UiT The Arctic University of Norway

Faculty of humanities, social sciences, and education.

Gaming at home vs. gaming at school

A mixed-methods study exploring the relevance on pupils' gaming experience in game-based learning with Minecraft Education

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Master's thesis in English didactics, LER-3902, May 2024

Abstract

The aim of this thesis is to investigate how and whether pupils' previous experience with video games matter in game-based learning, i.e. lessons that incorporate the use of video games. In this, it examines the belief that all pupils are competent "digital natives" due to their engagement with available technology in their daily lives. Using the term "preconditions" as a general term to encompass a series of factors that may be of relevance, the study seeks to find connections between out-of-school gaming and pupils' opportunities to learn from and enjoy in-school gaming activities. The study uses a mixed-methods approach where 40 pupils from 6th and 7th grade completed a questionnaire and created a product in Minecraft Education. The findings show that most pupils were able to build a product connected to the given topic, and that their previous gaming had minimal impact. However, the findings also indicate that there are differences among the pupils and that everyone has different preconditions for game-based lessons. The study highlights the need for nuancing the idea that all pupils are digitally competent and supports the need to differentiate game-based instruction based on pupils' previous experiences with gaming.

Sammendrag

Denne studien tar for seg hvordan elevers tidligere erfaringer med dataspill påvirker spillbasert læring, dvs. undervisning som benytter seg av dataspill. Studien utforsker oppfatningen om at alle elever er "digitale innfødte" og naturlig kompetente med teknologi. Ved å bruke "forutsetninger" som en samlebetegnelse for ulike relevante faktorer, prøver forskningen å trekke linjer mellom spillvaner utenfor skolen og hvordan disse påvirker elevers læring og glede av spill i skolesammenheng. Studien utgår fra en «mixed method»-design, hvor 40 elever fra 6. og 7. klasse svarte på en spørreundersøkelse og skapte et produkt i Minecraft Education. Resultatene viser at de fleste elevene kunne lage noe som var relevant for det oppgitte temaet og at deres tidligere spillerfaringer hadde liten betydning. Det kommer likevel fram at elever er forskjellige, og at hver enkelt elevs bakgrunn kan påvirke hvordan de tar til seg spillbasert undervisning. Studien understreker derfor et behov for å nyansere forestillingen om at alle elever er like digitalt kompetente, og viser til at tilpasset undervisning, basert på hver enkelt elevs spillerfaring, kan være nødvendig.

Acknowledgements

We would like to express our deepest gratitude to our supervisor Hilde Brox, whose patience and guidance has provided us with invaluable feedback to make this thesis possible.

We also want to thank the many friends we have made during our time at the university. They have provided us with many unforgettable moments and taught us invaluable lessons both inside and outside the classroom.

We would also like to thank each other, for great teamwork and moral support throughout the thesis. There have been fun times, and rough times throughout the semester, but keeping each other with good company, and some great chats, we have managed to reach the end of the road.

Finally, we would like to express our gratitude to our families for their unwavering support throughout this process. Ole would like to dedicate his efforts to his grandparents, thanking them for their continuous encouragement during his time at university. Jørgen wishes to thank his bandmates for the many musical moments and the memorable summit hikes they shared together.

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1 Introduction

1.1 Pupils and game-based learning

Digital technology has become a large part of people's lives and is something most of us use and benefit from daily. Every new generation grows up with access to even more powerful technologies compared to the previous one, and the ability to adapt to these changes has become increasingly more important (Kunnskapsdepartementet, 2017a). Playing videogames, commonly referred to as *gaming*, has become an activity enjoyed by people of all ages, especially the younger generation. According to a recent survey, 76% of all 9–18-year-olds in Norway play games on PC, consoles, or mobile devices (Medietilsynet, 2022 p. 91). Due to the massive rise in popularity of gaming, a natural consequence would be that schools take part in this development, by for example exploring and including games in education (Hill, 2015). Previous research has proposed that videogames are not merely entertainment, but encourage good principles of learning, and many educators therefore see the potential of game design concepts for promoting learning (Hill, 2015). Over time, researchers have developed terms to describe the learning that can come from playing games. *Game-based learning* is a cover term for various instructional strategies that use educational objectives with game mechanics. It focuses on achieving specific learning outcomes using games as a medium to engage learners (Plass et al, 2015; Poulsen, 2011, p.20). Research has shown that using games in education can engage students actively and motivate them with rewards while fostering skill development and learning. Games have been found to promote collaboration, provide a safe environment for failure, offer real-world applications, and facilitate assessment and progress tracking (Gee, 2003 p. 207; Kaimara et al, 2021; Poulsen, 2011 p. 19). The interest in video games has led to a vast body of research on the potential learning outcome pupils can get as the game medium characteristics gives an opportunity to teach in a different way compared to other teaching aids and methods (Skaug et.al, 2020).

The idea of introducing games into classrooms is also met with resistance, and there are several issues that can come to light when wanting to try to use them for educational purposes. Using games is not a straightforward task and requires knowledge and planning for efficient usage. For one, there are basic obstacles such as general technical difficulties and lack of access to games. Moreover, the fact that pupils may be more familiar than teachers with video games and

virtual worlds like Minecraft (Hill, 2015). In many situations, the pupils can be better than the teachers at video games, which can lead to unfortunate events where some pupils need help, but the teacher is unable to assist. Moreover, pupils may not perceive video games as a viable learning tool unless it is explicitly labeled as an educational game. This can be a problem; the pupils will only focus on the fun aspects of the game and ignore the relevant learning that is supposed to happen. This may lead to a lack of motivation for using games. Last, but not least, using games in education is met with a certain amount of skepticism from parents, along with the recent demands for less screen time in schools generally. Many parents are concerned with their children's excessive gaming, and challenge schools to counter rather than support the use of videogames (Rosenlund-Hauglid, 2023).

Still, it is generally assumed that pupils today like playing games, have a lot of experience with playing them, and would therefore enjoy using games in education. However, research has shown that there are pupils who rarely or never play games in their spare time (Medietilsynet, 2022 p. 91) and there is little research on how these pupils experience game-based learning in school. Similarly, we know that games are a big part of other pupils' lives and there is little research on how they experience game-based learning. At the same time, we know that for other pupils, games make up a large part of their private lives. Yet also for this group, there is little research on how they experience school-based gaming. As such, there is a need to nuance the idea that all pupils play, like, and enjoy video games, and especially the idea that all pupils are good at them. Likewise, there is a need to nuance the idea that more playtime equals more enjoyment when using games in school.

