital tools were used to enhance pedagogical strategies and support the teaching of the content, and vice versa. In other words, the digital tools, HDM VR and iPad VR, enhanced the pedagogy of CLT and authentic learning because VR aims to provide realistic experiences (Parisi, 2016). The technological tools supported the teaching of content by providing meaningful and authentic information and experiences about the topic. Also, content and pedagogy are closely related, as the topic of content, travel, consists of actual experiences that should be encountered in a realistic and authentic setting.

Planning the teaching based on the pedagogy of CLT and the TPACK framework resulted in, firstly, a learner-active introduction about the topic of travel with an emphasis on the learners' own experiences and thoughts to awaken their prior knowledge. Two different approaches to introduce the travel destinations were used: reading aloud and independent reading. The learners discussed what types of texts these were and their experiences with and thoughts about them. Further, the learners were divided into groups of 4, where one group experienced the travel destination with HDM VR and the other group with iPad VR. In the following lesson, the groups were swapped so that each learner experienced both HDM VR and iPad VR. The experience was a 360˚ video tour of Sydney (the first lesson) and Cape Town (the second lesson) from the application YouTube VR (see Section 4.6.1). Immediately following the completion of the experiences, the learners filled out a post-experience questionnaire (see Section 4.4.2). Finally, the learners were given the written assignments. One task was open and one was criterion-based. The reason for choosing one open and one more criterion-based assignment was to adapt the teaching by using varied methods and tasks. The procedure and implementation of the lessons are described in more detail in Section 4.3.1.

4.3 Action Research

This section describes action research as a method and its components. First, a concise overview of the concepts of action research relevant to this thesis is provided, with a primary emphasis on teacher research. Finally, the stages of the teaching and learning sessions are described in detail.

The overall method of this research project is action research. There is a great variety in approaches used to conceptualise, organise, and support action research in education (Zeichner, 2001). Action

research aims to contribute to improving teaching practises as well as provide a better understanding of particular aspects of practises, promote greater equity, and influence the social conditions of practise (Zeichner, 2001). Hence, I have planned, conducted, and reflected upon two teaching and learning sessions that are implemented in my action research (see Appendix 6). As there is a need for further development of the teaching profession's practises (Hiim, 2010), I am interested in learning how and why digital authentic tools such as virtual reality should or should not be used in the EFL classroom. Since this master's thesis is written for pedagogical education, the emphasis within action research will be on the implementation of a didactic framework through what Borg and Sanchez (2015, p. 1) refer to as "teacher research". In accordance with Borg (2013), I conducted this part of the research as both a teacher and researcher, as is common in action research. Borg (2013, p. 7) uses the phrase "conducted by teachers, alone or with the support of 'external critical friends'; its focus is teachers 'professional work; and its purpose is to bring about beneficial change, ultimately, in student learning" to further explain this concept. This concept was developed by Kurt Lewin and is related to the concept of conducting experiments, although in the field as opposed to the laboratory (Gustavsen, 2001). In other words, as both a teacher and a researcher, I use my field (the classroom) to investigate a phenomenon or situation structured within a didactic framework (TPACK; see Section 2.2).

Regarding pedagogical issues, I would argue that the best place to identify, address, investigate, and resolve them is within schools, together with learners and teachers. The "challenge" addressed and evaluated was the research question, which states "What is the Educational Value of Using Virtual Reality in EFL Teaching and Learning, and How Can an Authentic Virtual Reality Experience Facilitate Written Communication in the EFL Classroom in Norway?". In addition, bringing the research into the classroom and engaging the learners and teachers may yield results that can be implemented immediately and uncover issues that can be solved quickly (Guskey, 2000). However, parts of this research did not happen in the learners' own classrooms but rather at the Inland Norway University of Applied Sciences. This was due to some practical issues with the setup of the VR headsets. Therefore, the teaching and learning sessions took place in a room referred to as the "future classroom lab", which is a learning hall provided by some teacher education institutions in an effort to develop the teacher student's digital competence required in the future (Norwegian Directorate for Education and Training, 2018). Even though parts of the research did not happen in the learners' regular classrooms, the teaching and learning sessions were planned as if they were conducted in a regular classroom, focusing on several aspects of teaching and learning that the learners are used to, such as student active learning, exposure to texts, and practising writing skills.

As the objective of action research in pedagogy is to enhance the quality of education and acquire new information for future use (Hiim, 2010), the place of teaching was considered less important in this case than the teaching plans and teacher-learner interactions. Additionally, "[t]he purpose [of action research] is not to develop final solutions or procedures for the current field" (Hiim, 2010, p. 19, own translation), but rather to "develop a professional example showing how the educational work can be implemented, and which shows didactic work and development processes related to the current challenge" (Hiim, 2010, p. 19, own translation). Since action research is practise-oriented and involves everyone participating in the research, collaboration is essential (Christoffersen & Johannessen, 2012). Thus, I decided to include the learner and teacher perspective in my research. When individuals within a unit share their experiences with one another, "the experience is used as the basis for democratic decisions for future labor" (Hiim, 2010, p. 20, my translation). In other words, it is the teachers' and learners' everyday lives that might be impacted and altered as a result of this research; hence, from the learner and teacher perspective, their opinions, experiences, and attitudes are significant and need to be clearly emphasised and valued. Although teacher researchers do not necessarily share their results or findings outside their collegial (Yucel & Bos, 2015), this master's thesis will, in order to contribute to openness and the sharing policy, be published and made available to other educators, researchers, and learners.

4.3.1 The Teaching and Learning Sessions Step by Step

In this section, the teaching and learning sessions are described in detail to provide thick descriptions and frame the VR activities. The first lesson started by introducing today's topic by reading a postcard from Gold Coast, Australia. We discussed the text's content and components and linked them to the learners' own experiences with postcards. We also linked it to the digital world we now live in and how and what types of texts they would prefer to write when telling someone about their holiday. This activity was designed to stimulate learners' cognitive processes and prior knowledge. Next, the learners were introduced to the destination of today, Sydney, Australia. The learners were divided into two groups. Group 1 was introduced to Sydney through HMD VR, while group 2 explored Sydney through iPad VR (VR Gorilla, n.d.b). Group 1 got instructions on how to start the HMD VR experience and guidance on how to adjust the VR headset properly. Once all learners were busy wandering the streets of Sydney via digital means, no one made contact or asked questions until they were done about 15 minutes later.

Following the digital experiences, all learners answered a questionnaire about their experiences (see Section 4.4.2). As the learners finished the questionnaire, there was a fifteen-minute break. After the

break, the learners got a written assignment where they were supposed to tell a self-selected individual about their experience in Sydney. For the Sydney lesson, the learners were given an open task where they were expected to write a travel update. They could choose the type of text, like, for example, a travel letter as described in the introduction. Also, other examples the learners discussed in the introduction were visible to inspire, remind, and be of help in the starting process, such as multi-modal digital text messages, social media "story", etc. The learners got an example of how to start their text and were allowed to choose to copy it, use it as inspiration, or come up with their own initial text. I defined this as creative writing and did not put up any specific criteria beyond those presented above. The lack of specific criteria was due to the fact that the focus of this study was not the written assignment itself but rather the attitudes towards working with one. After about 40 minutes of working on the written assignment, the lesson ended with a summary of the learners' experiences.

The second lesson was conducted similarly to the first lesson. To introduce the topic to the learners, they were given a text, a travel brochure from Durban, South Africa. The learners read the text before discussing the content and components of it as well as linking it to their everyday lives. The destination for this lesson was presented as follows: "Today you are going to travel to Cape Town, South Africa!". This time, group 1 travelled digitally to Cape Town through iPad VR, whereas group 2 was introduced to Cape Town through HMD VR (Airpano VR, n.d.b), thus switching the tool used in the first lesson. The digital journey took about 15 minutes. Then, the learners answered the post-experience questionnaire and had a break. After the break, they received a written assignment with more specific criteria, where they had to design and write a travel brochure for Cape Town. They had the travel brochure from Durban as a model text. The learners worked for approximately 40 minutes prior to the summary. Following the second session, four learners were randomly selected from the two groups to participate in an interview at their school (see Section 4.5).

4.4 Questionnaire

In this section, I present the questionnaires used in this thesis in detail. The first method presented to the learners is the pre-participatory questionnaire (Questionnaire 1; see Appendix 3). All learners, with permission, completed Questionnaire 1. The second questionnaire was solely for the eight learners selected to participate in the main part of the research (Questionnaire 2; see Appendix 4). This questionnaire was implemented into the action research and teaching plan with the purpose of tracking initial reactions to the VR experiences. All questionnaires will be presented and described in detail below.

To collect the quantitative data, I have used three different questionnaires. Because questionnaires are a structured data collection method, it was essential that the questions asked were of high quality to obtain useful information. This method of data collection is intuitive and may be applied to large samples (Postholm & Jacobsen, 2016). However, for this research, the questionnaires were applied to a smaller sample, but with a structured approach similar to data collection in quantitative methods, where I get to examine, address, and emphasise all participants' voices and opinions. The questionnaires were designed to document and address different categories within the thesis, with the aim of converting the categories into both written text and numbers that can be processed statistically in the analysis and presentation of data. The inductive theory-driven categories chosen for these questionnaires touched upon the learners' experiences with digital tools in general, perspectives on the use of digital tools in the classroom, engagement, feelings and attitudes towards the VR experiences, and preferred way of working. Doing questionnaires can be both challenging and beneficial. Clark et al. (2021) present different advantages of using self-completing questionnaires, such as being cheaper, quicker, free from both interviewer effects and variability, and convenient for the respondents. They also raise awareness about the disadvantages, such as the fact that the researcher is not able to prompt, probe, or collect additional data; the number of questions needs to be limited; and participants are not answering due to it being hard to understand or just feeling irrelevant. The fact that the second questionnaire was implemented in the action research means that I, as both the researcher and teacher, was present while the learners completed the questionnaires. Therefore, the learners had the opportunity to prompt and probe any closed or open-ended queries they were unsure of or did not comprehend. On the other hand, this might have made me, as the researcher, affect the learners, which can lead to variability. In order to ensure understanding and minimise linguistic misunderstandings, all questionnaires were written in Norwegian. Additionally, all questionnaires were completed on paper and stored securely in accordance with Sikt, the company responsible for research data in Norway (see Appendix 2). While all learners had a say in the matter via the questionnaires, only a select group of learners were actually interviewed (see Section 4.5).

4.3.1 Questionnaire 1

The first questionnaire aimed to survey the participants' prior experiences with and attitudes towards different digital tools and virtual reality, in particular those linked to everyday life and education. The reason for doing this pre-participation questionnaire was to select my sample of participants (see Section 4.1.1). This questionnaire was conducted at the participants' school. All learners who got

permission from their parents within the deadline took the opportunity to complete this questionnaire. A total of 17 learners handed in their permissions. This questionnaire consisted of a total of 18 questions, 12 of which were on a 5-point Likert scale and six were open-ended. The questionnaire was structured by starting to address what types of digital tools and programmes the learners use in the English subject as well as what digital tools they use outside school. Further, it addressed the learners' opinions about digital tools and their use in the classroom. Lastly, I mapped the learners' experiences with, knowledge of, and opinions about VR. The learners got as much time as needed to complete the questionnaire during school hours.

4.3.2 Questionnaire 2

The other questionnaires, called Questionnaire 2 (see Appendix 4)[3], were, as briefly described above, divided into two different versions of the same questionnaire, where one version asked specifically about the HMD VR experience and the other about the iPad VR experience. Both versions mapped the learners' instant thoughts, reactions, and opinions about their experience, self-reported learning outcome, engagement in general, and inspiration towards written communication and further work on the topic. These questionnaires consisted of 14 questions, of which nine were 5-point Likert scale and five were open-ended. It sought to investigate the learner's thoughts and opinions about the experience. Further, it focused on the learner's engagement in continuing to work on this topic. Lastly, it was intended to map the learners' opinions on learning in different ways. These questionnaires were taken immediately after their HMD VR or iPad VR experience. Therefore, these questionnaires were taken at the Inland Norway University of Applied Sciences in the Future Classroom Lab. These questionnaires were answered after each experience with the different VR approaches, meaning that the learners who did HMD VR in the first session completed the "HMD VR Questionnaire 2", and the learners doing iPad VR completed the "iPad VR Questionnaire 2". Then, at the next teaching and learning session, the learners switched to the other digital tool and answered the other questionnaire subject. The purpose of these questionnaires was to collect data that would contribute to answering the research question.

4.5 Semi-Structured Focus Group Interview

---

[3] Combined into one questionnaire in appendix

For this research, the interview was the final data collection method used after completing the action research and questionnaires. The interview was a semi-structured focus group interview with one group of four learners. The interview guide (see Appendix 5) functioned as a guideline throughout the conversation and discussion. In this thesis, the interviewees will be presented with the pseudonyms Emily, Andrew, Mary, and Isaac. As this project aimed to investigate the learner perspective on the educational possibilities and challenges of using an authentic virtual reality programme as a starting point for written communication, I wanted to emphasise their opinions, thoughts, and feelings more in-depth than the questionnaire allowed. Hence, the qualitative interview complemented and made up for the limitations of the quantitative data, as "[q]ualitative research aims to generate deep insight concerning particular topics, and it does this through a considered engagement with places and social actors" (Clark et al., 2021, p. 350). The objective of conducting interviews in this research has been to gain a deeper insight into the learners' reflections about virtual reality's relevance in the classroom.

When conducting a semi-structured interview, the interviewer uses an interview guide with pre-written questions or a list of topics. To encourage the informants to give detailed responses, it was important to create good, open-ended questions. The interview guide focused on their experiences with HMD VR versus iPad VR, their engagement, their thoughts on learning outcomes, and the benefits and challenges of using HMD VR and iPad VR. The questions were similar to the ones in the questionnaire, intending to provide deeper insight. Additionally, conducting a semi-structured interview allowed me to deviate from the original interview guide, asking questions in a different way than they were outlined in the first place and adding questions that were not planned to follow up on a reply from the informant (Clark et al., 2021). A semi-structured interview should try to create a safe and pleasant atmosphere in order to make the informants feel comfortable (Tjora, 2017). "The quality of semi-structured interviews rests on earned trust between the researcher and the informant" (Tjora, 2017, p. 116). Therefore, the research was conducted with a group of learners I am quite familiar with.

The interview was conducted as a focus group interview. According to Krueger and Casey (2015, p. 6), focus group interviews typically contain five features or characteristics: "(1) a small group of people, who (2) possess certain characteristics, (3) provide qualitative data (4) in a focused discussion (5) to help understand the topic of interest". These characteristics were taken into account when planning this project. For my project, I chose a group of four (1), as it is important to have a small group that offers everyone an "opportunity to share insights and yet large enough to provide diversity

of perceptions" (Krueger & Casey, 2015, p. 6). As "[f]ocus groups are composed of participants who are similar to each other in a way that is important to the researcher" (Krueger & Casey, 2015, p. 6), I chose learners of the same age who are in the same class and who have a similar but also varied experience with digital tools. By using open-ended questions, the focus group was given the opportunity to provide qualitative data for the research (3). The questions were predetermined for the topic and carefully phrased, sequenced, and analysed (4). The decisions and conclusions were made after completing, analysing, and comparing the collected data (5). The reason for choosing focus groups was that this method is less threatening as there are more individuals to rely on within the group, and this is an important factor when one is discussing experiences, opinions, and attitudes (Krueger & Casey 2015).

I used the application "Diktafon" by Nettskjema to record the interview (version 3.7.0, 2022). I recorded with two private devices, an iPhone and an iPad, to ensure that there was a backup of the recording. A transcription of the interview was written in Norwegian the same day to better describe the context and situation. However, a summary of the transcription was written in English in order to get quotes, which is presented later in this thesis, translated from Norwegian to English. This was done by me for the purpose of presentation.

As mentioned above, the establishment of secure settings for interviews is essential for building trust and fostering an atmosphere in which the participants are at ease enough to express their opinions and perspectives (Tjora, 2017). I thought it would be best to establish this secure environment by having the learners sit together in a group and by conducting the interview in Norwegian. The choice was made because speaking in one's first language is easier and more natural, and because doing so can help one feel less apprehensive about speaking in another language (Tjora, 2017). As a consequence of this, the interview data's initial and full transcription was written in Norwegian, followed by a summary translated into English of the conversations. To promote a harmless environment for all, a pre-defined structure of the interview was followed, starting with the simplest questions that did not require a lot of reflection. Additionally, the interview took place at their school in a group room they were familiar with.