At present, there is a gap in studies taking pupils' previous game knowledge into consideration, and its impact on learning. Nebel, Rey & Schneider (2016) exemplify this gap by discussing the benefits of using Minecraft in education while acknowledging the potential limitations of both teachers' and pupils' familiarity with the game, without delving into how these limitations affect learning outcomes. Connoly et al (2012) have investigated the positive impacts of video games on education and student engagement, highlighting the necessity for further exploration, particularly through randomized trials, to better understand the incorporation of video games into teaching methodologies. Jørgen Hougen's study from 2023 utilized Minecraft Education as a tool for dyslexic pupils, who were tasked with recreating passages from texts. The results indicated heightened motivation and a sense of mastery among the pupils. However, Hougen

(2023), too, emphasized the necessity for further research, particularly regarding the experiences of individuals completely new to Minecraft. Baek et al (2020) conducted a comprehensive review of 28 articles on Minecraft's educational use, identifying challenges associated with students' varying levels of familiarity with the game. They observed a pattern where inexperienced pupils struggled to keep up with the task, while experienced pupils used knowledge to avoid doing the tasks. It seems urgent to bridge the existing research gap on how students' previous gaming experience affects their learning, as is crucial for improving educational approaches to use video games in an educational setting.

Pupils come to school with many different levels of prior knowledge, attitudes, experiences, and needs, and they all require equal opportunities for learning and growth regardless of their background. As outlined in the Education Act (Opplæringsloven, 1998), the school has to adapt education to the individual pupil. The graphs and data from the *Barn og medier* report published in 2022 (Medietilsynet, 2022) show widespread access to digital technology among elementary and secondary school pupils. Many pupils own their own cellphones and various devices such as tablets, computers, and gaming consoles (Medietilsynet, 2022, p.14). However, not everyone has access to everything, implying that pupils will arrive at school with different levels of understanding of how to use various digital technologies and video games, illustrating that prior knowledge varies among individual pupils. Each pupil will comprehend different concepts differently, influenced by their home environment and prior educational experiences.

Differentiated instruction can be found in many subjects at school, from mathematics to physical education. In mathematics, instruction is often done by giving pupils tasks adapted to their skills and abilities, or even by dividing them into groups according to their level. This way, the teacher seeks to ensure that all pupils are challenged on a suitable level. However, in physical education pupils often bring skills acquired from activities they enjoy doing in their spare time. For example, some pupils play football in their spare time and have become good at it, while other pupils never play football or do anything similar and are therefore less skillful. Consequently, both talented and less experienced players may not enjoy or benefit from lessons where they must play football. The experienced ones may not enjoy the lesson because there is less challenge involved as they must play with pupils with below their own level. Likewise, the pupils with less football experience, skills or interest may not enjoy the lesson because they feel insecure or uncomfortable or fear negative feedback from the more talented players.

Ultimately, the pupils that benefit and enjoy football lessons are likely to be the ones in between these skill levels; with enough skill to engage in the game but not enough for there to be no challenge.

Is it accurate to assume that extensive gaming at home leads to enhanced enjoyment and educational benefits when using games in school? Do individuals with less gaming experience face greater challenges and perceive game-based learning as less meaningful? Does this result in diminished educational gains? Given the limited research in this area, how can these questions be effectively addressed? We see that there is a need for more research on how our past gaming experience impacts our learning from games. Some pupils might struggle to grasp concepts as easily because they have not played many games before. On the other hand, there are those who have played a lot of games and might get through the tasks quickly and get bored. Figuring out how to balance these different experiences can be important for ensuring everyone benefits from gaming.

1.2 Game-based learning and the English subject curriculum

English is an important subject for cultural understanding, communication, and identity development (Kunnskapsdepartementet, 2019). Through the subject, pupils shall gain a foundation for communicating with others, both locally and globally, and pupils experience that the ability to communicate in several languages is an asset (Kunnskapsdepartementet, 2019). Within the English subject there are three core elements, communication, language learning, and working with texts in English. A text can be anything that contains forms of expression to present a message (Kunnskapsdepartementet, 2019). Games such as Minecraft are multimodal texts that include visuals and sounds, and where pupils can communicate and express themselves. As children are not learning to read only in a world of books, but in a world full of other media such as video games and films, games such as Minecraft are equally valid as texts to be worked with in the subject of English. As such, they can also be subject to critical readings (Habegger-Conti, 2015). Games such as Minecraft can also be used while working together and serve to develop communication skills. Pupils who play games often excel in English (Statped, 2020). Games are often played in English, and so players have to read instructions to get around. Additionally, when games are played online, the main language used to communicate is English, which gives them authentic opportunities to practice English. Pupils that are weak readers in their main language can sometimes be stronger readers in English due

to playing games. This shows that motivation, interest, and finding the content they read relevant, is important for the development of language skills (Statped, 2020). The 6th and 7th graders in the current project worked on two topics: Transportations: important inventions, and they wrote a review about the movie *Home Alone*. Both were connected to competence aims in the English subject curriculum. By recreating scenes from the movie *Home Alone*, and by creating vehicles for transportation, Minecraft served as a means to reinforce their understanding of the topic that they are working with.

1.3 Research question

It is assumed that pupils these days are digitally competent, especially when compared to the older generations (Blikstad-Balas, 2020). Our experience with pupils in grades 5-10 tells us that not everyone is as digitally competent as we might assume, and that there might be many struggles that go unnoticed as a result of assuming pupils are better than what they really are. Our goal for this thesis is to investigate how much previous experience matters in lessons related to video games. Specifically, we want to look at previous gaming experience and how much that matters in a lesson using gaming as a way to learn or show knowledge. The research question guiding our study is as follows:

"How do pupils' preconditions matter in a game-based English lesson?"

The project we created involved using Minecraft to demonstrate their knowledge of a subject. We made it as open as possible so it would be easier for teachers to accept trying it out in their class, as the project could be adapted into any subject they were currently working on. The project took place in a 6th grade class working on the subject "Transportations: important inventions", and a 7th grade class working on the subject "movie review" where they had just seen the movie *Home alone*.

The pupils who participated in our project had three tasks ahead of them. First, they were to answer a questionnaire about their previous gaming experience, and their attitudes towards gaming. In the questionnaire we included both closed and open-ended questions for the pupils to respond to. Secondly, they were going to build something in Minecraft Education connected to the topic they had worked on in school. Lastly, when they had finished their product in Minecraft, they were to take pictures of what they had made and insert it into a word document. They also answered questions of how they experienced working with previous topics in the English class in Minecraft, and gave other feedback connected to our project.

We created a score system to give the pupils scores based on their answers in the questionnaire, the products they made in Minecraft, and the answers they provided to us in the final document. We then separated them into groups based on how much time they spend playing video games, and created graphs to analyze if there are any trends and patterns. Our hypothesis based on our experience/expectations is that both pupils with higher and lower play time would stand out in some way compared to those in the middle.

1.3.1 Minecraft

Minecraft is a sandbox game which gives the player the freedom to create virtually anything using its block-based mechanics, which can be compared to building with Lego bricks. Within Minecraft, players can choose between two primary modes: survival and creative. Survival mode demands resource management, shelter construction, and there are monster encounters during the nights. Creative mode empowers players with endless number of resources and flight, ideal for unhindered exploration, focused building, and more. In most computer games the player is given rewards throughout the game, such as achieving a new level, getting goods, ranking up, etc. Minecraft has some of these elements, but it is more about discovering, and seeing the opportunities around you instead of focusing on the rewards (Giæver, 2014, p.47). Minecraft is also one of the most sold games in the world with 100 million copies sold by 2016, and more than 300 million copies sold by 2023 (Curry, 2024). Research has also shown that Minecraft is the most dominant title engaged with by children aged 3-12 (Mavoa et.al, 2018) The massive popularity has coincided with younger children's access to digital game play, the rise in popularity of digital game-related content, and the "mainstreaming" of gaming culture in general (Mavoa et.al, 2018). As a result of this popularity, research related to education has begun examining ways to leverage its potential benefits.

Minecraft Education (ME) is a version of Minecraft designed to be used in educational settings and provides additional tools for the teacher to utilize. The extra tools facilitate creativity and freedom for teachers to modify the game to suit their needs (Slattery et al, 2023). The usage of ME soared during 2020, where it got more than 100 million downloads between March-September (Minecraft, 2021). While this happens to coincide with Covid-19 and the increased use of remote learning, ME still had millions of downloads in 115 different countries before this. Research has also shown that ME supports the inclusion of students with a range of needs

and abilities (Slattery et al, 2023). Research has also found that Minecraft permits the creation of authentic learning activities and can be used as an educational tool for subject-specific skill development, while also enabling collaboration (Andersen & Rustad, 2022). In the end, Minecraft is a versatile game, that can be used in various school subjects while incorporating core elements. Due to its straightforward game design, it can be effectively integrated into different classes and across various grade levels (Giæver, 2014, p.47).

1.4 Overview of thesis

After this introductory chapter, Chapter Two will position the study within a theoretical and thematic framework. Video games in school have become accepted and many researchers argue that there are many positive aspects of using them in school. However, there are many preparations the teacher has to do before using them in a lesson, and pupils might not be as good at using digital tools as we might expect. Discussions around differentiated instruction create an important backdrop for the thesis as we connect it to the popular idea of the younger generation being digital natives. In Chapter Three we provide the methods we have used to collect our data, going in depth on the lesson plan for the project and how we analyzed the data we retrieved. For Chapter Four we will present our findings and how we interpret what the participants have answered in our data collection. Lastly, Chapter Five will contain a discussion and conclusion to our thesis question.

2 Thematic and theoretical field

The following chapter looks into the field of game-based learning, exploring its theoretical underpinnings, practical applications, and the varying impacts it has on pupils with different preconditions. The chapter contains three parts. First, we present theory related to game-based learning, the benefits of implementing it, the obstacles surrounding it, and a clarification of the difference between game-based learning and gamification. Second, we elaborate on the terms preconditions and differentiated instruction, and examine the popular idea of children as digital natives. Third, we connect pupils' preconditions for learning to game-based learning.

2.1 Game-based learning

Any attempt to address game-based learning must start with an understanding of games. In present-day education, references to games are almost exclusively references to digital games, also known as computer games or – the term we use here - *video games*. What is a video game? There have been many attempts at defining what video games are. These definitions often overlap in certain areas, but they can also contradict in others (Skaug et., 2020, p.14). Some definitions also exclude different types of games. For example, any definition that claims that video games have to include visuals would exclude video games that only include audio, such as *Audio Game Hub* (Arjoranta, 2019). Skaug et. al (2020) say that video games are like IKEA furniture that players themselves must build. In this case, building refers to taking actions that are required to progress in the game, compared to books and films where everything comes "pre-built" (Skaug et., 2020, p.14). However, this is more a description of how games are played, not a definition of what they are. A potential definition could be that a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome. This definition can apply to some games, but not all as there are thousands of different games that are all played in different ways. Video games are played differently based on what genre they belong to, such as first-person shooter and simulation games, and the decisions the player get to make will be different based on how the game is made. In some games the player is forced into a linear path where the decisions have little to no say on the outcome, while in other games the same path can diverge into multiple different outcomes. Ultimately, the simplest understanding can be that if it feels like a video game, is understood as a video game, sold as a video game, and has the qualities of a video game, then we call it a video game (Skaug et., 2020, p.14).

The past decade has seen an increased interest in utilizing games as a method for teaching and learning. This is often referred to as *game-based learning*, described as the practice of using games with specific educational objectives (Plass, Homer & Kinzer 2015) or combining educational content with games (Schabas, 2023, p.89). Plass, Homer & Kinzer (2015) argue that there are certain key elements involved in implementing game-based learning. These key elements are *motivation, adaptability, dealing with failure,* and *player engagement* - elements that underscore some of the benefits of using game-based learning in an educational setting as they can enhance pupils' learning. Games have proven to keep pupils' attention and keep them engaged for longer periods of time, which can be connected to a high level of motivation (Plass et al, 2015) and therefore beneficial in a school setting to keep the pupils focused and interested in learning and to investigate a particular topic (Kaldarova et al., 2023, p.2). Adaptability is required by the pupil as they must reflect on their current situation in the game and decide on how they want to proceed throughout the game (Plass et al, 2015). Being able to adapt is directly transferable to educational settings, where pupils often encounter new information and must learn to approach tasks in different ways, as not all tasks can be confronted in the same way (Gee, 2003, p.211). Failure is common in games, and there are low stakes connected to failing. In most games the player gets as many attempts as they need to succeed. By giving the player a chance to fail and retry, it promotes trying out new things, taking risks, and exploring unfamiliar places (Plass et al, 2015). Being able to fail and retry is important in video games, as it will help the player gain more control over what is going on inside the game (Kaimara et al, 2021). This results in players getting the opportunity to try different options without the fear of long-term consequences. This freedom can help players get more motivated to explore and utilize all their competence, knowledge, and skills (Kaimara et.al, 2021).