I had set aside approximately 45 minutes for the interview, and it lasted about 30 minutes. The interview guide functioned as a starting point, and the learners participated in an active and engaging way. The focus group interview contained mostly discussion between the learners, and when they did not have more to add to the discussion, I used the interview guide to guide them over to the next topic

or category. The learners discussed and expressed their own opinions, feelings, and reactions, not necessarily agreeing with what their fellow classmates meant, felt, or had experienced. Being the interviewer, I did not actively participate in the discussion; however, I interacted through affirmation, nodding, "mhm", "yes/no?", etc. This is something I tend to do as a person when speaking to give the people I talk to affirmation that I am following what is being said. However, this is not apparent in the transcription, summary of the interview, or data presentation, as the content produced by the interviewees is what makes the interview relevant.

4.6 Materials

Several materials were used in this research project. The different materials include digital tools, software, and programmes or applications. This section will present the digital tools and materials used as well as explain how and why they have been exploited. First, I will present and explain the different digital tools, HMD VR headsets and iPads, and their software. Then, information about the programme and application, YouTube VR, will be presented and explained in detail. Finally, justifications for choosing digital tools and materials are presented.

4.6.1 Digital Tools and YouTube VR

In this research, I have used a program, YouTube VR (version 17.46.4, 2022), with two different digital tools, VR headsets and iPads. The VR headsets used are all from a category called "standalone VR headset", which means that it is wireless and do not require other supplements to deliver the VR experience. Three of the VR headsets used were from what is known as Oculus Quest, recently changed to Meta Quest. Two of the three were Meta Quest generation one (Quest 1) and the third were Meta Quest generation two (Quest 2). The last VR headset was of the type called Pico and generation three (Pico 3).

This research used YouTube VR which is a version of the well-known program YouTube founded by Chen, Hurley and Karim in 2005. YouTube is now owned by Google, and has after Google took over expanded a lot and with several new features such as YouTube VR (Holm & Ervik, 2021). YouTube VR offers 360˚ videos which viewers can engage with in an authentic and immersive way. YouTube VR is compatible with any VR headset and also any mobile device, for example iPads, and runs from the regular YouTube application. This research project aims, among other things, to compare and contrast the differences in using these two approaches to VR. For this research project,

I chose two stationary video experiences demonstrating a guided tour in two English speaking countries, namely Sydney, Australia, and Cape Town, South Africa (see section 4.2). The guided tours offered a lot of information and facts about the place as well as it is aided with visual support by bringing the places they show directly to you. The videos lasted 9-12 minutes depending on which video clip shown. The guided tour in Sydney was made by an award-winning virtual reality production studio called VR Gorilla (VR Gorilla, n.d.a). "VR Gorilla focuses on making breathtaking VR films and experiences" (VR Gorilla, n.d.a). The other video about Cape Town is made by a company called AirPano VR. They offer several services such as 360° panoramic creations, virtual tours and exhibitions (Airpano VR, n.d.a). These two companies have both in common that they publish guided tours on YouTube VR.

For the HMD VR experience, the learners did not need to do anything to set up, as everything was prepared in advance such as turning on the equipment, navigate to the right program and video, and creating a guardian boundary. The guardian boundary is a safety function which lets you design a play area, and if you cross this pre-set boundary, you will vanish from the program and see your regular circumstances. Even though all this was fixed in advance, they all needed to use a touch control, which functions as a virtual hand, to start the video. After they used the controller to press start, the controller was placed back down, and they got to explore the video by moving their body 360° around while seated. I chose to have the participants seated as this was a stationary experience, meaning there was no moving function except for the 360° turning, and to prevent cybersickness symptoms (see Section 4.10 for a definition and discussion).

The other digital tools explicitly used in this research were iPads. The learners used "school iPads", or "learning tablets" as they call them. These tablets were from Apple and were the ninth generation of iPads from this company. As with the VR headsets, the learners watched a video clip from YouTube VR for about 9-12 minutes on the iPads. The iPads were set up in advance as well, and the only requirement from the participants was to touch to start the video and move the iPad around in order to view the 360° function. The participants were seated during this experience as well.

4.6.2 Justification for Choosing Digital tools and Materials

"[D]igital tools and technology only become truly transformative when they are used with pedagogical purpose" (Hoem & Iversen, 2020, p. 157). Therefore, I chose to use Hoem and Iversen's (2020) guidelines on six topics related to how to select and evaluate digital learning tools when

choosing digital tools and materials for this research. These guidelines aim to function as "a starting point (…) to start critically evaluating the tools they use and the information they access digitally" (Hoem & Iversen, 2020, p. 171). They offer several criteria that should be considered when choosing what tools to include in education. Even though Hoem and Iversen (2020) focus on digital technology like machine translation tools, text-to-speech programmes, and grammar and spell checkers, the criteria offer transfer value when choosing a suitable VR programme.

First, the tools' and materials' purpose had to be addressed, like, how is this relevant and how can it support learning. Several purposes for using YouTube VR with two digital tools were considered. Firstly, two of the competence aims after year 7 justified this choice: "The pupil is expected to be able to use digital resources (…) in language learning, text creation, and interaction" and "read and present content from various types of texts" (Norwegian Directorate for Education and Training, 2019, p. 7). Furthermore, the emphasis in the core elements of the English subject curriculum is on how communication should foster experiences, usefulness, and exploration through a teaching strategy that emphasises "the opportunity to express themselves and interact in authentic and practical situations" (Norwegian Directorate for Education and Training, 2019, p. 2). In this case, YouTube VR in combination with iPads and VR headsets offered interactions in authentic and practical situations where the learners encountered a digital multimodal text for the purpose of communication.

Second, it was important to consider user-friendliness and customisation. YouTube VR is user-friendly in that a lot of people are familiar with YouTube, and YouTube VR is structured in the same way. It is simple to seek for and locate 360˚ videos, and with a few clicks, you can begin interacting. However, finding suitable and educational materials might be more of a challenge. iPads were also considered user-friendly in terms of familiarity and navigation. Since all learners received an iPad at the start of their education, they were well-versed in its use as a learning tool. HMD VR as a tool, however, may not be particularly user-friendly if you are unfamiliar with the technology, as were the majority of the participants. The VR headsets offer a variety of configurations, settings, options, and assistive tools, such as touch controllers. Setting up, navigating, and preparing required specialised digital competence.

Accessibility was another factor to take into consideration; be aware of how and where it is accessible. Due to the limited school budget, it is important for the teacher to check a tool's accessibility. In Norway, "[a]ny tool introduced in education must be freely available to all" (Hoem & Iversen, 2020, p. 172). This restricts the tools a teacher can use, as they must be either free or something the school

is willing to pay for. As for the digital tools used in this research, iPads were accessible to all learners because they were paid for and provided by the school. YouTube VR, on the other hand, is free for everyone because it offers a "freemium" version. For this research project, the premium version was used to avoid advertisements; however, this is not required when using the programme. Lastly, VR headsets are typically out of reach for schools due to their prohibitive cost. VR devices were borrowed for the purpose of this study from the Inland Norway University of Applied Science.

The fourth aspect listed by Hoem and Iversen (2020) is engagement. The teachers need to be aware of how digital tools can foster engagement and motivation and should use them as a beneficial factor in English language learning (Hoem & Iversen, 2020). "In order to promote student engagement with a program, course, or activity in a virtual environment, it is necessary to generate immersion" (Farley, 2016, p. 137). Furthermore, Hoem & Iversen (2020, p. 172) emphasise the importance of using digital tools that can relate to authenticity when stating that "tools that allow text production in authentic contexts can achieve high levels of engagements". These factors were considered when choosing tools for providing VR in this research project. Hence, the different tools were chosen because they aim to generate immersion and authenticity. This being engaging and motivating will also provide learners with scaffolding, the feeling of relevance, importance, usefulness, and meaningfulness, which is again important for learning to actually happen (Lund & Villanueva, 2020; Ministry of Education and Research, 2017).

Moreover, when using digital tools, it was important to address concerns and obtain information about privacy and data protection. "Privacy concerns cannot be fully addressed by individual teachers, but as a teacher you still need to consider what data is stored by a digital tool and where, particularly when the users are students in school" (Hoem & Iversen, 2020, p. 172). As the teacher and researcher for this research project, I have considered ethical concerns related to the General Data Protection Regulation (GDPR) and adapted the project to meet all requirements (see section 4.10). Hoem and Iversen (2020) emphasise the importance of professional evaluation as well. Therefore, an application was submitted to Sikt, which evaluated and authorised my research project in accordance with current GDPR regulations (see Appendix 2).

Lastly, Hoem and Iversen (2020) emphasise the importance of quality, which can be seen as the sum of all the criteria mentioned above. The sum of these guidelines indicates that VR is suitable for EFL teaching and learning. This conclusion is based on my ability "to evaluate the extent to which the tool is suitable for the context of language learning, appropriate for the intended age group, and whether

it comes from a credible source" (Hoem & Iversen, 2020, p. 172). In terms of the TPACK framework, I have selected, assessed, and evaluated the tools used and their content in this research in terms of language, being appropriate for learners in year 7, and cross-checked the facts presented in the YouTube VR videos with other credible sources as well. "Selected and used judiciously and with pedagogical intention, digital technology (…) provide scaffolding for learners, and promote linguistic awareness and critical thinking, thereby encouraging *deep* rather than *surface* learning" (Hoem & Iversen, 2020, p. 173).

4.7 Trustworthiness

In this section, I will discuss the trustworthiness of this research. Trustworthiness is a critical aspect of research that aims to ensure reliable, credible, and transferable results (Kvale & Brinkmann, 2015). Therefore, I will examine reliability, credibility, and transferability in my choices of action and reflections in this research.

Reliability concerns the trustworthiness of the research (Kvale & Brinkmann, 2015), and refers to the consistency and stability of the results obtained from a research study. Reliable research should produce consistent results even when repeated under similar conditions (Flick, 2018). However, qualitative research may be difficult to retest (Postholm & Jacobsen, 2018; Flick, 2018). Some parts of this research are possible to re-test, as, for instance, the questionnaires and interview guide. Although the interview guide can be re-used, the interview itself was a semi-structured focus group interview containing both open-ended and follow-up questions, which would be difficult to re-use in terms of consistency (Kvale & Brinkmann, 2015). Additionally, the design of the action research is thoroughly described (see Section 4.3), which makes it easily replicable for use in other future projects. However, it is the learners' and teacher's subjectivity to VR and written communication that is being measured and collected, and this can impact the study's ability to consistently produce replicable results.

Credibility refers to the extent to which the research findings are believable and trustworthy. Credibility can be established by ensuring that the study is well-designed, uses appropriate methods, and is conducted by qualified researchers. Hence, the study is designed from a pedagogical theoretical framework, TPACK, as well as using a variety of methods in order to ensure appropriate data collections. Since I am not a trained researcher, I decided to do a pilot study in order to ensure a well-designed study with appropriate methods (see Section 4.1.2). "This testing is important to establish

the content validity of scores on an instrument; to provide an initial evaluation of the internal consistency of the items; and to improve questions, format, and instructions" (Creswell & Creswell, 2018, p. 154).

Transferability refers to the extent to which the research findings can be applied to other contexts or populations (Flick, 2018). Therefore, I desire to ensure that the methods and results are transparent and clearly described in this thesis so that other researchers can assess the transferability of the findings. The findings can be used to make informed decisions or policies or as a basis for future research.

4.8 Data Analysis and Techniques

In this section, I will present my analytical scheme across all methods that provided concrete data, namely the questionnaires and the interview. In order to answer the research question "What is the Educational Value of Using Virtual Reality in EFL Teaching and Learning, and How Can an Authentic Virtual Reality Experience Facilitate Written Communication in the EFL Classroom in Norway?", it was necessary to sort the data gathered from the questionnaires and the interview into categories and label these with codes in an analytical process of segmenting, coding, and reassembling (Boeije, 2010). I used f4analyse (version 3.4.2, 2022), a programme that provides a decent overview when data is broken down into segments and codes. Then, these codes were reassembled into new categories to see connections across the different sources of data and the different participants. The codes were partly based on theoretical perspectives, i.e., inductive concept-driven coding, and themes that emerged while working with the material, i.e., deductive data-driven coding. Going back and forth between these two analytical methods is called abduction and is a more flexible approach that "seeks a situational fit between observed facts and rules" (Timmermans & Tavory, 2012, p. 171). Although observations and interactions that emerged from action research were noted, analysed, and placed in categories, this chapter focuses on interview and questionnaire analysis and techniques (see Chapter 5 for data presentation).

4.8.1 Interview Analysis and Techniques

In this thesis, Flick's (2018) five steps were used when analysing the data. The first step is to do the transcription yourself. As I did it myself, I read the transcripts several times and began initial coding. The second step was to develop codes. This is considered to be one of the main activities of qualitative

data analysis, also known as segmenting (Boeije, 2010). The term segmenting is "referred to as unfolding, unravelling, breaking up, separating, disassembling or fragmenting" (Boeije, 2010, p. 77). In other words, when segmenting the data, codes were created. Charmaz (2014, p. 111) defines coding as "naming segments of data with a label that simultaneously categorizes, summarizes, and accounts for each piece of data".

For this thesis' data, I first categorised the participants' quotes using the following inductive pre-made codes: The use of iPad in EFL education, the use of HMD VR in EFL education, written tasks, iPad VR experience, HMD VR experience. Other data-driven codes emerged from the process of transcribing and coding the interview, such as digital tools and learning, preferable experience, and digital competence.

Further in the analytical process, reassembling occurred as the third step (Flick, 2018). "Reassembling of data is commonly described by a variety of terms, such as synthesizing, structuring, integrating, putting together, recombining and modelling" (Boeije, 2010, p. 79). As mentioned, I used the program f4analyse (version 3.4.2, 2022) to reassemble the data that emerged from the interview. This programme allowed me to highlight sections of the transcription. The highlighted text was assigned a colour that corresponded to the established codes and categories. I was required to consider, assess, and sort the data in the process of reassembling it to evaluate the relationships between the categories that evolved. Thus, groups of codes were organised into new, bigger categories. Further, in what Flick (2018, p. 475) describes as the fourth step of refinement, the themes were broken down, leaving out information that was not relevant, such as digressions and topics that touch upon other subjects than I intend to investigate. This led into the final step, a presentation of the results that "serves as an in-depth view of the social phenomenon that is studied" (Boeije, 2010, p. 79; see Chapter 5).

4.8.2 Questionnaire Analysis and Techniques

The questionnaires contained a combination of questions with Likert scale and in-depth answers. Therefore, the analysis techniques will vary between the analysis of text (in-depth answers) and the analysis of numbers (Likert scale answers). The analysis of text followed the same technique as the interview analysis, with segmenting, coding, and reassembling (see Section 4.8.1). The analysis of numbers followed a technique called descriptive analysis, also known as distributional analysis (Postholm & Jacobsen, 2016). This analysis focused on an evaluation of individual questions from the questionnaire (Postholm & Jacobsen, 2016). Chapter 5 of this thesis provides a description of how the learners' responses to the questions were distributed. Each individual question is represented as a

variable, and the answer alternatives are designated as values in this context. In this thesis, I will present the results alongside other findings from other methods. I have chosen to distinguish between the responses regarding the possibilities and challenges of the VR approaches as well as the learner and teacher perspective (see Chapter 5). However, these divisions will be compared and contrasted at the end (see Section 5.4).

4.9 Limitations of the Approach

There are several limitations to the research design of this thesis. Firstly, the sample size was quite small. The desire to go further in-depth and collect thick descriptions by using several methods with a small selection of participants was prioritised because, in this research, I wanted to find out how VR unfolded in the classroom and get the learners' opinions on it. Instead of just skimming the surface of "all" learners through questionnaires, the focus group interview provided a deeper insight into the participants' perspectives on the educational value of VR. Another reason for the small sample is that there was not enough technological equipment available to conduct the study, as class sets of HDM VR headsets are uncommon, especially in primary schools. Additionally, one of the eight participants got sick and missed the second teaching and learning session. Consequently, these data were removed, leaving data representing the remaining seven learners.