Exploring the educational potential of popular culture reveals opportunities for learning, particularly through video games, which allow young people to take control of their learning process by engaging in different activities. Young people could be learning a lot from popular culture, and the school should be paying more attention to this, which is not a new topic (Buckingham, 2007, pp. 99-100). Additionally, young people could be learning from media like video games on their own, without anyone teaching or talking down to them. Video games let pupils explore and learn in their own way and at their own pace, giving them control of their learning (Buckingham, 2007, p.100; Skaug et al., 2020, p,16). When younger people play video games, they usually learn through trial and error by exploring the game, and by experimenting

with what is possible within the game. A single game contains many cognitive elements, such as remembering, hypothesis testing, predicting and strange planning (Buckingham, 2007, p.100). Most research done in the game-based learning field has been using educational games. These games are usually lacking in qualities that make the game feel like a "real" game. These educational games are usually single-player games, bad graphics, and limited interactivity (Buckingham 2007, p.114). In contrast, other researchers are more interested in the use of mainstream games in the classroom (Buckingham, 2007, p.114; Camacho-Sànchez et al., 2023 p.1), with games like Minecraft Education seen as ideal because Minecraft is one of the world's best-selling video games currently (Curry, 2024).

Yet, there are many obstacles to implementing game-based learning. First, there are the practical challenges associated with using games in the classroom. These issues may be technical, such as lack of internet connection or other problems connected to either opening or downloading a game (Hidayat, Aziral & Sutrisno, 2023, p. 175). There are also challenges in finding a game that suits every pupil in a classroom. Some pupils will be interested in competitive games, while others might favor cooperative games, making it difficult to find a game that caters to everyone (Hidayat et al., 2023, p.175; Skaug et al., 2020, pp.73-74).

Many games require teachers to invest a significant amount of time to create effective lessons. The teacher must consider how the game works and how it can align with the curriculum (Buckingham, 2007, p. 114; Hidayat et al., 2023, p. 175). The learners, too, need sufficient time to learn the basic mechanics of the game (Buckingham, 2007, p. 114). Furthermore, the attitudes of learners, teachers, and parents impact how video games in the classroom work as a medium (Buckingham, 2007, p.115). Research has found that older students would look at the use of video games as trivial, more as a distraction from serious learning, making them ignore the potential educational value that the game would provide. As such, incorporating video games into the classroom may cause learners to take the class less seriously (Buckingham, 2007, p.116; Skaug et al., 2020, pp.82-83).

Another obstacle for game-based learning is that learners may become too immersed in the game they are playing, leading them to ignore the teachers' questions and interventions (Buckingham, 2007, p.116; Zagal, 2008, p.34). As pointed out by Zagal (2008), there may be

difficulties understanding the relevant learning objectives of a current game being used in a classroom. Students who were successful at playing a game, and could describe it, did not focus on the learning objective but on other things (p.34).

Critics have also pointed out the limited evidence of game-based learning in terms of learning (Buckingham, 2007, p.116; Skaug et al., pp.82-83). Although research indicates an increase in motivation among learners who play video games, there is little evidence that shows increased learning (Buckingham, 2007, p.116). It has also been difficult to establish whether elements learned from video games can be transferred to other situations, as research points out that those who only play fun games at home are likely to perform poorly in school. Additionally, they tend to be less sociable and have lower self-esteem (Buckingham, 2007, p.117). If video games are effective in developing children's thinking, one would expect to find evidence supporting this idea (Buckingham, 2007, p.117). The common assumption is that individuals who play a lot of games would be able to transfer these skills to other information and communication technology (ICT) areas. However, there is no evidence to suggest that experienced gamers are better at handling these technologies than non-gamers (Buckingham, 2007, p.117). Buckingham (2007) criticizes Gee and Prensky, two influential advocates for the potential of computer games for learning. Neither of these make any significant reference to academic literature in "games studies". What Gee and Prensky write about is anecdotal, which means that what they claim is based upon their own experiences (Buckingham, 2007, p.102). Critics also point out that the negative sides of using video games in school tend to be downplayed in game-based learning research (Buckingham, 2007, p.103).

Crucially, game-based learning should not be confused with the concept of *gamification* which is to use game design elements to enhance non-game contexts. Gamification involves turning the learning process into a game, where they give the learners different game-elements (Al-Azawi, Al-Faliti & Al-Blushi, 2016; Bharamgoudar, 2018; Kingsley & Grabner-Hagen, 2015). These elements can be badges, achievements, climbing a leaderboard, to name a few. For example, if learners complete a task, they will get a sticker to place in their book. This could motivate the learner to complete more tasks to get more decorations (Al-Azawi et.al, 2016; Bharamgoudar, 2018; Kingsley & Grabner-Hagen, 2015). A common usage of this is in lessons where the goal is to complete tasks such as in math or grammar lessons. For example, the pupils get a sticker for every five tasks they complete. In gamification, learners are motivated by

external rewards. Game-based learning, on the other hand, is about using games as part of the learning process. Game-based learning aims to provide the learners with opportunities to reach goals within the game itself, which can motivate them and help them learn new concepts (Al-Azawi et al, 2016). While gamification focuses on external rewards, game-based learning focuses on intrinsic rewards such as giving the learners a sense of mastery instead of a sticker (Al-Azawi et al, 2016; Bharamgoudar, 2018; Kingsley & Grabner-Hagen, 2015). Some practitioners have therefore decided to downplay the "games" part of game-based learning as they connect games with mindless entertainment, whereas previous research points out that when players play a game, they can hardly do so without learning something new (Poulsen, 2011, p.19).

According to Ashinoff (2014), video games have large potential as pedagogical tools, where there are two rules of thumb one must follow. The first rule is the importance of selecting the appropriate game for the classroom. It is important that teachers consider the educational objectives as different games will improve different skills. Some games improve social skills by making the pupils work together. Other games can improve problem solving skills but lack the teamworking aspect. The other rule is to remember that video games do not replace the teacher or a curriculum, but well-judged assessment can help integrate a suitable video game into the class which can complement an educational program (Ashinoff, 2014, p.3).

Choosing the correct game can be difficult as it relies on the teachers' knowledge of what games are available and appropriate, and the knowledge to create teaching schemes based on these games. James Paul Gee, a pioneer in the field of games and learning, has identified 36 key principles that good games incorporate (Gee, 2003, pp.207-213). Some of these principles include *mastery, critical thinking, commitment, identity, practice, multimodality,* and *transferability*. There are many more, and it can be difficult to identify whether these principles are present in a game. However, many of them are present due to the inherent nature of a game. Players can achieve mastery and practice by repeatedly attempting to reach their goals, develop their identity through character-driven decisions, and experience multimodality through various communication forms like text, sound, and color. Additionally, transferability occurs as skills learned in one part of the game can be applied to others. Taking these principles into action, the player would typically be presented with easier puzzles at the beginning of the game, in order to understand the mechanics of how the puzzles work. Throughout the game the puzzles will

progressively become harder, but the player is still using the same mechanic to solve them. This results in the player knowing how the puzzles are supposed to be solved but must find the solution to each puzzle on their own (Gee, 2003, p.211). Solving more difficult puzzles can give the player a sense of mastery, while using the same mechanic gives them the opportunity to practice and hence achieve transferable skills to use in other puzzles. More experienced players will know about these elements and will usually expect them to be present whenever they try out a new game. For example, a more experienced player might be willing to die more often in a game, where a less experienced player might try to avoid death as much as possible. The more experienced player understands that death is a part of the game and utilizes it to learn more about the game, while the less experienced player will avoid death as they believe that progression only happens by staying alive.

Minecraft is a "good game" that can be connected to Gee's principles, as well as to various aspects within the core curriculum and the English subject curriculum. Gee (2003) mentions principles such as identity and critical thinking, which are both central parts of the core curriculum (pp.207-208). Minecraft can also be connected to other parts of the core curriculum such as the joy of creating, engagement, and the urge to explore (Kunnskapsdepartementet, 2017b). In addition, if pupils play Minecraft together, topics such as democracy and civic participation, social learning, and development, can easily be put into play. Moreover, use of the English language can be met when the pupils play together and communicate, orally or in writing, in or around the game (Kunnskapsdepartementet, 2019). The key concept in Minecraft is to survive by gathering resources. Anything beyond survival are goals set by the individual player and will therefore vary from person to person. How a player chooses to survive and what goals they set creates a new identity in the game. As such, the player has to reflect on and mediate the relation between their different identities (Gee, 2003 p. 208). Exploration in Minecraft is a commitment, if players die they lose all their items and have to get back to them before they all disappear. However, exploration can reward players with new types of blocks, which can then be used to create more detailed buildings or make their characters more powerful. Losing items can be punishing but may also promote critical thinking as players need to reflect on their current situation; whether they should go back and store their items, or carry on with the risk of losing them. Even if players die, they still get the opportunity to go back and try again, a feature that promotes practice. Likewise, overcoming difficulties may eventually promote mastery. Should pupils work together to survive and/or build something, there will be

a need for communication about what is going on and what they want to do. This potentially promotes democratic processes to ensure everyone get to participate. Additionally, it promotes social learning as everyone might want different things and one would have to navigate around these desires to make everyone content. In summary, Minecraft encourages exploration and collaboration, which can serve as a great way to facilitate the acquisition of a variety of essential skills listed in the core curriculum and the English curriculum.

2.2 Pupils' preconditions for learning

According to the dictionary, the word *precondition* refers to something that must happen or be true before something else can occur (Cambridge, 2024). In our thesis, we use this word in a somewhat wider sense, as we focus on the factors that may influence how different pupils respond to the use of video games as a teaching method in the classroom. We are interested in the knowledge, abilities, and experiences that pupils bring from home and their leisure time to school. As such, differences in regard to gaming experiences are parallel to other differences among pupils.

Pupils come to school with many different levels of prior knowledge, attitudes, experiences, and needs, and they all require equal opportunities for learning and growth regardless of their background. As outlined in the Education Act § 1-3 (Opplæringsloven, 1998), the school is obliged to provide education that is adapted to each individual pupil's abilities. Differentiated Instruction is written about in the Education Act (Opplæringsloven, 1998), and is a fundamental principle for guiding the Norwegian educational system (Hølland, 2021). It is not an isolated goal, but a way to ensure satisfactory learning outcomes for all pupils. Because the school needs to focus on the broader group instead of the individual, the teachers have to adjust their teaching and include a variety of teaching methods and approaches in order to accommodate the diversity of learning needs. Many studies have pointed to how implementing differentiated instruction can be difficult for teachers. Moreover, as pointed out by e.g. Hanssen and Husebø (2022), many teachers feel they do not fully comprehend the term, only know about it on a theoretical level, or associate differentiated instruction more to special education than to a general, class-wide approach.

There is a significant challenge in ensuring that all pupils are engaged in activities suited to their individual levels and needs. Reflective teachers recognize that not all pupils can complete the same task in the same way and adapt their lessons to allow for variations that can be tailored to each pupil (Utdanningsforskning, 2016).

Differentiated instruction involves tailoring teaching environments and approaches to accommodate individual learning needs across various subjects. In practice, this means that teachers have to employ diverse learning strategies, such as mind mapping and group work, and adjust the complexity of the tasks to match individual capabilities. For instance, in English classes a subject could be storytelling, and teachers could let the pupils use different methods to understand and retell the plot, thus catering to different learning styles. In mathematics, differentiation could be done be assigning tasks of varying difficulty levels, or by grouping the pupils based on their levels, thus allowing pupils to work at their own pace (Hundstad, 2015, pp.45-46; Rasch, 2019, pp.45-47).