Another constraint was that this equipment had to be set up at the Inland Norway University of Applied Sciences. Though it may have been more beneficial to use the learners' regular classrooms or a space at their school, conducting it at the university was preferred due to several logistical and practical considerations, such as the setup of the VR headsets and the time constraint. During the pilot, a YouTube advertisement appeared, interrupting and perhaps distracting the VR experience. In order to fix this and hinder interruptions, I bought YouTube Premium for the time spent conducting the action research. However, since schools typically do not have YouTube Premium, I think this could be a limitation for the use of YouTube VR in schools. Another drawback was also found during the pilot research, which was the restriction of using YouTube through a browser as opposed to downloading the YouTube app to the iPad. Only the programme, not the browser, supported the 360° motion capability. To make this capability work effectively, the YouTube application had to be downloaded to the iPads. However, this might also be a problem in primary school since, from my experience, learners are typically not allowed to download YouTube. Additionally, the method of action research itself was another restricting element because the learners were only exposed to two teaching and learning sessions, and the project, as well as their experiences and viewpoints, were

restricted to those two sessions. In future action research, I will ideally have the opportunity to do several cycles of testing and approving the teaching and learning sessions.

4.10 Ethical Considerations

When conducting research, various ethical factors must be taken into account. In social research, it is common to deal with ethical guidelines in four areas in which ethical considerations must be made: informed consent, confidentiality, consequences, and the role of the researcher (Kvale & Brinkmann, 2015; Boeije, 2010). In the following section, I will describe what ethical considerations were addressed in this research project.

In research, "[c]onfidentiality concerns data (records, field notes, digital recordings of interviews, transcripts and the like) and agreement as to how the data are to be handled in the research in order to ensure privacy" (Boeije, 2010, p. 46). To ensure confidentiality, it is important to see the term in a close connection to anonymity. This means making sure that the participants' identifying information is not attached to the data collected (Boeije, 2010; Kvale & Brinkmann, 2015). I applied to Sikt and received approval to conduct my research in October 2022. All data gathered about the participants was saved and stored as agreed with Sikt. To maintain the anonymity of the participants throughout this thesis, I gave them pseudonyms (see Section 4.5). All participants signed a written information letter and consent form (see Appendix 1). For ethical reasons, it is important that the participants are aware of their rights, such as the fact that participating is voluntary and they can withdraw from the project at any time (Kvale & Brinkmann, 2015). Since the eight participants were under the age of 18, they were noted as vulnerable, which added an extra risk factor. The consequences of this were that "these groups sometimes may not understand their rights or may not be entirely capable of exercising their right to refuse to participate in research when asked by someone of apparent authority" (Boeije, 2010, p. 50). Therefore, consent could not be given by the children alone but had to be given by a legal guardian. Hence, I was clear in my speech when handing out the information letter that I wanted the learners to discuss it with their parents and only participate if they wanted to. When discussing the consequences of participating, the balance of harm, or risk, and benefits is central (Boeije, 2010; Kvale & Brinkmann, 2015). The risks of participating in this research may have triggered stress and insecurity due to unfamiliar contexts and situations.

Even though I have worked as a substitute teacher for more than 6 years, I am totally new to the role of researcher. For this research project, I combined these roles, which was a challenge. I coped with

this challenge by choosing participants I knew well. My relationships with the participants helped make it more comfortable not only for me but for the participants as well. Nonetheless, this relationship may have influenced how the participants responded and interacted with me as the teacher and researcher, leading to possible biases in the data.

Further ethical considerations concerned the recommended age limit of the HMD VR manufacturers. The majority of manufacturers and sellers provide age recommendations and guidelines ranging from 6 to 13 years, depending on the advancement of the equipment. One of the reasons for these age recommendations is the importance of cognitive, psychological, and physiological development in how youngsters perceive virtual reality (Stranger-Johannessen, 2021). For example, children are more sensitive to auditory and visual stimuli than adults (Baumgartner et al., 2008), and it may be difficult for them to distinguish virtual reality experiences from real life (Segovia & Bailenson, 2009). According to this advice, I conducted this research project with learners in year 7 who either are or will turn 13 this year.

A review of studies done by Jensen and Konradsen (2017) made me aware of another ethical challenge, which I had not considered in the early planning process but which I was made aware of during the pilot project (see Section 4.1.2). VR exposure is associated with the potential occurrence of cybersickness (Jensen & Konradsen, 2017). Stanney et al. (1997) define cybersickness as physical discomfort or malaise caused by visual motion when interacting with VR. The symptoms of cybersickness are typically disorientation symptoms (Stanney et al., 1997). According to Jensen and Konradsen (2017), the frequency of cybersickness symptoms ranged from very uncommon to nearly every participant. "When present, cybersickness influenced the learner attitude towards the technology negatively" (Jensen & Konradsen, 2017, p. 1523). It is an ongoing discussion about how immersiveness might affect the relationship between presence and cybersickness (see Weech et al., 2019 for a discussion). To prevent cybersickness from occurring in the research project, the learners were told to sit down during the experiences, as the pilot participants expressed this as a way to stall the feeling of dizziness.

4.11 Summary

This chapter provides transparent information about the methods and materials used in the research project. Interview and questionnaire data were used to complement the action research method. These three methods were used to acquire data for the purpose of answering the research question. HMD

VR devices and iPads were used as materials. Prior to their use, these were carefully considered and evaluated. In addition, the design of the research and the structure of the teaching plans have been described in detail to provide the reader with the necessary information for various purposes, including further research, re-testing of the research, and the opportunity to assess the transferability of the findings. Further, a description of the data analysis methodologies was given. Ultimately, trustworthiness, limitations, and ethical considerations were discussed.

5. Results and Discussion

In the following chapter, I report and discuss the results from the data collected in this study, focusing on the educational possibilities and challenges of using two approaches to VR, namely HMD VR and iPad VR, to facilitate written communication in EFL teaching and learning. The results and discussions are divided into separate paragraphs for each topic throughout the discussion. Initially, each section reports the results and findings of the research project. Further, I move onto the discussion based on the results in light of the research question's different foci. The findings and discussion are based on the Norwegian EFL learner and teacher perspective on VR and its effect on written communication. The learner perspective is based on their responses in the questionnaires and the interview, whereas the teacher perspective is based on findings from the action research and considerations from planning the action research, as well as other relevant factors teachers should be aware of in general. As mentioned in Section 4.5, the interview was conducted in Norwegian; hence, all quotes are translated from Norwegian to English by me for the purposes of presentation, and they are numbered. The sub-research questions for this thesis served as the foundation for the chapter's structure. In Section 5.1, I explore the category that emerged from the data-driven codes, digital competence, while Section 5.2 concerns the concept-driven codes about the educational value of the two approaches to VR separated to distinguish between the educational possibilities and challenges as well as the learner and teacher perspective. Section 5.3 also emerged from concept-driven codes and answered how the interaction with the VR experience facilitates written communication. Finally, in Section 5.4, I compare and contrast the aforementioned results and discussions in order to identify commonalities in the preceding discussion.

5.1 Digital Competence

5.1.1 The Learners' Digital Competence

From the responses to the questionnaire, all the learners reported having good digital competence and skills. The digital tool that all learners mention is their everyday use of the iPad in school. Two of the learners state they use laptops as well, but rarely. No other digital tools were brought up in relation to school. These responses might come across as the learners' immediate reflections, as other digital tools came up in the interviews. Emily mentioned a digital tool named BlueBot, which they have been using to practise English vocabulary from a multidisciplinary perspective with coding in math. Also,

Andrew acknowledges their common use of AppleTVs, projectors, and SMART boards in the classroom. Observations from the action research implied that the learners' digital competence was sufficient for using iPads; however, all learners required assistance with the HMD VR device, which may indicate a lack of practise and competence.

According to guidelines provided by the Ministry of Education and Research (2017), schools shall provide learners with knowledge, competence, and skills to function in today's digital and continuously developing society. First and foremost, the learners need to be introduced to what digital tools are actually out there and how they function. The learners self-report to have *good* digital competence, and that might be true, as they are probably exposed to other digital tools outside school. However, I believe that the learners have *acceptable* general digital competence. As reported, their competence is good for the tools used in school, but these tools are few considering all the digital tools that exist and are common in today's society. Due to the need for assistance when introducing the learners to HMD VR, the lack of specific competence and skills is notable. From a teacher perspective, we need to introduce, teach, and equip the learners with several digital tools in order for them to practise the competencies and skills required in today's society. Then, providing learners with a variety of new and possibly unfamiliar digital tools and technologies, such as VR, is important, not only to expose them to a variety of tools but also to have them interact with and discuss the learning potential and limitations of the materials provided by the tool. Such an interaction is emphasised in the English subject curriculum as a part of digital competence linked to critical thinking (Norwegian Directorate for Education and Training, 2019).

Future digital technologies that will be common as these learners grow up have likely not even been conceived, so why should we expose them to multiple tools that may be outdated by the time they enter society as adults? From a teacher perspective, by training such competencies and skills, the learners gain from being exposed to several different digital technologies and tools, helping to foster transferable skills such as exploration of new technology. The school shall prepare the learners for future participation in society (Ministry of Education and Research, 2017). If the school is stuck in a bygone era where only iPads and projectors are used, the learners will miss out on the opportunity to learn a great deal about exploring, acquiring information, and developing the competence and skills necessary to use digital technologies and tools in a useful and learning-promoting manner. Therefore, in order to give all learners the same possibilities when it comes to the use of digital technology and tools, the Norwegian national curriculum needs to be explicit about what digital tools the learners should be exposed to in order to gain a proper digital competence and not just implicitly say that the

learners shall be "able to use digital media and recourses" (Norwegian Directorate for Education and Training, 2019, p. 4).

5.1.2 The Teacher's Digital Competence

Growing up, portable digital technologies and tools were accessible; hence, I assume that I hold an acceptable level of digital competence. Regarding the digital tools I use in my everyday life, both in school as a teacher and outside of school in my spare time, I consider myself to be digitally competent due to the time spent exploring, practising, and training. This applies to smart phones, laptops, tablets, projectors, smart televisions, and various video game consoles. Additionally, I have been exposed to and tried HMD VR a few times during my teacher education. Even though I have been working as a substitute teacher for six years and have had teaching practise periods included in my teacher education, I have never been exposed to other digital tools other than iPads, laptops, SMART boards, and projectors for teaching and learning purposes.

Based on my experiences, I am under the impression that it is up to the teacher to initiate the use of digital tools, but within the limits of the school budget. Then, as a teacher, you need to be inquisitive and interested in learning about and applying other digital tools for teaching and learning, as there is limited financial support and time available for implementing them. If that is so, only a small number of learners will be introduced to, taught, and equipped with other digital technologies that are uncommon in school today despite being common in society. Although digital competence is explicitly specified as a set of skills learners must acquire in school, this also applies to teachers, as they must possess a certain level of competence in order to teach these skills and competencies to learners. Furthermore, if the school is unable to provide a variety of digital learning tools, it will be difficult for teachers to remain updated on technology, which brings me back to my earlier point about teachers initiating the use of digital tools. This means that teachers may use their leisure time and personal funds to explore school options. Therefore, teachers must be provided with the necessary tools, materials, and training in order to provide learners with the digital skills they need to succeed in the modern world.

5.2 The Educational Value of HMD VR and iPad VR

5.2.1 The Learner Perspective on the Educational Possibilities of HMD VR and iPad VR

From the interview, it emerged that Emily, Mary, and Andrew agreed that they preferred the HMD VR approach, while Isaac preferred the iPad VR approach when comparing HMD VR and iPad VR. Isaac explained his choice by emphasising that you are not locked inside another world, which makes it possible to focus on several things at the same time. For instance, Isaac pointed out the benefit of necessary communication with the teacher being more convenient by not being inside another world. In contrast, wearing the VR headset was highlighted as a benefit by Mary and Andrew due to the effect of going into a new world and being able to look around 360˚ without getting disturbed by other learners or objects. Mary explained it like this:

> I was kind of there because you have the video on your eyes. It was a different learning experience than sitting in a classroom because you get to actually look around and be present at the place you are learning about. 1

Andrew continued with, "You were able to visit the place instead of reading a text about it, so you actually got a sense of what the place was like" (2). Discussing this, all learners reported and emphasised that this experience provided authenticity and meaning to them. This also coincides with the findings from the questionnaire. All seven learners either strongly agreed (n=3) [4]or agreed (n=4) that the HMD experience felt real. Even though Andrew, Mary, and Emily described the HMD VR experience as more authentic and real than the iPad VR experience, Isaac did not express any difference between the HMD VR and iPad VR experiences: "I think they both felt just as real as the other. There was not a big difference in the experiences" (3). In the questionnaire, the learners reported an even distribution, ranging from strongly agreeing to disagreeing that the iPad VR experience felt real.

Further in the interview, the learners discussed how these approaches affected and could affect teaching and learning. One item of the questionnaire stated, "The (iPad or HMD) VR experience made it easier to understand the content". Five out of the seven learners claim that the HMD VR experience made it easier to understand the content of the experience. Results emerging after the iPad experience were distributed between strongly agreeing (n=3), agreeing (n=2) and neither agreeing nor disagreeing (n=2). In relation to this, Mary reflected on the use of regular videos in school:

> You get more than if you just look at one place in a normal video. Usually, we watch regular videos at school, and then we only get to see a little of what is really there, whereas with 360˚ we can look around and get a greater impression. 4

[4] n=x, n stands for number of participants

They all emphasised the importance of getting an overall impression of the experience, which you do not necessarily get through a picture or a written text in the same way.

Additionally, all seven learners reported that they strongly agreed that the HMD VR experience was engaging. When answering an open-ended question about what was engaging, all learners emphasised the feeling of authenticity and presence. For the iPad VR experience, five learners reported strongly agreeing that it was engaging, whereas one agreed and one neither agreed nor disagreed. When answering an open-ended question about what was engaging, all learners emphasised that it was a new way of using the iPad that was more fun. Two explicitly reported that the 360˚ view was nice for orientation, whereas two others reported that they learned better because of the 360˚ function. In the interview, the learners highlighted the HMD VR experience as interesting, engaging, and fun and directly linked this to a better learning environment and improved learning outcomes. Andrew describes this by stating: "This may help it become quieter in the classroom because the learners pay attention to what is going on, and then you learn better too" (5). All learners claim in the questionnaire that the HMD VR experience contributed, more or less, to learning and that HMD VR is a method they prefer, in terms of learning, over regular classroom teaching using written texts and pictures. The results from the iPad VR questionnaire showed that three learners claimed to strongly agree with the experience contributing to learning, whereas one learner agreed and three learners neither agreed nor disagreed. When reporting interest in further work on the topic, most learners using HMD VR were strongly interested (n=5), whereas one learner was interested, and one chose the neutral option of neither agreeing nor disagreeing to be interested. For iPad VR, most learners agreed (n=4), two strongly agreed, and one was uncertain about their interest in further work on the topic. Finally, the questionnaire asked an open-ended question about which tools and methods the learners felt helped them learn best. In total, five of seven learners mentioned the iPad explicitly as a tool that contributes to learning, whereas four mentioned HMD VR explicitly.

These results shed light on the first part of the research question concerning the educational possibilities of HMD VR and iPad VR. HMD VR provides a 3D, 360˚ view, aiming to be realistic, immersive, and present (Parisi, 2016). As presented above, the learners emphasised, in both the interview and questionnaire, that the characteristics of HMD VR made the experience feel authentic and meaningful. Furthermore, a certain sense of authenticity was applied to iPad VR as well. The learners were rather positive towards the iPad VR approach being supportive for learning the content, and no learners responded to the negative side of the scale when self-reporting whether or not the iPad VR experience contributed to learning in general. Previous research has also demonstrated such

a connection between reality and what is being learned and how it facilitates language learning (Nelson & Erlandson, 2012; Shadiev et al., 2019). The results reported above show a similar connection between authentic situations and learning. This indicates the importance of intersecting pedagogical knowledge with content knowledge in order to effectively and optimally facilitate learning (Angeli et al., 2016). Hence, it is reasonable to support the conclusions of Nelson and Erlandson (2012) and Shadiev et al. (2019) that learning in authentic contexts promotes learning. These findings are consistent with several studies that found that learning in authentic contexts increased positive attitudes towards motivation, engagement, and inspiration (Shadiev et al., 2019; Garrido-Iñdigo & Rodríguez-Moreno, 2015). Shadiev et al.'s (2019) arguments align with the learners' report of a high level of engagement throughout the HMD VR experience and that most learners were interested in further work on the topic. Reportedly, the iPad VR experience was quite engaging, and the learners were quite interested in further work on the topic. To connect this to the theoretical framework of this thesis, the reciprocal relationship between the VR tool's technology and its content serves TCK (Angeli et al., 2016). In other words, TCK is influenced by the reported engagement of the learners, which may be related to the VR tool, the content, or a combination of the two. In total, this demonstrates that the interaction between pedagogy, content, and technology (TPACK) impacts engagement, inspiration, meaningfulness, and learning (Mouza, 2016; Angeli et al., 2016).

However, since HMD VR in general scored higher than the iPad VR approach concerning the educational possibilities, it is reasonable to question the impact TK has on the interactions with PK and CK. It would be reasonable to think that iPad VR, which is an approach using a well-known tool, should influence the CK and PK even better, resulting in higher perceived engagement, inspiration, meaningfulness, and learning. On the other side, these aspects of knowledge have a reciprocal relationship, meaning that the content and pedagogy may as well influence the technology (Angeli et al. 2016). One possible reason the results imply that HMD VR scores higher can be due to the strong correlation it has with the pedagogy focusing on authenticity and the content focusing on travel and meaningful writing. Alternatively, it could be about the new and intriguing VR tool or what the learners appreciated the most. It may also be due to interest in the topic, as travel is a relevant and relatable subject. This alone may be sufficient to desire further work. It is therefore difficult to determine whether it was the approach or the topic that made them interested in further work.

The learners' self-reported feelings and opinions towards the different approaches are valued in this research. However, as a researcher, it is reasonable to question and be critical of the results collected.

Therefore, it would be interesting to see if the learners' points of view changed over time if these approaches went from new and interesting to normal and were implemented in their everyday learning. On the one hand, the VR experiences could be engaging and fun because they are new, and therefore the learners reported them to be instructive. On the other hand, iPads seem to be a preferred mode of learning, as iPads were named by the majority of the learners as their favourite learning instrument, even though they have had iPads since their first day of school. For future research, then, it would be interesting to see how and if the learners' engagement, inspiration, and self-reported learning would decrease, be stable, or increase.

5.2.2 The Teacher Perspective on the Educational Possibilities of HMD VR and iPad VR

When planning the action research, in the role of the researcher, I evaluated and assessed the materials and approaches from a teacher perspective. As a teacher, I have reflected on the interactions and observations made during the research project. With HMD VR, planning, testing, and preparation were more difficult than with iPad VR. I owned an iPad but had to make special arrangements in order to obtain VR headsets. I had no difficulty managing and navigating the iPad. However, my unfamiliarity with the setup and functions of the VR headset made it difficult for me to manage and navigate without assistance. Therefore, I received training from the individual who allowed me to borrow the VR headset. In other words, my digital competence was sufficient for administering iPad VR, but because I lacked the specific digital skills required to manage the VR headset, the possibility of learning something new arose. In the process of planning, other practical considerations were taken into account, such as the possibility of implementing iPad VR in schools today since the learners already have an iPad for educational purposes. As iPads are a digital tool prioritised by many municipalities, the expenses and cost of these are not an issue for the school. The fact that iPads are accessible to all learners makes it easier to implement this type of VR with a larger group in a regular classroom. This opens for using iPad and all its means throughout primary and secondary school, and iPad VR is one of the means iPads can provide for teaching and learning. Simultaneously, the fact that iPads are provided to learners beginning in the first grade allows them to practise and develop the necessary skills and competencies over a number of years. In addition, more practical considerations pertaining to HMD VR were made, albeit in relation to challenges (see Section 5.2.4).

Observations and interactions that emerged as a result of the action research highlighted a number of possibilities for using HMD VR and iPad VR. I observed the learners using and navigating the iPads without assistance, whereas they all required assistance, support, or guidance to adjust the VR headset and initiate the experience. As the teacher, I experienced that the iPad VR approach retained the

possibility of necessary communication as well as surveillance by the teacher. This was more complicated with the HMD VR (see Section 5.2.4). Additionally, I perceived the learners to be engaged based on the way they expressed themselves orally and through body language. The learners were eager to get started and expressed fascination before, during, and after the use of VR. For the iPad VR experience, five of the learners reported being inspired to talk about the experience to some degree (strongly agree n=2, agree n=3), whereas one learner was uncertain and one was uninspired. Three learners report that they were strongly inspired to talk about their HMD VR experience; two were inspired, and two were unsure whether they were inspired to talk about it or not, which demonstrates some variance between my observations and my questionnaire data, as I observed the learners expressing a strong desire to share their opinions about VR experiences on multiple occasions.

Another possibility I considered from a teacher perspective was how using any of the VR approaches offered exposure to different types of texts in a wide sense (see Section 1.1.3), which again facilitated practise and training in reading complex digital texts. For instance, the VR texts used in this research facilitated the practise of psychomotor skills related to head movement, such as visual scanning and observational skills. Based on my observations of my own practise and learner interactions, finding the right materials and approaches is important.

In discussing these results, it is evident that both VR approaches offer opportunities, albeit in distinct ways. For some of the factors offered by the different approaches to VR, a factor of HMD VR could provide possibilities, whereas the same factor of iPad VR offered challenges, and vice versa. For instance, HMD VR provided the possibility of mastering a new digital tool. On the other hand, the iPad was a familiar tool, and thus it allowed teachers and learners to begin using it instantly. Meanwhile, in Norway, HMD VR is uncommon to have in school (Stranger-Johannessen & Fjørtoft, 2021), whereas iPads (or similar digital tools) are accessible for teachers and learners without additional arrangements or costs. Adding to this, teachers and learners are continuously trained to use iPads as digital tools in their everyday teaching and learning. As reported above, the learners managed to navigate the iPad without assistance, which may indicate that they met the requirements of skills and competencies needed to implement VR for the iPad. Additionally, where HMD VR had the learners inside another world, iPad VR made necessary communication and surveillance by the teacher more possible and convenient. Even though learners did not require assistance during the iPad VR experience, this was a possibility I considered when planning the project, which I viewed as a potential challenge for HMD VR (see Section 5.2.4 for a discussion).

According to the Ministry of Education and Research (2017, p. 8), "[t]he teaching and training must give the pupils rich opportunities to become engaged". This can be accomplished through inventive and diverse learning processes, such as those offered by VR. In this research, the VR experiences aimed to develop the learners' engagement and inspiration to express themselves. From the observations, it seemed like the engagement and urge to express themselves were clearly present for the learners. This can be seen in relation to what Garrido-Iñigo and Rodríguez-Moreno (2015) found in their research, explaining that the feeling of participating in an authentic experience facilitates motivation and makes the learners eager to comment on the experience. From the results of the questionnaire, most learners reported being inspired to talk about their experience with the HMD VR experience, which scored marginally higher than the iPad VR experience. Despite the fact that not all learners reported being inspired to discuss the topic, all learners participated and appeared enthusiastic when discussing it.

Moreover, the iPad VR approach enabled learners to gain access to an entirely new dimension of teaching and learning without requiring additional space or equipment. Almost the same holds true for HMD VR; however, equipment was required. Both VR approaches made it possible to go on exhibitions, field trips, and travel and expose the learners to different real-life situations in English-speaking contexts. These possibilities are provided through VR as an approach to using different digital tools and would otherwise be nearly impossible to do for schools due to cost and distance.

Further, the broad definition of texts in the English subject curriculum opens up several possibilities for the use of digital and diverse texts (Norwegian Directorate for Education and Training, 2019; see Section 1.1.3). It is emphasised in the curriculum that learners should be exposed to a variety of texts and that "[l]anguage learning takes place in the encounter with texts in English" (Norwegian Directorate for Education and Training, 2019, p. 3). As a teacher, this is your responsibility, and by exposing learners to the VR texts used in this research project, they get to participate, interact, and experience life-like and practical situations that aim to be engaging and promote learning. Connecting this to the theory, the CLT approach emphasises these factors as they contribute to increasing several competencies, such as communication competence, which includes grammatical competence, discourse competence, sociocultural competence, and strategic competence (Savignon, 2002). Also, these sets of competences trained facilitate the practise of a set of skills that may be much more needed in the future, namely the skills of navigating and reading complex digital texts.

Reading digital texts is much more complex in terms of navigation than on paper (Ørevik, 2020). With the development of modern technology, digital texts will not become less complex, so the school must keep up with this change and teach, practise, and train alongside the learners (Ørevik, 2020). Providing learners with such VR texts will facilitate learning and engagement and enrich the skills and competencies needed in a society in constant change (Stranger-Johannessen & Fjørtoft, 2021; Selwyn, 2022). Although the learners reported that the experience felt instructive and educational, learning as such cannot be observed or tracked by me as a teacher and researcher in this research project. Therefore, I must trust the learners and validate their responses.

5.2.3 The Learner Perspective on the Educational Challenges of HMD VR and iPad VR

Several challenges were also discussed in the interview or brought forward from the questionnaire. In the focus group interview, learners discussed the challenges linked to the two approaches to VR that they had either personally encountered or could foresee as being problematic. For HMD VR, the discussion revolved around challenges that mainly focused on physical challenges. For instance, Emily expressed that the VR headset was a bit too tight or loose and a bit heavy to wear. Also, Isaac mentioned that if he moved too far, he got out of the video and saw just his regular surroundings, but when he moved within the "box" (a safety net or box to ensure that they do not crash into obstacles in their real surroundings that I had set up prior to the testing; see Section 4.6.1), there were no problems at all.

For the iPad VR experience, the topic the learners mainly discussed as a challenge was distractions. Discussing being "inside" two different worlds at the same time, the learners reported different issues. Emily reported getting a bit distracted. The fact that you are able to see what is going on in two different worlds at the same time could be distracting, and Mary described this as an issue because "when you are 26 learners in a classroom and everybody is doing the same, there will be a lot of movements around you, and it can be hard to focus" (6). Andrew reported getting more tired of focusing on the iPad VR than the HMD VR due to how many worlds he was present in. Another challenge that also revolves around the topic of distractions was presented by Emily, who said, "It can be a bit easier and more tempting to do other things on the iPad, like search for something else or play Minecraft Education, for example, and that will disturb what we were supposed to do" (7). Further, the learners discussed whether or not HMD VR could be somewhat distracting because, as Emily said, "for some, it may be distracting to be in HMD VR because there is so much to look at and do" (8). Looking at the learners' responses in the questionnaire, four learners reported that they strongly disagreed that the HMD VR experience was distracting, whereas three learners disagreed

with this statement. In comparison, the learners reported a wide range of answers when it came to iPad VR being distracting, but most learners disagreed to some degree that the iPad VR experience was distracting. One learner reported getting distracted, one learner was uncertain, three learners disagreed with the iPad VR experience being distracting, and two learners strongly disagreed.

The challenge of cybersickness was discussed, and two of the learners pointed out that someone could become dizzy and nauseous due to the possibility of spinning 360° (see Section 4.10 for elaboration about cybersickness). Although this was pointed out by several learners, only Mary reported getting a bit nauseous and dizzy from the iPad VR experience. When discussing this, Andrew pointed out that "when you took off the VR headset, it felt like entering a totally different world" (9).

These results provide insights that help investigate the part of the research question concerning the educational challenges of VR. The challenges regarding physical discomfort with the VR headset can easily be solved with adjustments to the equipment. Cybersickness, on the other hand, is a more complex challenge that is hard to solve as it can occur from a physical reaction caused by visual motion in VR (Stanney et al., 1997). These types of physical discomforts are definitely problematic factors. Even though I modified the pilot study by requiring participants to conduct the experiences while seated, this did not appear to solve the problem for all learners in the research project. This is a potential pitfall for the implementation of VR technology in education. Because it is difficult to determine what causes the body's reactions to VR, individual adjustments or alternate options must be provided.

Distractions are brought up as one of the main challenges for the learners. As reported above, there is discord among the learners regarding the extent to which iPads are distracting and about what iPad features are distracting. Although most learners reported not getting distracted in the questionnaire, three of the four learners in the interview reported getting distracted in some sense when conducting the iPad VR experience. There can be several reasons for these incoherent responses. When responding to a questionnaire, your initial reaction may be that it is not disturbing or distracting. However, when discussing in a focus group interview, you are suddenly exposed to the opinions of others, which may inform and provide new perspectives on aspects that you did not consider while completing the questionnaire individually. This is closely related to their definition and interpretation of the term distractions, which may have varied. For reference, as it was brought up in the focus group interview, the learners came up with various aspects and factors of distractions, such as two worlds, movement of other individuals and objects, and self-distraction, indicating that the learners may have

viewed the distractions from multiple perspectives. However, there is no incorrect answer, as everything mentioned is a form of distraction. Additionally, all the possible self-distracting choices linked to, for instance, applications, the internet, and programmes being distracting and taking attention away from the lesson itself are emphasised by Ørevik (2020) as a challenge of using digital tools in general. However, it is up to the teacher to make sure that the learners do what they are supposed to. This is not just an issue with the iPad, as the learners mention, but with any digital smart tool. At least when the learners use iPads, the teacher can easily monitor what the learners do. However, surveillance is a bigger challenge for HMD VR, as the teacher cannot actually see what the learner is seeing or doing.

For HMD VR, the only possible distraction discussed was that, due to the high level of immersion, the experience can be overwhelming because of its rich stimuli. Although the learners discussed this distracting factor about HMD VR, the results suggest that no learner experienced being distracted with HMD VR in this research. Previous research shows that the more immersive the VR experience is, the more distractions and cognitive overload are reported (Papin & Kaplan-Rakowski, 2022). This is contradictory to the self-reported distractions in this thesis. According to this study's participants, the ability to observe your actual surroundings with potential moving items and people having two possible foci at once makes using an iPad VR more distracting than using an HMD VR headset because there is only one possible focus. No concrete explanation of this occurrence is provided in this thesis; however, it is conceivable that it has to do with the individual learner's lack of ability to block out irrelevant information and focus on what is essential. It would be intriguing to examine this further because these findings are in conflict.

Reportedly, HMD VR is less distracting compared to iPad VR. In terms of the TPACK framework, the challenges related to distractions provided by VR technology may influence the content and pedagogy as well. Effective and engaging learning occurs when a teacher plans according to the TPACK framework, ensuring that the framework's components intersect and interact (Mishra & Koehler, 2006; Angeli et al., 2016). However, the distractions caused by iPad VR may have an effect on the content and pedagogy. In this research project, the fact that iPad VR came across as distracting may have affected how learners perceived the experience's content and the authenticity it intended to impart. This may indicate that the teacher, in this instance myself, lacked adequate knowledge of iPad VR technology and its potential pitfalls. Nonetheless, in order to enlighten other educators and researchers, the purpose of this research is to bring to light both these educational challenges and possibilities and to compare and contrast them.

5.2.4 The Teacher Perspective on the Educational Challenges of HMD VR and iPad VR

From the teacher perspective, I experienced and observed certain challenges while planning and teaching the VR sessions. The first challenges are linked to VR's technical and ethical challenges and the need for knowledge and certain competencies. From planning the teaching and learning sessions, I experienced it as time-consuming as I needed to familiarise myself with everything that was new, including the VR headset, VR as an approach in general, the TPACK framework, and the content of the lesson. Regarding time, finding good, suitable resources and materials to use for the teaching and learning sessions was a challenge. Moreover, to gain the knowledge and competencies required, I had to seek help with all aspects of VR. I received training in how to use the VR headset from my contact person at the university. Therefore, I have spent hours testing, trying, and failing, as well as planning and assessing choices, materials, and tools concerning the teaching and learning sessions. Although some training was received, in preparation for each learning session, I required assistance with the setup and orientation of the HMD VR. The VR headsets were prepared by me and my contact person at the university. I discovered that all learners required help to adjust the equipment by tightening and releasing the VR headset, as well as guidance to begin the experience. In addition, the planning phase considered and raised ethical challenges. These challenges included limitations to the approach, such as age recommendations and cybersickness (see Section 4.10 for discussions on these topics).