However, as the principle of differentiated instruction revolves around dealing with the large variety that exists in the student body, it therefore also includes pupils with a high potential for learning (Olsen, 2020). Pupils with high learning potential, or gifted pupils, are those who exhibit superior performance in a particular domain relative to their peers (Worrell et al, 2019). There are many ways to define giftedness, some look at specific traits that need to be in place, such as high IQ, while others look at the potential for these traits to become something more. Regardless of definition, being gifted as a child does not necessarily result in outstanding achievements as an adult because there is a need for opportunities and resources to develop the talent (Worrell et al, 2019). There are different ways to create these opportunities, the indirect way of intervening would be to actively differentiate the education in areas such as content, process, products, and learning environment. While a more direct way would be to accelerate specific curriculum, or even to let the pupil start school earlier (Olsen, 2020). Ultimately, gifted pupils have the same rights for differentiated instruction as those who are not as gifted. However, this does not always happen because the focus tends to be on those who struggle in school, rather than those who are doing well and need more challenge (Olsen, 2020).

2.2.1 Equaling out the digital divide

Issues of adapted education, differentiated instruction, and the schools' mandate to even out pupils' different preconditions for learning have in the past decades been tightly connected to discussions about digital technology. Since 2006, digital skills have been one of the basic skills in Norwegian education. The arguments for introducing technology in education build on different views and arguments. In what could be called an "instrumentalist" perspective, technology is seen as a means to improve learning, and its value and relevance is asserted in terms of how the given technology proves to be effective in reaching pre-defined goals (Hamilton & Friesen, 2013). In this view, games can be regarded as valuable in terms of improving language skills, for instance. A more "techno-determinist" perspective, on the other hand, sees technology as transformative and a driving force in shaping our future (Chandler, 2011). Considering how widespread gaming as a hobby has become, it can be said that it has had a major societal impact, and so it should be no surprise that the usage of gaming as a teaching tool has increased. Both these perspectives can be found in educational policy documents and in popular debate (Fritze, Haugsbakk & Nordkvelle, 2015, pp.47-49). However, most scholars and practitioners seem to agree that as digital technology is ubiquitous, then it should also be integrated in school life. Pupils these days are born in a world where their "default mode" is to have access to internet, and not utilizing it as a part of their education would make the school less authentic and relevant (Blikstad-Balas, 2020).

As schools include digital tools to even out the disparity that pupils face when transitioning from home to school, they confront not just the technological divide but also the generational gap. This transition necessitates a nuanced understanding of digital literacy across different ages and backgrounds. While the instrumentalist and techno-determinist perspectives emphasize the role and impact of technology in educational settings, Marc Prensky's notion of digital natives adds a different perspective by shifting the focus towards the learners themselves. Prensky's theory suggests that those born into the digital age, termed *digital natives*, are inherently different in their cognitive abilities due to lifelong exposure to digital technology (Prensky, 2001a). The term suggested that the younger generation possessed inherently superior digital skills. However, it oversimplified the complex nature of digital proficiency among pupils (Helsper & Eynon, 2010). By assuming that an entire generation is "digitally native", we may overlook the significant variability in access, usage, and mastery of digital tools. This oversimplification conceals the deeper educational challenges of ensuring

that digital tools benefit all pupils equally (Helsper & Eynon, 2010). This sets the stage for a critical examination of the digital native concept, challenging its broad generalizations and advocating for a more differentiated approach in educational strategies (Bennett et al, 2008; Helsper & Eynon, 2010).

The concept of the digital native, first introduced by Marc Prensky in 2001, has been influential both in popular opinion and in parts of the educational field. The term refers to how pupils today grow up with digital technology and therefore have a fundamental change in how they think and process information (Prensky, 2001a). To support his theory, Prensky refers to neuroplasticity and the human brain's ability to change and reorganize itself throughout life, resulting in physical changes in the brain. According to this theory, pupils born in the digital age receive completely different inputs than previous generations and will therefore have physically different brains when compared to those who were born outside of it (Prensky, 2001b). The older generations, who have had to adapt to the digital technology later in life, are hence *digital immigrants*, often retaining some old habits or "accent" (Prensky, 2001a). This "accent" can potentially hinder communication with the digital natives as they have developed a different language and accumulated new experiences (Prensky, 2001a). Prensky, and many others following him, have argued that teachers who are digital immigrants must adapt their teaching methods to incorporate more digital and future-oriented content to fit the language and learning style of the digital natives.

Although the concept of digital natives became popular in public and political debate, research has shown a mismatch between the confidence in which these claims were made and the evidence supporting these claims (Bennett et.al, 2008; Helsper & Eynon, 2010). A reason for why the term gained so much popularity can potentially be explained with Cohen's notion of a "moral panic", which is used to explain how an issue of public concern can achieve a prominence that exceeds the evidence in support of the phenomenon in question (Bennett et.al, 2008). Calls for change often appeal to common sense, like pointing out how different generations have access to different resources as they grow up, and they use recognizable anecdotes to call for a fundamental change in the educational system (Bennett et.al, 2008). An important question to raise is to which extent the differences between digital natives and digital immigrants can be explained by generational differences. If digital nativeness is determined by age, then older generations would be lost, and a solution to the "disconnect" between the

generations would no longer be possible (Helsper & Eynon, 2010). Research in support of the "digital native" idea tends to assign broad characteristics to an entire generation and suggests that all young people are experts with technology. Crucially, these supporters tend to ignore the complexity and diversity in the technology young people use (Helsper & Eynon, 2010).

Many researchers have pointed to the fact that young people are not a homogenous generation of digital children, and that the distinction between natives and immigrants could potentially be harmful as there might be expectations about a level knowledge that may not be accurate for all young people (Helsper & Eynon, 2010). It has been shown out that any immigrant can learn how to use the technological language with enough experience, hence the distinction between "natives" and "immigrants" becomes blurred. Any native might be an "immigrant" due to lack of experience with and of exposure of technology (Helsper & Eynon, 2010). If young people have more access to digital tools and use them often in their daily lives, this will affect their expertise, but not because they are young. Thus, while there is some anecdotal support for the concept of digital natives, more recent views agree that the difference between natives and immigrants is much more nuanced than what it was originally made out to be (Bennett & Maton, 2010; Jones et.al, 2010).