Additionally, in the planning process, I considered a challenge related to the cost and expenses of HMD VR. Because it is unavailable at most schools in Norway (Stranger-Johannessen & Fjørtoft, 2021), it will require financial resources in an already tight budget. Investing in HMD VR will be expensive for schools due to the expense of the tool itself and the need for adequate training, as this is a complex technological tool.

The observations and experiences regarding the VR teaching and learning sessions also presented challenges. The possibility of practising complex digital reading skills was previously discussed. Nonetheless, it can also be a challenge. No learners identified this as a challenge; however, I observed, in total from the two teaching and learning sessions, two out of seven learners who rotated back and forth in the 360° function without necessarily concentrating on what the guide was communicating. These learners were also constantly looking at the other learners who were rotating following the experience. This challenge indicates that movements from several learners at the same time can distract some learners. These observations will be discussed below.

In discussing these results, the challenge concerning time is complex. Finding and assessing materials, obtaining competence, and practising specific skills are all challenges concerning time. In order to conduct acceptable teaching with technologies, like, for instance, VR, it is required to hold a mix of content knowledge, pedagogical knowledge, and technological knowledge in order to know how to use it, when to use it, what to use it for, and why to use it (Mishra & Koehler, 2006; Angeli et al., 2016). Because obtaining such knowledge required careful training, planning, and assessment of VR, CLT, travel, and writing, it was quite time-consuming. As presented above, the need for a certain and specific competence and set of skills is crucial. Stranger-Johannessen and Fjørtoft (2021) also address this, as it hinders teachers from using such an approach when the necessary digital skills are lacking. In relation to the theory, with an educated and certified teacher as a starting point, content knowledge (CK) or subject competence should be present due to a five-year professional teacher education. Due to the complexity of technology competence and a society in constant change, the teacher's digital competence may be insufficient for using specific tools, such as VR, in general or for educational purposes. Voogt et al. (2016) argue that "teachers need a deep understanding of the affordances of specific technologies" in order to teach learners how to effectively use technologies to promote learning. Hence, the teachers must receive training to utilise HMD VR in a manner that effectively promotes learning. Simultaneously, in order for the teachers to receive training, VR headsets must be accessible. However, the equipment cannot simply be bought; purchasing HMD VR will only be an investment if both teachers and learners have the required competence or receive the necessary training to acquire it. In other words, training competencies and obtaining equipment are interdependent. This also relates to the challenge of time, as we have seen that practising and acquiring specific skills can require a considerable amount of time.

As stated above, the availability of VR headsets in Norwegian primary schools is limited (Stranger-Johannessen & Fjørtoft, 2021). Stranger-Johannessen and Fjørtoft (2021) present the expenses of VR headsets and the requirement for funding as challenging. Although VR headsets do not require much equipment, space, or adaptations in school, the expenses are immense on an already tight budget. In contrast, based on these studies' results, which indicate that HMD VR provides a high level of engagement and a self-reported improved learning outcome, the costs of VR headsets compared to what HMD VR can offer are not that high. If we do not educate our learners for contemporary society, the costs will increase in the long run. To achieve this, HMD VR must become a priority for the teacher, municipality, or government.

Although it is emphasised that the teacher needs to have a deep understanding and knowledge of the technology used (Stranger-Johannessen & Fjørtoft, 2021; Voogt et al., 2016), some specific competencies need to be required by the learners as well. In order for the teaching and learning to be most effective when using VR in the classroom, the learners would also need practise and instruction to set up and use the HMD VR device. Although the HMD VR device and experience had been prepared in advance, the learners still required assistance and guidance to get ready and start. This implies that practise and knowledge are crucial when implementing HMD VR in the classroom, as assisting all learners in a larger group would be time-consuming. Since the preparation was completed prior to the teaching and learning sessions, the learners did not have the opportunity to practise the HMD VR digital skills but rather focused on a specific aspect of digital competence in which they were to evaluate content and digitally orient and read texts in a 360˚ environment. Navigating and reading digital texts requires a complex skill (Ørevik, 2020). As discussed in Section 5.2.2, both VR approaches offer the possibility to practise and train these required skills. On the other hand, this could be a challenge for a number of learners, as this is not merely a digital text but a 360˚ digital experience filled with information of varying importance. Not only is the ability to filter out less important information and focus on more important information required, but also the ability to assess and determine what is less and more important information, and because this was a video experience, the learners had to assess and determine this instantly. From observations done regarding action research, a few learners had difficulties with this, and it could seem like they got distracted by the 360˚ function. This may be due to the fact that VR provides 360˚ views, which were novel, fascinating, and engaging to the majority of the learners. Testing the 360˚ function may have been more appealing than paying attention to the VR text. As an effect, this can be caused by the fact that VR is fascinating or if the topic presented in the experience was of little or no interest. Papin and Kaplan-Rakowski (2022) report that due to rich stimuli, learners can experience cognitive overload and therefore become distracted. Papin and Kaplan-Rakowski's (2022) argument is another possible explanation for why these two learners behaved as they did. The iPad VR experience appeared to have another issue related to distractions for these same few learners. It seemed like movements from other learners appeared to be a distraction, as the two learners looked away from their own screens repeatedly to observe other learners conducting the iPad VR experience or the HMD VR experience. Although this is a challenge, it is common in traditional classrooms, where learners can see each other at all times during class. Hence, the learners must be able to filter out irrelevant distractions, such as the movements of other learners, in order to concentrate on the task at hand.

Although ethical concerns, such as privacy, secure networks, and the school's firewalls, are important considerations when using digital tools and VR (Stranger-Johannessen & Fjørtoft, 2021), I would argue, based on my findings, that age recommendation is an ethical challenge that needs to be taken into account before introducing VR in primary school. It is important to be aware of and have knowledge about how VR can affect younger learners. As we have seen (see Section 4.10), young learners have not fully developed their brains, meaning it can be harder for them to distinguish between what is real and the virtual reality presented (Stranger-Johannessen & Fjørtoft, 2021; Segovia & Bailenson, 2009). This can be overwhelming and lead to cognitive overload or even cybersickness (Papin & Kaplan-Rakowsky, 2022; Stanney et al., 1997). As reported from action research, a few of the learners who became distracted may have experienced cognitive overload. Also from the interview, one learner reported cybersickness symptoms (see Section 5.2.3 for a discussion).

5.3 An Authentic VR Experience Facilitating Written Communication

5.3.1 The Learner Perspective on How an Authentic VR Experience Facilitate Written Communication

During the interview, I asked the learners how they felt the different experiences affected their attitudes towards the written assignment. Mary mentioned that you got the same information from the iPad VR experience as from the HMD VR experience, but the experiences themselves were different. She got a bit more inspired towards the written assignment after the HMD VR experience because it felt more authentic than the iPad VR experience. Emily said that she agreed with Mary because "it is easier to focus because you only have one world to be present in, and this made me more motivated as I knew more about the topic" (10). Isaac still felt the same way towards the different approaches and felt that there was no difference in engagement or inspiration towards the written assignments. Further, the learners compared working with VR as an introduction to a written assignment to how they are usually introduced to written tasks in the EFL classroom. Isaac and Emily were eager and reported that working with both types of VR is better than how they usually work before a written assignment. Reportedly, they typically worked with written texts or images prior to the written task or received just a written task without any preparation.

From the questionnaire, the learners rated themselves quite low on being inspired to write a text, regardless of what type of VR experience they had. Two learners reported agreeing that HMD VR inspired them to write a text, whereas the other five were evenly distributed across the other categories

(neither agree nor disagree n=2, disagree n=2, strongly disagree n=1). For iPad VR, five learners were uncertain if it inspired them to write a text, whereas one disagreed and one strongly disagreed that it inspired them to write a text. In an open-ended question aimed at addressing what made them inspired or uninspired to write a text about their experience, three learners reported that the iPad VR experience was quite engaging, explaining it by doing something interesting, new, and informative. Two learners reported being uncertain about their opinion, whereas two reported not being inspired due to their attitudes towards writing in general. For the HMD VR experience, three learners reported being inspired to write a text explaining it because the experience was engaging and real; one learner reported not being engaged as it was difficult to keep up; two reported not knowing; and lastly, one reported not liking to write anyhow. During the interview, Mary discussed the task itself when stating:

> It depends a bit on what kind of task it is because I am a person that likes English as a subject, and then you like most of what is done, but it depends on what we do and what it is about, but this was in general a more fun task because you got to experience something more real and the tasks were kind of real too. 11

Emily responded to this with, stating:

> But, for example, if you are to write an assignment about a fork, even if you like the English subject, the task is pretty boring. These tasks were fun because you wrote real things like a postcard and a travel brochure about something you had experienced in a way, so it did not feel as abstract and something you are just forced to do. 12

Mary agreed, as she said:

> I feel like these tasks are more relevant than many other tasks we do in school because this is actually something you could do for a living or you usually do during or after a holiday. You get a better sense of it and understand how to use it later. 13

Emily also emphasised that starting to write was easier when you had an actual experience with it, not just reading or being told something. Further, the learners mention some projects that have included planning and travelling that they have done earlier this year. They agreed that they should have known about this way of working because that would have given them a better and stronger experience working with the project, as Andrew points out that such an experience "makes it easier to write as well" (14).

As we have seen from previous results, the learners experienced HMD VR and iPad VR differently in terms of authenticity and engagement. Results concerning the written assignment demonstrate a

connection between authenticity, engagement, and the written assignment. Even though the experiences contained identical content, the VR approaches are described differently due to their different degrees of authenticity. A strong connection and interaction between content, pedagogy, and technology results in effective learning (Mouza, 2016). Reportedly, HMD VR provided a higher level of immersion, authenticity, engagement, and inspiration. Consequently, the presented results may have occurred because the connection between HMD VR technology and authenticity pedagogy is stronger than it is for iPad VR. Further, the experience may have influenced how the students approached the written assignment. This is consistent with the study Shadiev et al. (2019) did on authenticity, where the results showed that learning in authentic settings increased motivation, engagement, and inspiration. The data in this thesis show similar findings from how the learners described the various VR approaches during the interview.

The learners reported in the interview that being active and participating made it simpler to write about their experiences. "As we have seen, what motivates the students now is what has always motivated them: to feel that they actively participate in the activities" (Garrido-Iñigo & Rodríguez-Moreno, 2015, p. 468). In this case, travel and a virtual trip provided an authentic, engaging context with a decent match between the topic and the context, which promotes learning (Nelson & Erlandson, 2012). Although HMD VR came across as more engaging than iPad VR, the learners expressed their preference for any of the VR approaches as an introduction to a written assignment compared to typical classroom activities they are exposed to regularly. However, there was a discrepancy between the negatively skewed answers in the questionnaire's Likert scale statements and the positive answers in the open-ended questions in the questionnaire. Those who still expressed a negative attitude explained that they did not like writing in general. There are various reasons why learners may respond negatively to Likert-scale statements compared to open-ended questions. One of the reasons may be that learners are forced to delve deeper and consider why, spending more time considering a reason for open questions. Whereas taking a perspective on a claim does not necessitate in-depth consideration or evaluation of the claim.

An interesting finding emerged from the interview. The learners experienced getting more inspired to write after knowing the content of the written task. The fact that the task was aiming to be meaningful and authentic in some way reportedly made the learners inspired. As we have seen, it went from a negative view on being inspired to write reported in the Likert scale to a more positive attitude towards writing from the open-ended questions, whereas from the interview, the learners suddenly appeared to be greatly inspired. Connecting this to the theoretical framework, this indicates

a strong correlation between technology, content, and pedagogy. When the knowledge of technology interacts with the knowledge of content and pedagogy, it creates engaging and effective learning experiences (Mishra & Koehler, 2006). However, because the learners were unfamiliar with the content regarding the writing task, there was a disconnect between the content and the other TPACK components. In other words, the connection between the engagement provided by the technology, the authenticity provided by the pedagogy, and travelling as the topic were present. However, the disconnect may have occurred because the learners only knew there would be a writing task and not its components that were intended to be meaningful and authentic in order to connect with technology and pedagogy. Moreover, this can indicate that designing teaching sessions using the TPACK framework, where these knowledges interact, impacts the learners' learning in a positive way.

5.3.2 The Teacher Perspective on How an Authentic VR Experience Facilitate Written Communication

During the text production stage of the lesson, I interacted with and observed the learners. I only interacted with the learners by answering questions they had related to vocabulary, sentence structure, and content. As reported in Section 5.3.1, the learners claimed on the Likert scale that they were not particularly inspired to begin writing after the VR experiences. Contrasting results emerged from the action research (and interview; see Section 5.3.1). By interacting with and observing the learners, a change in their attitudes towards the written assignment became apparent. Before receiving the task, the learners appeared neutral or uninterested in beginning the writing assignment. This became visible through body language and comments such as "do we have to?" and "why write?" As soon as they received information about the task and its components, the learners were enthusiastic to engage in discussions about the task; smiles appeared on their faces, and ideas were called out. As they began, and based on my observations, three of the seven learners used the sentence starter provided in the first task. During the first teaching and learning session, all learners were able to complete within the timeframe, whereas in the second, five learners finished and two were nearly done. The two who did not finish asked if they could finish it at home. After completing the written task, a number of learners expressed and emphasised that the written tasks were enjoyable and meaningful.

To relate these findings to previous research and theory, it is necessary to consider how the various TPACK framework components may influence a given writing task. Shadiev et al. (2019) argue that authenticity increases motivation, engagement, and inspiration. These arguments are supported by the action research findings of my investigation. As we have seen previously, it appears to be

necessary to have a connection between the VR experiences and authenticity (TCK and PK). Nonetheless, the connection between the pedagogy of authenticity and the content of the writing assignments is also crucial (PCK; Angeli et al., 2016). This has to do with incorporating meaningfulness into the writing task, which is one of the factors that Lund and Villanueva (2020) emphasise to facilitate motivation for writing. There are a number of possible explanations for why the learners appeared more engaged and inspired after receiving information about the task compared to before meeting the task. In addition to providing meaningfulness, variety is another factor related to Lund and Villanueva's (2020) writing motivation principles. Reportedly, these teaching and learning sessions offered variety, as the learners expressed that this was new to them. The VR approaches, which served as an introduction to the written assignment, represented a new way of working with texts before a written assignment. According to Lund and Villanueva (2020), varying teaching and learning methods, materials, and approaches motivate writing. Nonetheless, it appeared to be insufficient to simply vary the approach or method, as the learners also appeared to require variation in the writing task in order to be engaged and inspired.

Despite the fact that several learners changed their attitude towards the writing task, the writing process can be challenging. As a result, sentence starters were provided to assist in getting started, as I have found the beginning process to be a time-consuming factor in previous teaching experiences. Multiple learners' use of the sentence starters suggests that it was an efficient method for facilitating the writing task. Even though some learners may use it out of laziness, they are just given a small portion of the text, and the remainder must be completed independently; therefore, even if any learner uses it out of laziness, they must still complete the text's actual work. Because most learners completed the writing task, it may have indicated that aspects of the task were enjoyable, making the learners desire to focus on the task. On the other hand, the learners might as well have hurried through it to complete it and not challenged themselves significantly. Since the texts produced in the research were not collected and no prior work was reviewed, I am unable to determine whether these indications are correct or incorrect. Nonetheless, the fact that the learners who did not complete the task asked if they could complete it at home indicated that they enjoyed the task, which may be the perception of several of the learners based on the interview and action research results where several learners, after completing the sessions, commented that they enjoyed not only the lesson and experience but also the task itself, as it was distinct from what they typically encounter in class. Therefore, it is clear to me from a teacher perspective that to make writing enjoyable and not something that learners have preconceived notions about, the approaches as well as the assignments should be meaningful, authentic, and interesting to the learners.

5.4 Comparison of the Educational Value of HMD VR Versus iPad VR

In this section, the aforementioned results and discussions are compared across the defined categories presented above to provide a better link between the results and tie the different foci together in order to answer the research question. The discussion is focused on comparing and contrasting the educational value of using different approaches to virtual reality in EFL teaching and learning. The second part of the research question "How can an authentic virtual reality experience facilitate written communication in the EFL classroom in Norway?", will not be discussed in this section, as Section 5.3 already compares and discusses how the two approaches to VR facilitate written communication.

A few studies have compared HMD VR, desktop VR, and 2D pictures and videos to see how they affect learning (Papin & Kaplan-Rakowsky, 2022; Makransky et al., 2020; Tai & Chen, 2021). From two post-tests, a receptive and a productive, results have revealed that desktop VR (similar to iPad VR) was significantly more effective than HMD VR and the use of 2D pictures in the receptive post-test. The productive post-test, on the other hand, revealed no difference in the approaches (Papin & Kaplan-Rakowsky, 2022). Another study found similar results from one post-test: there was no significant difference between learning with HMD VR versus 2D video. Simultaneously, another post-test in the same study revealed that learners using 2D video scored higher than learners learning with the HMD VR approach (Makransky et al., 2020). The cause of these results was that HMD VR could lead to cognitive overload and be distracting (Papin & Kaplan-Rakowsky, 2022; Makransky et al., 2020). A similar approach to iPad VR and 2D videos provided the learners with the right amount of immersion and embodied learning, making them more effective than HMD VR and 2D pictures (Makransky et al., 2020; Papin & Kaplan-Rakowsky, 2022). Although this master's thesis does not measure learning like the studies just described, these results are interesting to discuss in terms of distractions. As we have seen, the learners in this research reported getting more distracted during the iPad VR experience than the HMD VR experience. This contradicts Papin and Kaplan-Rakowski's (2022) and Makransky et al.'s results and conclusions, as they state that the learners get distracted and cognitively overloaded from HMD VR compared to desktop VR or 2D videos. There could be a difference in how the learners perform compared to how they feel and what they report as distracting factors. On the one hand, the learners can get cognitively overloaded without knowing it because the feelings of enjoyment and engagement might block the feeling of cognitive overload. On the other hand, the learners' familiarity with desktops and iPads can affect the results as they have practised and trained with this tool more than HMD VR. Here, I argue that the results from Papin and Kaplan-

Rakowski (2022) and Makransky et al. (2020) may be influenced by the learners' capability to read, comprehend, and interact with a well-known and highly used digital tool compared to a new and unfamiliar tool. This can be influenced because reading digital texts in different and unfamiliar ways is far more complex than reading on, for instance, a familiar and common material such as paper (Ørevik, 2020).

For the results presented in this thesis, they can be affected by feelings and attitudes towards new technologies, as new generations are positive about embracing the new and latest digital tools (McGovern et al., 2019). Despite the fact that Papin & Kaplan-Rakowsky (2022) and Makransky et al. (2020) found no or little evidence that HMD VR facilitated learning compared to desktop VR and 2D videos, Tai and Chen (2021) found in their study that learners using HMD VR had significantly better listening comprehension and retention than learners using 2D videos. Also, Bahari (2021), who reviewed 75 studies, concluded that VR contributes to improving several aspects of language acquisition, such as productive skills, intercultural sensitivity, deep learning, cooperation, motivation, and cognitive processes. In this research, the learners self-report that VR in general contributes to learning. However, the results are higher for HMD VR than iPad VR. This cannot be directly compared to other studies that did measurements and testing, but looking at a possible transfer value, the self-reported data contradicts some of the other studies reviewed in this thesis (Makransky et al., 2020; Papin & Kaplan-Rakowsky, 2022); however, it also shows similar indications to other studies (Bahari, 2021; Tai & Chen, 2021; see Chapter 3). Given the contradictory research findings in this field, it will be necessary and interesting to conduct additional research on learners' actual learning outcomes. Additionally, this research implies that both approaches were viewed as engaging, with HMD VR performing marginally higher than iPad VR. Similar results were found in several studies indicating that HMD VR offered authentic experiences that were more engaging than other approaches such as desktop VR (or iPad VR), 2D videos, or pictures (Makransky et al., 2020; Tai & Chen, 2021; Stranger-Johannessen & Fjørtoft, 2021). In terms of authenticity, the HMD VR approach scored substantially higher than the iPad VR approach. According to Shadiev et al. (2019), authentic situations increase learning, motivation, engagement, and inspiration. Similar findings can be found in this study, as learners reported being more engaged with HMD VR and being marginally more positive about the written assignment after completing the HMD VR experience compared to the iPad VR experience.

The implementation of VR in education and its needs are emphasised and agreed upon by several researchers to be based on competence and carefully planned teaching and learning sessions in order

for it to be appropriate for learning (Makransky et al., 2020; McGovern et al., 2019; Godwin-Jones, 2016; Lin & Lan, 2015). However, the lack of research in the field makes teachers and educators uncertain about the educational value (Rienties et al., 2020), as the tools and materials are not made explicitly for educational purposes (Selwyn, 2022). Godwin-Jones (2016) argues that the teacher plays a significant role in this process and needs to have a good understanding of the tool's affordances. However, I believe that the teacher also needs to have a good understanding of the tool's constraints. In other words, the teacher needs to have acceptable competence in the field of digital VR. Teachers in Norwegian classrooms today, I believe to a certain extent, hold acceptable competence with iPad as a tool, and with this competence, they can easily understand and be able to use iPad VR as such. HMD VR, on the other hand, would require different skills, as it is a completely different tool. Whenever a teacher is trained to use VR headsets, it is not about how to use the tool anymore but rather how to implement it in teaching and learning sessions. This is what the TPACK aims to do for teachers in all phases of planning these sessions (Mishra & Koehler, 2006). When using the TPACK framework to plan, conduct, and assess teaching and learning sessions, it is required that the teacher have competence and knowledge of technology, pedagogy, and content (Mishra & Koehler, 2006). First of all, these competencies need to be held by the teacher, so the teacher must be qualified to use HMD VR or iPad VR (TK), have knowledge of the learning content (CK), and be comfortable with the pedagogy employed (PK). Second, what I would argue to be the consequence for the learners is that they get to practise and train their digital skills and competence (TK), in this case with VR as a tool, through learning specific content (CK), namely travel and writing, in terms of the pedagogy of CLT with an emphasis on authentic learning and writing skills (PK; Mishra & Koehler, 2006; Savignon, 2002). Even though teachers have frameworks such as TPACK at their disposal, they are useless if they lack the digital tools they wish to implement in the classroom. One of the greatest challenges emphasised in the study by Stranger-Johannessen and Fjørtoft (2021) is the lack of funding to buy and store VR headsets in schools. Although HMD VR requires purchasing new digital equipment, implementing VR in Norwegian schools today does not require funding of any kind. iPad VR offers a different but acceptable VR experience without any additional costs or equipment. The learners all agreed that no matter what approach or experience they had, this was a fun way of learning compared to their regular teaching and learning practises in school. They were overall positive about using such approaches in English, as it felt like an interactive activity where they participated in a more realistic way than before. The question to be further explored is whether the educational value of HMD VR justifies the costs or whether iPad VR is sufficient.

6. Conclusion

In this master's thesis, I have investigated and discussed "What is the Educational Value of Using Virtual Reality in EFL Teaching and Learning, and How Can an Authentic Virtual Reality Experience Facilitate Written Communication in the EFL Classroom in Norway?" Through action research, I have been able to plan, conduct, assess, and explore teaching and learning sessions using VR, providing observations and interactions that promote the teacher perspective, as well as questionnaires and an interview with learners in year 7 that have provided insights into the learner perspective.

6.1 Concluding Remarks

The first part of the research question concerns the educational value of incorporating VR into EFL teaching and learning. The educational value is divided into two parts, concerning the possibilities of VR on one side and the challenges of VR on the other. Furthermore, these categories are subdivided into HMD VR and iPad VR while also distinguishing between the teacher and learner perspective. There are several possibilities and challenges to be aware of when incorporating VR into education. On the one hand, learners cited a strong feeling of being engaged as the most important potential aspect of HMD VR. All participants emphasised their high level of engagement. High scores were also given for the learner's sense of authenticity and involvement and how HMD VR provided a realistic experience based on meaningful content. This was another factor that the learners directly related to engagement. In addition, the learners valued, to varying degrees, the facilitation of learning that HMD provided, as well as the fact that the content was simpler to grasp. Regarding the possibilities addressed by the learners, as a teacher, I can affirm that engagement was also recognised. The other possibilities highlighted by the learners I was unable to observe or verify in any way. Nonetheless, based on observations and interactions through action research, the learners expressed a desire to convey themselves following the experience. From a teacher's perspective, HMD VR also offers training in interpreting complex digital texts, interaction in realistic contexts, and limitless opportunities to explore and "travel".

On the other hand, several challenges regarding HMD VR were discussed. The learners point to a set of physical challenges as well as practical challenges. Although just one learner reported physical challenges, the discussion mainly centred around this topic. Possible physical challenges mentioned

were physical discomfort, cybersickness, and disturbances related to cognitive overload. The teacher perspective addressed the same physical challenges as the learner perspective, adding a practical issue concerning expenses. The reading of complex digital texts was previously mentioned as a possibility, but it can also be addressed as a challenge. In addition, technical and ethical challenges were emphasised. The main technological challenge is the lack of a specific form of digital competence, with privacy, secure networks, and age requirements presenting additional ethical challenges.

Moreover, the educational value of iPad VR has been addressed, pointing to several possibilities and challenges as well. The possibilities the learners put forward were authenticity and engagement. Even though these numbers are slightly lower for iPad VR than for HMD VR, there are factors that are present and affect the learners' view of the experience. It was suggested that iPad VR is more entertaining than regular use of iPads and that the 360° function is useful for orientation and learning. Other possibilities were also addressed. iPad VR, for example, makes a number of things easier: firstly, it is easier to use in general because the required digital competence is met and there are no additional costs because schools are already equipped; secondly, it is easier for learners to communicate with the teacher if necessary and vice versa; and thirdly, it is easier for learners to comprehend the content. Lastly, the participants indicate, to varying degrees, that the experience was educational and that it stimulated their interest in pursuing the topic further. From the teacher's perspective, similar possibilities were provided. Emphasis was placed on existing digital competence, the accessibility of iPads in schools, the 360° orientation function, and interest and engagement.

In contrast to the possibilities, the challenges associated with distractions were discussed. Due to the 360° functionality, the learners focused on distractions from outside the experience, such as other learners' movements and objects. In relation to this, cybersickness and fatigue were addressed. The ability of learners to self-distract and use iPads for other purposes was another form of distraction discussed. Distractions were also accentuated, and a focus area from the teacher perspective was linked to physical distractions and movement in the classroom. Reading or interacting with VR experiences, seen from the perspective of a teacher, requires a complex skill set and can lead to cognitive overload. In addition, time and locating dependable resources can be challenging factors for teachers in general.

Looking at the results, discussion, and summaries, it is reasonable to conclude that VR in general provides several educational possibilities as well as challenges. Overall, the educational possibilities of VR are that it is authentic, engaging, meaningful, and in context, facilitating learning in general,

training complex digital skills and digital competence, and providing limitless opportunities. The educational challenges concern the lack of digital competence, cybersickness, expenses, finding good and instructive resources, the lack of competence to read and interact with complex digital texts, and internal disturbances and external distractions.

Although the above-mentioned factors and aspects describe the educational possibilities and challenges of VR in general, differences between the two approaches occurred. Overall, the HMD VR approach was preferred by the learners due to a higher feeling of authenticity and engagement. HMD VR scored marginally higher in all categories, including interest in further work, inspiration to communicate orally and in writing, content comprehension, and learning in general. Hence, iPad VR does not come across as powerful or immersive as a dedicated VR headset, but it offers similar educational value, just to a lesser extent, and is a great way to try out VR and experience the technology in a more accessible and mobile form. Although the possibilities of HMD VR appear to be greater than the possibilities of iPad VR, the expenses, digital competence, physical discomfort, and cybersickness posed by the HMD VR approach may seem to be greater challenges than the challenges of iPad VR. Due to the indications that HMD VR contains both the most possibilities and the most challenges, it is illogical to conclude or make a determination regarding what works best in EFL teaching and learning in Norway. Alternatively, as the objective of action research is not to develop final solutions but rather to develop a professional example demonstrating the implementation of educational and didactic work as well as development processes (Hiim, 2010), this thesis contributes to demonstrating how VR can be implemented in education and the educational value of didactic work.

The second component of the research question aimed to determine how VR could facilitate written communication in EFL classrooms. In this regard, the learner perspective indicates that VR stimulated interest in further work on the topic. However, the learners were not particularly inspired to write a text. In fact, they were more inspired to discuss it orally. This seemed to be due to their prior experiences with writing in English and their preconceived notion that they disliked writing. Despite the fact that the learners reported disliking writing and not being inspired by the experience, an authentic written task appeared to inspire and engage them more. Consequently, the HMD VR experience inspired some learners to want to write a text, while the authentic written assignment seemed to inspire and engage the majority of the learners. From the perspective of the teacher, TPACK has been fundamental to this (see Section 2.2). To facilitate written communication, technology, pedagogy, and content have been of central importance. In this instance, the connection

between these aspects and how they function together was evident. As we have seen, technology alone—the VR experience—was insufficient to inspire and engage learners to write about their experience. However, when the pedagogy of CLT with authenticity and the content of writing were combined, the learners' behaviour changed, and they appeared engaged and inspired when presented with the authentic writing task. In other words, when technology, pedagogy, and content worked in reciprocal interaction, written communication was facilitated. The VR experiences were insufficient to influence this alone for most learners. Consequently, this is the advantage of utilising a framework such as TPACK to plan, implement, and assess teaching and learning sessions that will facilitate learning and, in this instance, written communication.

6.2 Limitations

This thesis investigates the educational value of VR in education and how it can facilitate written communication. There were seven learners who represented the learner perspective in this study. The teacher perspective has been implemented through action research, where I contributed as a teacher and researcher. Consequently, it is essential to note that the results presented in this study may not be generalised to other EFL learners or teachers in Norway. As this is a qualitative study concentrating on the opinions, thoughts, and immediate responses of the learners, the results cannot be generalised to all Norwegian seventh-grade EFL learners. Nor can results from the teacher perspective be considered representative, given that these observations, interactions, and interpretations were made by me as the teacher and researcher who had a vested interest in the research.

6.3 Suggestions for Further Research

This thesis's research has focused on the use of VR in primary school education, with an emphasis on writing. As seen in Chapter 3, this is a field that requires additional research and has great potential for future study. As there is no prior research on the learner perspective of using VR in education in Norway, the contribution of this thesis is new knowledge and pedagogical work in the field of teaching and learning with VR in a seventh grade EFL classroom in Norway. Nevertheless, additional research can help guide and provide more information regarding the educational value of VR. As the perspectives of learners are subjective, I would contend that measuring the effects of learning various basic skills with VR could provide a more accurate assessment of VR's value. Also, it appears that learners self-report that they are learning, which the teacher cannot observe; thus, it may be interesting

to compare self-reported learning to the actual effects of learning. Lastly, it would be of interest to do similar research with multiple learners and teachers to determine whether the results have transferability or whether new discoveries are made.

7. References

Airpano VR. (n.d.a). *Services*. Retrieved 15. January 2023 from https://www.airpano.com/services.php?service=service360video

Airpano VR. (n.d.b). *Cape Town, South Africa. Virtual travel. Aerial 360 video in 8k* [Video]. YouTube. https://youtu.be/ghdAW41b-2c

Angeli, C. Valanides, N. & Christodoulou, A. (2016). Theoretical Considerations of Technological Pedagogical Content Knowledge. In M. C. Herring, M. J. Koehler & P. Mishra (Eds.), *Handbook of Technological Pedagogical Content Knowledge (TPACK) for educators* (pp. 11-32). Routledge.

Bahari, A. (2021) Affordances and challenges of teaching language skills by virtual reality: A systematic review (2010-2020). *E-Learning and Digital Media, 0(*0), 1-26. DOI: 10.1177/20427530211036583

Barrett, A., Pack, A., Guo, Y. & Wang, N. (2020). Technology acceptance model and multi-user virtual reality learning environments for Chinese language education. *Interactive Learning Environments, 27*(4), 30-46. DOI: 10.1080/10494820.2020.1855209

Baumgartner, T., Speck, D., Wettstein, D., Masnari, O., Beeli, G. & Jäncke, L. (2008). Feeling present in arousing virtual reality worlds: Prefrontal brain regions differentially orchestrate presence experience in adults and children. *Frontiers in Human Neuroscience*, *2.* https://doi.org/10.3389/neuro.09.008.2008

Boeije, H. R. (2010). *Analysis in qualitative research*. SAGE.