2.3 Pupils' preconditions for Game-based learning

What, then, has been said about meeting pupils' different experiences with leisure gaming in game-based learning at school? Judging by the research literature, it seems as if the focus on adapted education and games primarily has been on how games can be used to even out or meet pupils' differences in other areas. In other words, the interest has largely been on how pupils' differing skills and abilities in areas such as reading, writing or mathematics can be met through games. Games have been found to enhance motivation, concentration, and skill development, and to be especially beneficial for pupils with special needs. Games are said to provide a safe environment for tackling challenging topics and practicing social skills through inclusive learning activities that utilize visual aids, helping those with reading and writing difficulties (Statped, 2020). Furthermore, as games can allow pupils to progress at their own pace, this can facilitate adaptable and uniquely tailored experiences, which aligns with the concept of differentiated instruction and Gee's principle of multiple routes to facilitate personalized learning paths (Harmon, 2009; Gee, 2003, p.209). Minecraft has also been studied from this primarily instrumental perspective, where it has been used to motivate pupils based on their

interests and needs, and it can be beneficial for some pupils as they get to complete tasks in their own time. For example, Hougen (2023) tried using Minecraft Education as a tool to help pupils with dyslexia work with literature. Similarly, Stone et al (2019) used Minecraft as way to develop social skills amongst pupils with autism spectrum disorder. In contrast, there has been less interest related to pupils' background in gaming and how this influences their ability to take part, enjoy, and benefit from game-based learning setups in educational settings.

This is not to say that there has not been interest in children's gaming habits. Quite the contrary; for decades many researchers have studied what children do online and with games in their spare time. Research has long shown interest in how children use digital technology. Recent studies, such as those by Brevik (2019) and Medietilsynet (2022), highlight a gender divide in these habits: boys often lean towards gaming and internet surfing, while girls are more inclined to use social media. This difference is further underscored by statistics from Medietilsynet (2022), which show that 76% out of 3195 participants in Norwegian schools, between the age 9-18 play video games in their spare time. 92% of all boys play video games, while 59% of all girls play video games, which supports that there is a difference in gaming habits between boys and girls in technology usage.

Scholars have also taken interest in children and young peoples' game-related involvement outside the actual games. The concept of affinity spaces, defined by Gee (2012), refers to a "space" of people who share a common interest in something, whether it is online or offline (p.70). Different people gather in these spaces over shared interests such as video games, books, TV shows, and photography, showing how flexible the way people form groups around their interest can be. Unlike "communities", which generally involves closer ties and often requires formal membership, an affinity space is more open and accessible via a "portal", which can be any shared interest. For example, in a Minecraft affinity space, both the game itself and any related content, such as books and videos about Minecraft, can be seen as portals (Gee 2012, p.74). These portals allow individuals to enter these spaces where everyone, irrespective of their race, class, or gender, is welcome. Inside affinity spaces, the level of knowledge and engagement can vary significantly. Some participants may have a deep understanding of the mechanics of a game, while others might only have a general knowledge about the game. The variety of people and their knowledge makes the space better, allowing everyone in a space take part and share what they know, whether it is giving expert tips or just having friendly chats

about the topic (Gee, 2012, p.78). For example, if someone encounters a problem in Minecraft, they can seek help within the affinity space by looking up guides on YouTube, or on any forums related to the topic. When someone within space has already provided the answer, it can show *tacit knowledge.* Tacit knowledge can be seen as doing something through trial and error, or by watching others (Gee, 2012, p.78). There are multiple ways to participate in an affinity space; while various portals can grant you access, participation in the space can vary from person to person (Gee, 2012, p.78).

The way people participate in affinity spaces shows us not just how diverse their knowledge and engagement are, but also points to larger issues about who can access digital spaces and technology. Socioeconomics plays a crucial role in deciding what digital technologies individuals can access, affecting their ability to engage fully with digital spaces including gaming, educational software, and online resources (Scholes et al, 2022, p.3). For instance, during the COVID-19 pandemic, differences in access to necessary technology impacted the ability of some students to continue their education online while others faced challenges due to limited access to technology (Scholes et al, 2022, p.3; OECD, 2020, p.2). These differences extend to how students interact with digital technologies at home, as shown by the Program for International Student Assessment (PISA) results. Students with access to a larger group of digital technology generally performed better than those with limited access (Scholes et al, 2022, p.3). This example shows how socioeconomic factors can influence one's engagement and success within digital platforms, impacting their educational potential and more.

Like socioeconomic factors, gender stereotypes also impact the engagement within digital areas, affecting how different genders access and participate in various digital activities. Previous research has shown that gender stereotypes related to interests can limit student engagement in these spaces (Master, Meltzoff & Cheryan, 2021, p.1; Scholes et al, 2022, p.3). It is possible that boys' higher engagement in gaming may advance their digital skills more than girls, potentially encouraging the boys' long-term involvement in digital activities (Scholes et al, 2022, p.3; Wong & Kemp, 2018, p.302). Many young boys identify as gamers, as the gaming culture is typically seen as a male-dominated space, which can be unwelcoming to girls. The common stereotype is that girls are less interested and less skilled in gaming, and more likely to face harassment and exclusion, which might be a factor that keep them from getting involved in gaming (Fisher & Jensom, 2017, pp.89-90; Scholes et al, 2022, p.3). When

students begin to believe that their abilities are defined by their gender, it can cause them to perform below their potential, especially in areas where they have self-doubt (Scholes et al, 2022, p.4).

Each pupil is unique; some are highly experienced at video games, while others have hardly played at all. Some pupils have knowledge about games but have little personal experience with them, while other pupils have grown up in environments where gaming is the number one free-time activity. Some pupils have had access to their own consoles at home, while others do not (Manger 2015, p.243). All the factors above illustrate how individual pupils' preconditions are influenced by their different experiences and circumstances.

The central theme for our project is the significance of pupils' preconditions when they meet game-based learning in school. As shown, preconditions depend on a whole range of factors, including socio-economic and gender factors, attachment to affinity spaces, and more. These factors determine the extent and ways in which person engages with games: their exposure, experience, skills, and much more. As such, it may be relevant to draw a parallel to the concept of literacy, and to whether a term like *game literacy* may be of use.