Borg, S. (2013). *Teacher Research in Language Teaching: A Critical Analysis*. Cambridge University Press.

Borg, S. & Sanchez, H. S. (2015). Key Issues in Doing and Supporting Language Teacher Research. In S. Borg & H. S. Sanchez (Eds.) *International Perspectives on Teacher Research. International Perspectives on English Language Teaching* (pp. 1-13). Palgrave Macmillan.

Brevik, L. M., Lund, A., Skarpaas, K. G. & Røkenes, F. M. (2020). Language and technology - Digital competence in English. In L. M. Brevik & U. Rindal (Eds.) *Teaching English in Norwegian Classrooms. From research to practice* (pp. 43-64). Universitetsforlaget.

Charmaz, K. (2014). *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. SAGE publications.

Christoffersen, L. & Johannessen, A. (2012). *Forskningsmetode for lærerutdanningene*. Abstrakt.

Clark, T., Foster, L., Sloan, L. & Bryman, A. (2021). *Bryman's social research methods*. Oxford University Press.

Cope, B. & Kalantzis, M. (2009). Ubiquitous Learning: An Agenda for Educational Transformation. In B. Cope & M. Kalantzis (eds.), *Ubiquitous Learning*. University of Illinois Press.

Creswell, J. W. & Creswell, J. D. (2018). *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.

f4analyse. (Version 3.4.2, 2022). Audiotranskription. https://www.audiotranskription.de/en/f4analyse/

Farley, H. S. (2016). The Reality of Authentic Learning in Virtual Worlds. In S. Gregory, M. J. W. Lee, B. Dalgarno & B. Tynan (Eds.), *Learning in Virtual Worlds: Research and Applications* (pp. 128-142). Athabasca University Press.

Flick, U. (2018). *An introduction to qualitative research* (6th ed.). SAGE.

Garrido-Iñigo, P. & Rodríguez-Moreno, F. (2015). The reality of virtual worlds: pros and cons of their application to foreign language teaching. *Interactive Learning Environments, 23(*4), 453-470. https://doi.org/10.1080/10494820.2013.788034

Godwin-Jones, R. (2016). Looking back and ahead: 20 years of technologies for language learning. *Language Learning & Technology, 2*(20), 5-12.

Guskey, T. R. (2000). *Evaluating Professional Development*. SAGE Publications.

Gustavsen, B. (2001). Theory and Practice: the Mediating Discourse. In P. Reason & H. Bradbury (Eds.), *Handbook of Action Research. Participative Inquiry and Practice* (pp. 17-26). SAGE publications.

Herring, M. C., Koehler, M. J., Mishra, P., Rosenberg, J. M. & Teske, J. (2016). Introduction to the Second Edition of the TPACK Handbook. In M. C. Herring, M. J. Koehler & P. Mishra (Eds.), *Handbook of Technological Pedagogical Content Knowledge (TPACK) for educators* (pp. 1-8). Routledge.

Herrington, J., Reeves, T. Oliver, R. & Woo, Y. (2004). Designing authentic activities in web-based courses. *Journal of Computing and Higher Education, 16*(1), 3-29.

Him, H. (2010). *Pedagogisk aksjonsforskning: Tilnærminger, eksempler og kunnskapsfilosofisk grunnlag*. Gyldendal Akademisk.

Hoem, J. & Iversen, S. H. (2020). Digital learning tools in the age of machine intelligence. In C. Carlsen, M. Dypedahl & S. H. Iversen (Eds.), *Teaching and Learning English* (pp. 156-176). Cappelen Damm Akademisk.

Holm, A. & Ervik, A. (2021, 2. august). *YouTube*. Store Norske leksikon. https://snl.no/YouTube

Jensen, L. & Konradsen, F. (2017). A review of the use of virtual reality head-mounted displays in education and training. *Education and Information Technologies*, *23*(4), 1515-1529. https://doi.org/10.1007/s10639-017-9676-0

Johannessen, L. E. F., Rafoss, T. W. & Rasmussen, E. B. (2018). *Hvordan bruke teroi? Nyttige verktøy i kvalitativ analyse*. Universitetsforlaget.

Kim, Y. (2010). The Pilot Study in Qualitative Inquiry: Identifying Issues and Learning Lessons for Culturally Competent Research. *Qualitative Social Work, 10*(2), 190–206. https://doi.org/10.1177/1473325010362001

Krueger, R. A. & Casey, M. A. (2015). *Focus Groups. A Practical Guide for Applied Research*. SAGE Publications.

Kvale, S. & Brinkmann, S. (2015). *Det kvalitative forskningsintervju*. Gyldendal Akademisk.

Lan, Y-J. (2020). Immersion, interaction and experience-oriented learning: Bringing virtual reality into FL learning. *Language Learning & Technology, 24*(1), 1–15. http://hdl.handle.net/10125/44704

Lebow, D. & Wager, W.W. (1994). Authentic activity as a model for appropriate learning activity: Implications for emerging instructional technologies. *Canadian Journal of Educational Communication*, *23*(3), 231-144

Lester, J. N., Cho, Y. & Lochmiller, C. R. (2020). Learning to Do Qualitative Data Analysis: *A Starting Point. Human Resource Development Review, 19(1*), 94-106.

Lin, T-J. & Lan, Y-J. (2015). Language learning in virtual reality environments: past, present and future. *Journal of Educational Technology & Society, 18*(4), 486-497.

Lund, R. E. & Villanueva, M. C. (2020). Writing in English. In C. Carlsen, M. Dypedahl & S. H. Iversen (Eds.), *Teaching and Learning English* (pp. 122-140). Cappelen Damm Akademisk.

Makransky, G., Andreasen, N. K., Baceviciute, S. & Mayer, R. E. (2021). Immersive Virtual Reality Increses Liking but Not Learning With a Science Simulation and Generative Learning Strategies Promote Learning in Immersive Virtual Reality. *Journal of Educational Psychology, 113*(4), 719-735. http://dx.doi.org/10.1037/edu0000473

McGovern, E., Moreira, G. & Luna-Nevarez, C. (2019). An application of virtual reality in education: Can this technology enhance the quality of students' learning experience? *Journal of Education for Business, 95(*7), 490-496. https://doi.org/10.1080/08832323.2019.1703096

Merchant, Z., Goetz, E. T., Cifuentes, L., Keeney-Kennicutt, W., & Davis, T. J. (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and

higher education: A meta-analysis. *Computers & Education*, *70*, 29-40. https://doi.org/10.1016/j.compedu.2013.07.033

Ministry of Education and Research. (2017). *Core Curriculum - values and principles for primary and secondary education*. Laid down by Royal decree. The National curriculum for the Knowledge Promotion 2020. Retrieved from: https://www.udir.no/Udir/PrintPageAsPdfService.ashx?pdfId=150459&lang=eng

Ministry of Education and Training (2017). Rammeverk for grunnleggende ferdigheter. Established as regulations. The National curriculum for the Knowledge Promotion 2020. Retrieved from: https://www.udir.no/api/PdfApi/PrintLargeDocumentAsPdfDocument/103077

Mishra, P. & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record: The Voice of Scholarship in Education*, 108(6), 1017-1054. https://doi.org/10.1177/016146810610800610

Mouza, C. (2016). Developing and Assessing TPACK Among Pre-Service Teachers: A Synthesis of Research. In M. C. Herring, M. J. Koehler & P. Mishra (Eds.), *Handbook of Technological Pedagogical Content Knowledge (TPACK) for educators* (pp. 169-190). Routledge.

Munden, J. & Myhre, A. (2020). *Twinkle twinkle: English 1-4* (4th ed.). Cappelen Damm Akademisk.

Nelson, B. C. & Erlandson, B. E. (2012). *Design for learning in virtual worlds*. Taylor & Francis Group.

Nettskjema. (Version 3.7.0, 2022). Diktafon. https://nettskjema.no/

Norwegian Directorate for Education and Training. (2019). *Curriculum in English (ENG01-04)*. Retrieved from: https://data.udir.no/kl06/v201906/laereplaner-lk20/ENG01-04.pdf?lang=eng

Norwegian Directorate for Education and Training. (2018, March 2). *Hva er framtidens klasserom i lærerutdanningene?* https://www.udir.no/kvalitet-og-kompetanse/profesjonsfaglig-digital-kompetanse/framtidens-klasserom-i-larerutdanningene/hva-er-fremtidens-klasserom/

Papin, K. & Kaplan-Rakowski, R. (2022). A study of vocabulary learning using annotated 360˚ pictures. *Computer Assisted Language Learning*, 1-28. https://doi.org/10.1080/09588221.2022.2068613

Parisi, T. (2016). *Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web and Mobile*. O'Reilly Media, Inc.

Postholm, M. B. & Jacobsen, D. I. (2016). *Læreren med forskerblikk: Innføring i vitenskapelig metode for lærerstudenter*. Cappelen Damm Akademisk.

Reeves, T.C., Herrington, J. & Oliver, R. (2002). Authentic activities and online learning. In A. Goody, J. Herrington, & M. Northcote (Eds.), *Quality conversations: Research and Development in Higher Education*, Volume 25 (pp. 562-567). Jamison, ACT: HERDSA.

Rienties, B., Lewis, T., O'Dowd, R., Rets, I. & Rogaten, J. (2020). The impact of virtual exchange on TPACK and foreign language competence: Reviewing a large-scale implementation across 23 virtual exchanges. *Computer Assisted Language Learning*, *35*(3), 577-603. https://doi.org/10.1080/09588221.2020.1737546

Rindal, U. (2020). English in Norway - A language and a school subject in transition. In L. M. Brevik & U. Rindal (Eds.) *Teaching English in Norwegian Classrooms. From research to practice* (pp. 23-42). Universitetsforlaget.

Savignon, S. J. (2002). Communicative Language Teaching: Linguistic Theory and Classroom Practice. In S. J. Savignon (Ed.), *Interpreting Communicative Language Teaching: Contexts and Concerns in Teacher Education* (pp. 1-27). Yale University Press.

Segovia, K. Y. & Bailenson, J. N. (2009). Virtually true: Children's acquisition of false memories in virtual reality. *Media Psychology*, *12*(4), 371-393. https://doi.org/10.1080/15213260903287267

Selwyn, N. (2022). *Education and technology: Key issues and debates*. Bloomsbury Academic.

Shadiev, R., Liu, T. & Hwang, W-Y. (2019). Review of research on mobile-assisted language learning in familiar, authentic environments. *British Journal of Educational Technology 51*(3), 709-720. https://doi.org/10.1111/bjet.12839

Stanney, K. M., Kennedy, R. S. & Drexler, J. M. (1997). Cybersickness is Not Simulator Sickness. *SAGE journals*, *41*(2), pp. https://doi.org/10.1177/107118139704100292

Stranger-Johannessen, E. & Fjørtoft, S. O. (2021). Implementing virtual reality in K-12 classrooms: Lessons learned from early adopters. *Smart Education and e-Learning 2021*, 139-148. https://doi.org/10.1007/978-981-16-2834-4_12

Sun, F., Pan, L., Wan, R., Li, H. & Wu, S. (2018). Detecting the effect of student engagement in an SVVR school-based course on higher level competence development in elementary schools by SEM. *Interactive Learning Environments*, *29*(1), 3-16. https://doi.org/10.1080/10494820.2018.1558258

Tai, T.-Y. & Chen, H. H.-J. (2021). The impact of Immersive Virtual Reality on EFL Learners' Listening Comprehention. *Journal of Educational Computing Research, 59*(7), 1272-1293. DOI: 10.1177/0735633121994291

Timmermans, S. & Tavory, I. (2012). Theory construction in qualitative research: From Grounded Theory to Abductive Analysis. *Sociological Theory*, *30*(3), 167-186. https://doi.org/10.1177/0735275112457914

Tjora, A. (2017). *Kvalitative forskningsmetoder i praksis*. 3. utg. Gyldendal Akademisk.

United Nations. (1989). *FNs konvensjon om barnets rettigheter*. Barne- og familiedepartementet. Retrieved from: https://www.regjeringen.no/globalassets/upload/kilde/bfd/bro/2004/0004/ddd/pdfv/178931-fns_barnekonvensjon.pdf

Voogt, J., Fisser, P., Tondeur, J. & Braak, J. (2016). Using Theoretical Perspectives in Developing an Understanding of TPACK. In M. C. Herring, M. J. Koehler & P. Mishra (Eds.), *Handbook*

of Technological Pedagogical Content Knowledge (TPACK) for educators (pp. 33-52). Routledge.

VR Gorilla. (n.d.a). *About us*. Retrieved 15. January 2023 from https://www.vr-gorilla.com/#we-are-vr

VR Gorilla. (n.d.b) *Sydney, Australia Guided Tour in 360 VR - Virtual City Trip - 8k Stereoscopic 360 Video* [Video] YouTube. https://youtu.be/GqnCZNGkdfc

Weech, S., Kenny, S. & Barnett-Cowan, M. (2019). Presence and Cybersickness in Virtual Reality Are Negatively Related: A Review. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00158

YouTube VR. (Version 17.46.4, 2022). Google LCC. https://vr.youtube.com

Yucel, M. & Bos, V. (2015). Action Research as a Means of Stepping Out of the Teaching Comfort Zone. In S. Borg & H. S. Sanchez (Eds.) *International Perspectives on Teacher Research. International Perspectives on English Language Teaching* (pp. 29-46). Palgrave Macmillan.

Zeichner, K. (2001). Educational Action Research. In P. Reason & H. Bradbury (Eds.), *Handbook of Action Research. Participative Inquiry and Practice* (pp. 273-283). SAGE publications.

Ørevik, S. (2020). Digital Technology in the English Classroom. In A-B. Fenner & A. S. Skulstad (Eds.), *Teaching English in the 21st Century* (pp. 165-184). Fagbokforlaget.

8. Appendices

8.1 Appendix 1 – Information Letter and Declaration of Consent

Vil du delta i forskningsprosjektet
"Virtual reality i engelsk språkundervisning"?

Dette er et spørsmål til deg som foresatt om ditt barns deltakelse i et forskningsprosjekt hvor formålet er å se hvordan en autentisk opplevelse gjennom virtual reality (VR) kan inspirere elever til å kommunisere skriftlig, og hvilke muligheter og begrensninger et slikt digitalt hjelpemiddel har i undervisningssammenheng. I dette skrivet gir jeg deg informasjon om målene for prosjektet og hva deltakelsen vil innebære for ditt barn.

Formål
Formålet med prosjektet er å kartlegge pedagogiske muligheter og begrensninger med å bruke et virkelighetsbasert VR program som utgangspunkt for en skriftlig oppgave og kommunikasjon i engelsk. Prosjektet er et forskningsprosjekt tilknyttet en masteroppgave i engelsk ved Høgskolen Innlandet, campus Hamar. I masteroppgaven jobber jeg mot å svare på følgende problemstilling: «Hva er den pedagogiske verdien av å bruke virtuell virkelighet (VR) i undervisning og læring av engelsk som fremmedspråk (EFL), og hvordan kan en autentisk VR-opplevelse legge til rette for skriftlig kommunikasjon i EFL-klasserommet i Norge?»

Hvem er ansvarlig for forskningsprosjektet?
Høgskolen Innlandet har hovedansvaret for prosjektet.

Hvorfor får du spørsmål om å delta?
Jeg har vært i kontakt med skolen om et ønske om å gjennomføre forskningsprosjektet i ditt barns klasse. Gjennom tidligere vikariater er jeg kjent med klassen, og ser på det som positivt å ha noe kjennskap og en relasjon til deltakerne. Etter avtale med skolen får hele klassen tilbud om å delta. Høgskolen i Innlandet har begrensede antall VR-headset, derfor er det begrensede antall plasser til deltakere (ca 8). Dersom det er flere som ønsker å delta enn antall plasser blir utvalget trukket gjennom noen utvalgskriterier etter gjennomført spørreskjema.

Hva innebærer det for deg å delta?
Deltakelse i dette forskningsprosjektet innebærer å delta i to ca 75 minutters lange undervisningsøkter med engelsk hvor VR headset og iPad brukes som hjelpemiddel. Øktene vil fordeles over en 2-ukers periode henholdsvis uke 48 og uke 49 (evt. forskyvning til uke 49-50) ved Høgskolen i Innlandet, campus Hamar. Før prosjektet er det ønskelig at elevene svarer på et spørreskjema som vil ta om lag 15 minutter. Dette spørreskjemaet har til hensikt å kartlegge elevenes erfaringer med VR og andre digitale hjelpemidler, samt syn på bruk av VR og andre digitale hjelpemidler. Svar fra spørreskjema registreres i papirform og oppbevares trygt. Etter endt 2-ukers periode er det ønskelig at 4 av 8 elever som har deltatt gjennomfører et gruppeintervju. Det vil under intervjuet tas lydopptak i henhold til NSD's krav om personvern. Dersom det er ønskelig kan foresatte ta kontakt for å se spørreskjema og intervjuguide på forhånd. Undervisningen med VR vil foregå med høgskolens egne VR-headset og med bruk av et eksternt program kalt YoutubeVR. Gjennom dette programmet vil elevene få oppleve ulike steder, situasjoner og ekskursjoner som baserer seg på virkeligheten. Elevene vil få muligheten til å se, lytte, utforske og oppleve som om de skulle vært der selv. Dette vil fungere som utgangspunkt for en skriftlig oppgave i etterkant.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Dersom du ikke ønsker å delta (eller antall tilgjengelige plasser er fylt) legges det til rette for at de ikke-deltakende får tilbud om et alternativt opplegg i regi av skolen.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om ditt barn til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Ingen sensitiv informasjon eller personopplysninger utover ditt barns fornavn samles inn.

Ved behandlingsansvarlig institusjon (Høgskolen Innlandet) vil det være Anna Ertsås (student) og Petter Hagen Karlsen (veileder) som har tilgang til dataene som samles inn. Alt datamateriale samles inn og slettes etter endt prosjekt og avtale.

Ingen deltakere vil kunne gjenkjennes i publikasjon da alle personopplysninger anonymiseres.

Hva skjer med personopplysningene dine når forskningsprosjektet avsluttes?

Prosjektet vil etter planen avsluttes i juli 2023. Etter prosjektslutt vil datamaterialet med dine personopplysninger slettes.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra Høgskolen Innlandet har Personverntjenester vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:
- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
- å få slettet personopplysninger om deg
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger

Hvis du har spørsmål til studien, eller ønsker å vite mer om eller benytte deg av dine rettigheter, ta kontakt med:
- *Høgskolen Innlandet* ved Anna Ertsås (student) ▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ og/eller Petter Hagen Karlsen (veileder ved høgskolen) ▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮
- Vårt personvernombud: Anne Sofie Lofthus, ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮

Hvis du har spørsmål knyttet til Personverntjenester sin vurdering av prosjektet, kan du ta kontakt med:
- Personverntjenester på epost (personverntjenester@sikt.no) eller på telefon: 53 21 15 00.

Med vennlig hilsen

Anna Ertsås ved Høgskolen Innlandet

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet *Virtual reality i engelsk språkundervisning*, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta på spørreskjema i forkant av VR-prosjekt
- ☐ å delta i VR-prosjekt
- ☐ å delta i spørreskjema i etterkant av VR-prosjekt
- ☐ å delta i intervju i etterkant av VR-prosjekt

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

----
(Signert av foresatt til prosjektdeltaker, dato)

8.2 Appendix 2 — Approved Sikt Application

Sikt

Meldeskjema / Virtual Reality in Education – Research on Norwegian EFL learners' a... / Vurdering

Vurdering av behandling av personopplysninger

Referansenummer   **Vurderingstype**   **Dato**
231557   Standard   17.10.2022

Prosjekttittel
Virtual Reality in Education – Research on Norwegian EFL learners' and teachers' perspectives of how authentic experiences influence communication

Behandlingsansvarlig institusjon
Høgskolen i Innlandet / Fakultet for lærerutdanning og pedagogikk / Institutt for pedagogikk og samfunnsfag – Hamar

Prosjektansvarlig
Petter Hagen Karlsen

Student
Anna Ertsås

Prosjektperiode
15.08.2022 – 15.08.2023

Kategorier personopplysninger
Alminnelige

Lovlig grunnlag
Samtykke (Personvernforordningen art. 6 nr. 1 bokstav a)

Behandlingen av personopplysningene er lovlig så fremt den gjennomføres som oppgitt i meldeskjemaet. Det lovlige grunnlaget gjelder til 15.08.2023.

Meldeskjema ↗

Kommentar
OM VURDERINGEN
Personverntjenester har en avtale med institusjonen du forsker eller studerer ved. Denne avtalen innebærer at vi skal gi deg råd slik at behandlingen av personopplysninger i prosjektet ditt er lovlig etter personvernregelverket.

Personverntjenester har nå vurdert den planlagte behandlingen av personopplysninger. Vår vurdering er at behandlingen er lovlig, hvis den gjennomføres slik den er beskrevet i meldeskjemaet med dialog og vedlegg.

VIKTIG INFORMASJON TIL DEG
Du må lagre, sende og sikre dataene i tråd med retningslinjene til din institusjon. Dette betyr at du må bruke leverandører for spørreskjema, skylagring, videosamtale o.l. som institusjonen din har avtale med. Vi gir generelle råd rundt dette, men det er institusjonens egne retningslinjer for informasjonssikkerhet som gjelder.

TYPE OPPLYSNINGER OG VARIGHET
Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 15.08.2023.

LOVLIG GRUNNLAG UTVALG 1
Prosjektet vil innhente samtykke fra foresatte til behandlingen av personopplysninger om barna. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan

dokumenteres, og som den registrerte/foresatte kan trekke tilbake.

Lovlig grunnlag for behandlingen vil dermed være foresattes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

LOVLIG GRUNNLAG UTVALG 2
Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake.

Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER
Personverntjenester vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om:

– lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at foresatte får tilfredsstillende informasjon om og samtykker til behandlingen
– formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke viderebehandles til nye uforenlige formål
– dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet
– lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER
Personverntjenester vurderer at informasjonen om behandlingen som de registrerte og deres foresatte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.

Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18) og dataportabilitet (art. 20).

Vi minner om at hvis en registrert/foresatt tar kontakt om sine/barnets rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER
Personverntjenester legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1. f) og sikkerhet (art. 32).

Ved bruk av databehandler (spørreskjemaleverandør, skylagring, videosamtale o.l.) må behandlingen oppfylle kravene til bruk av databehandler, jf. art 28 og 29. Bruk leverandører som din institusjon har avtale med.

For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og eventuelt rådføre dere med behandlingsansvarlig institusjon.

MELD VESENTLIGE ENDRINGER
Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til oss ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde:
https://www.nsd.no/personverntjenester/fylle-ut-meldeskjema-for-personopplysninger/melde-endringer-i-meldeskjema. Du må vente på svar fra oss før endringen gjennomføres.

OPPFØLGING AV PROSJEKTET
Personverntjenester vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.

Kontaktperson hos oss: Markus Celiussen
Lykke til med prosjektet!

88

8.3 Appendix 3 — Questionnaire 1

Spørreskjema 1

Navn:

_____

1. Hvilke digitale verktøy bruker du i engelskfaget? (F.eks. datamaskin, nettbrett, smarttelefon, VR, andre?)

_____

_____

_____

2. Hvilke programvarer eller nettsider bruker du i engelskfaget? (F.eks. Word, Salaby, SmartØving, andre?)

_____

_____

_____

3. I engelsk undervisning bruker vi ofte digitale verktøy som iPad og PC.

◯ Svært enig

◯ Enig

◯ Hverken enig eller uenig

◯ Uenig

◯ Svært uenig

1 av 6

4. Hvilke digitale verktøy bruker du på fritiden? (F.eks. pc, iPad, smarttelefon, VR, andre?)

_____

_____

_____

5. Hvor ofte bruker du digitale verktøy som iPad, PC, smarttelefon, osv. på fritiden?

◯ Hver dag

◯ Flere ganger i uken

◯ En gang i uken

◯ Sjeldent (mindre enn en gang i uka)

◯ Aldri

6. Jeg synes det er nyttig å bruke digitale verktøy i engelskundervisning

◯ Svært enig

◯ Enig

◯ Hverken enig eller uenig

◯ Uenig

◯ Svært uenig

2 av 6

7. Jeg foretrekker engelsktimer der jeg jobber på iPad eller PC fremfor engelsktimer uten iPad eller PC

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

8. Jeg synes digitale verktøy er forstyrrende i engelskundervisning

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

9. Jeg skulle ønske vi kunne bruke digitale verktøy mer i engelsktimer

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

3 av 6

10. Hva synes du om å bruke digitale verktøy (iPad, PC) i engelsktimer og hva er grunnen til dette?

_____

_____

_____

_____

11. Hvilke hjelpemidler og metoder gjør at du selv føler du lærer du best?

_____

_____

_____

_____

12. Jeg vet hva VR (virtual reality) er

◯ Ja, jeg vet hva det er og har brukt det.

◯ Ja, jeg vet hva det er, men han ikke brukt det selv.

◯ Jeg har hørt om det, men er ikke sikker på hva det er.

◯ Nei, jeg har ikke hørt om det.

4 av 6

13. Jeg har erfaring med VR fra tidligere

◯ Ja, jeg har brukt det selv.

◯ Ja, jeg har sett andre bruke det.

◯ Nei, jeg har aldri brukt eller sett VR før.

14. Jeg bruker VR på fritiden

◯ Hver dag

◯ Flere ganger i uken

◯ En gang i uken

◯ Sjeldent (mindre enn en gang i uka)

◯ Aldri

15. Jeg bruker VR i undervisning på skolen

◯ Hver dag

◯ Flere ganger i uken

◯ En gang i uken

◯ Sjeldent (mindre enn en gang i uka)

◯ Aldri

16. Jeg bruker VR i engelsktimer

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

17. Jeg skulle ønske at vi brukte mer VR i klasserommet

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

18. Jeg synes det er nyttig / høres nyttig ut å bruke VR i skolen. Hvorfor/hvorfor ikke?

_____

_____

_____

_____

8.4 Appendix 4 — Questionnaire 2

Spørreskjema 2 - iPad VR / HDM VR

Navn:

_____

1. Jeg føler at denne HMD VR- / iPad VR-opplevelsen var ekte.

- ◯ Svært enig
- ◯ Enig
- ◯ Hverken enig eller uenig
- ◯ Uenig
- ◯ Svært uenig

2. Jeg ble interessert i å jobbe videre med dette temaet.

- ◯ Svært enig
- ◯ Enig
- ◯ Hverken enig eller uenig
- ◯ Uenig
- ◯ Svært uenig

1 av 5

3. HMD VR- / iPad VR-opplevelsen gjorde meg inspirert til å skrive en tekst

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

4. HMD VR- / iPad VR-opplevelsen gjorde meg inspirert til å snakke om det

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

5. HMD VR- / iPad VR-opplevelsen gjorde det enklere å forstå innholdet

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

2 av 5

6. Hva gjorde deg engasjert eller ikke engasjert for videre arbeid med tema?

_____

_____

_____

_____

7. Hva gjorde deg engasjert eller ikke engasjert for å skrive en tekst om opplevelsen?

_____

_____

_____

_____

8. Hva gjorde at du forsto eller ikke forsto innholdet i HMD VR- / iPad VR-opplevelsen?

_____

_____

_____

_____

3 av 5

9. Jeg føler at denne opplevelsen var lærerik

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

10. Hva med denne HMD VR- / iPad VR-opplevelsen opplevde du som mest lærerik? (Lytting, bilder/video, aktivitet, etc.)

_____

_____

_____

_____

11. Jeg føler at denne opplevelsen var engasjerende

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

4 av 5

98

12. Jeg blir forstyrret av hvordan HMD VR / iPad VR oppleves og dens funksjoner (som at man kan bevege seg 360˚ og se rundt seg uten å «være» i en annen verden)

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

13. Jeg føler jeg får med meg mer av læringsinnholdet gjennom hvordan HMD VR / iPad VR oppleves og dens funksjoner (som at man kan bevege seg 360˚ og se rundt seg uten å «være» i en annen verden)

○ Svært enig

○ Enig

○ Hverken enig eller uenig

○ Uenig

○ Svært uenig

14. Hvilke hjelpemidler og metoder gjør at du selv føler du lærer du best?

_____

_____

_____

_____

5 av 5

99

8.5 Appendix 5 — Interview Guide

Intervjuguide:

1) **Hvordan opplevde dere disse undervisningsøktene?**
   - Hva var bra?
   - Hva kunne vært annerledes?
   - Hva var utfordrende?

2) **Hva var positivt med HMD VR-opplevelsen?**

3) **Hva var positivt med iPad VR-opplevelsen?**

4) **Hva var negativt med HMD VR-opplevelsen?**

5) **Hva var negativt med iPad VR-opplevelsen?**

6) **Hvilken av HMD og iPad VR-opplevelsene foretrekker dere?**
   - Hvorfor?

7) **Hvordan påvirket opplevelsen den skriftlige oppgaven i etterkant?**
   - Ble du mer eller mindre motivert, engasjert, inspirert?
   - Følte du det var lettere eller vanskeligere å skrive en tekst basert på denne opplevelsen?

8) **Hvilke utgangspunkt har dere vanligvis for oppgaveskriving?**
   - Hva gjør dere i forkant av andre oppgaver?

9) **Hvordan foretrekker du å jobbe før en skriftlig oppgave?**
   - Slik dere vanligvis gjør?
   - Lesing, bilder, videoer?
   - Med VR?
   - Andre måter?

10) **Hvilke muligheter kan bruk av HMD VR i klasserommet ha?**

11) **Hvilke muligheter kan bruk av iPad VR i klasserommet ha?**

12) **Hvilke utfordringer kan bruk av HMD VR i klasserommet ha?**

13) **Hvilke utfordringer kan bruk av iPad VR i klasserommet ha?**

14) **Noe mer dere vil legge til?**

8.6 Appendix 6 — Teaching Plans

Teaching plans VR

First lesson: A travel to Sydney, Australia

1) Introduction:
    - Present a postcard from Australia by reading out loud (Postcard from Gold Coast)
    - Discuss with the pupils:
        - What type of text/genre?
        - What are the components of writing postcards?
        - Experiences with writing postcards? How, when, where?
        - Experiences with other texts related to travels, how do the learners communicate when on a holiday nowadays?
        - Experiences with traveling and tours
        - Present today's travel destination Australia, Sydney!
2) The pupils watch: https://youtu.be/GqnCZNGkdfc (with either a tablet or VR-equipment)
3) Questionnaire 2
4) Break
5) Writing task: Write a text to a friend or a family member about your experiences in Sydney. You can choose to write a postcard, text message, a social media story-series, or any other texting technique you use in your daily life. Remember, you use the different types of texts for different purposes, adapt your text to the receiver and your self-chosen type of text.

    An example of how to start writing a postcard:

    Dear _____

    I have now arrived Sydney after a long flight, and today I went for a guided tour in Sydney!

    (Or you can come up with a beginning to the postcard yourself)

Second lesson: A travel to South Africa

1) Introduction:

   -Present a travel brochure from South Africa in which the learners read themselves (Travel

   Brochure Durban)

   -Discuss with the pupils:

       - What type of text/genre?

       - Experiences with travel brochure / commercials? How, when where?

       - What are the components of travel brochures?

       - Experiences with traveling and tours

       - Present today's travel destination South Africa, Cape Town!

2) The pupils watch: https://youtu.be/ghdAW41b-2c (with either a tablet or VR-equipment)

3) Questionnaire 2

4) Break

5) Writing task: Write a multi-modal text for a travelling company. The travel brochure needs to

   contain facts and possible experiences. You may start like this:

   Cape Town!

   Best of both worlds, big city life and beach life! Welcome to Cape Town! Cape Town is

   actually one of three capitals in South Africa. With its population of 4,6 million people, it

   offers a whole range of activities and experiences.

   (Or you can come up with a beginning to the letter yourself)

6) Interview

7) Summary and thanks for participating!