Historically, literacy has been considered to be the ability to read and write. Over time this definition has been added to, and literacy is now understood as a means of identification, understanding, interpretation, creation, and communication (UNESCO, 2024). This extends to a larger set of skills which include digital skills and media literacy. In a world that is increasingly more digital, being digitally literate is important when engaging with digital technologies, and developing digital literacy involves adopting a critical mindset, which will build resilience when facing the large amounts of information that is online (UNESCO, 2024). Game literacy, then, can be seen as a more specific form of digital literacy which delves deeper into the knowledge and skills that are developed by playing games. Where digital literacy is required in order to be considered digitally competent, game literacy is required to understand and interact with game mechanics and narratives to complete game-based tasks (Li et al, 2024; Skaug et al., 2020; Zagal, 2008; Zimmerman, 2008). Many of the skills required to be digitally literate also apply to game literacy, such as critical thinking, communication, collaboration, and

problem-solving (Li et al., 2024; Tinmaz et al., 2022), but game literacy directly affects the effectiveness of game-based learning and game-based assessment tools (Li et al., 2024).

Applying the term game literacy allows a closer inspection of the range of factors that can affect a person's ability to perform in a game, which again can influence their enjoyment and interest in playing it. These extend to various abilities such as technical skills, physical skills, and game understanding. First, understanding how to use the tools required to play the game (e.g. a controller or keyboard and mouse) is crucial for being able to navigate the game (Skaug et al., 2020; Zagal, 2008). This can both apply to getting around in the game and being able to navigate the interface. Being able to recognize patterns is also important as similar solutions can be applied to different challenges within the game. Additionally, recognizing patterns across games can give players a better starting point and will make the transition from one game to another much smoother. Knowing the lingo of the game is relevant for understanding how to complete tasks and will be beneficial when communicating with other players (Zagal, 2008). Finally, game literacy is not just about a person's abilities to play the game, but also about being able to think critically about the game and see it in relation to the culture it was made in and ask questions about the message it is trying to convey (Skaug et al., 2020). As such, game literacy encompasses a wide range of skills and attitudes.

The concept of *self-efficacy* seems appropriate in discussing why pupils' game literacy and preconditions matter in game-based learning environments. Perceived self-efficacy is people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives (Bandura & Wessels, 1994, p.1). Self-efficacy determines how people feel, think, behave, and motivate themselves, and people with high self-efficacy can enhance individual accomplishments and personal well-being in many ways (Bandura & Wessels, 1994, p.1). Being able to approach a challenging task instead of avoiding it shows intrinsic interest and immersion in the activities and people with high self-efficacy can heighten and sustain their efforts in the situations where they encounter failure. When encountering a situation that threatens their self-efficacy, they can exercise control over it and can reduce stress and produce personal accomplishment (Bandura, 1994 & Wessels, p.1). On the opposite end, you have the ones with low self-efficacy. They doubt their capabilities and shy away from difficult tasks when they approach (Bandura & Wessels, 1994, p.2). When those with low self-efficacy are confronted with challenging tasks, they tend to focus on their own

weaknesses, the obstacles ahead, and potential negative outcomes, instead of putting effort into figuring out how to succeed. When working on difficult tasks, they give up quickly, and are slow to recover their sense of self-efficacy following a failure or a series of setbacks and since they see their underperformance as a lack of ability, they quickly lose confidence in their skills (Bandura & Wessels, 1994, p.2). One may imagine, in a classroom using Minecraft Education as the game, there are two pupils: one with high self-efficacy and one with low self-efficacy in terms of their perceived abilities. The pupil with high self-efficacy embraces the challenge of building structures in Minecraft. Their confidence allows them to experiment and learn through trial and error, enhancing their understanding of how to be more effective in the game and boosting their self-efficacy further. On the other hand, the pupil with low self-efficacy feels overwhelmed by the same task. When starting, they doubt their ability to create a structure in Minecraft and become discouraged by making mistakes, which reinforces their negative self-view. The success of the pupil with high self-efficacy could be connected to socioeconomic factors, access to various digital technologies at home, and being male. In contrast, the struggles of the second pupil could be linked to not having access to game consoles at home and being female, which ties into gender stereotypes and may contribute to self-doubt in a male-dominated arena.

In sum, the literature identifies several factors that ideally should be considered in order to include pupils' backgrounds and preconditions in game-based learning in the classroom. Factors related to access to technology, technological infrastructure and learning environments play a part, but equally important are the individual and out-of-school gaming experience of the pupils. Different levels of game literacy will affect individual abilities for navigating and understanding both game mechanics, forms of communication and narrative structures within games. Socioeconomic status and gender also play a critical role in determining access to digital technologies and affinity spaces. All these differences can affect how engaged and successful pupils are in game-based learning settings, potentially impacting their educational benefits and learning outcomes from game-based learning activities in school (Li et al., 2024; Master, Meltzoff & Cheryan, 2021; Scholes et al., 2022; Zagal, 2008; Zimmerman, 2008).

There is still a scarcity of empirical studies that set out to explore the connections between individual pupils' gaming experiences and game-based learning. A better understanding of these connections could improve the chances of success with game-based learning setups in the classroom for both teachers and pupils. Recognizing the variance in pupils' preconditions can be an important part in developing educational practices that are inclusive and effective for all.

3 Materials and methods

In this chapter, we will detail the materials and methods we used in order to collect data for our project. First, we present the research design, and explain the decision to apply a mixed-methods approach for data collection. Next, we address the process of selecting participants, and the choice of Minecraft Education for our project. We outline the lesson plan before moving on to explain the process of data analysis and the score system we developed to make the data measurable. We showcase some examples of what the participants created and explain how their scores were set. Finally, we turn to issues regarding research quality, focusing on reliability, validity, and research ethics.

3.1 Research design

We used a mixed-method design for our project to address our research question, which involves utilizing both qualitative and quantitative methods to collect data (Creswell & Gutterman, 2021, p.595). Integrating both qualitative and quantitative methods offers a more comprehensive understanding of the research, instead of just relying on one or the other. When using mixed methods, researchers have to analyze quantitative and qualitative data by merging and combining the data collected from the different methods used. This approach is suitable when a single type of research is not enough to address the research question, and when researchers aim to present different perspectives (Creswell & Gutterman, 2021, p.595).

We decided to use mixed methods because we wanted more than just written responses regarding pupils' capabilities playing video games. Instead, we aimed to observe their actions within video games in an educational setting. If we were to only rely on written responses or in-game actions, we would lack comparative data. Hence, selecting a mixed-method design offered us a more suitable approach to our research objectives. We decided to use a questionnaire to collect quantitative and qualitative data from a larger group of participants. Furthermore, we had pupils play Minecraft Education as we wanted to see what they were able to do in the game connected to their previous gaming experiences. Lastly, we had the pupils provide us with written feedback where they would provide us with their thoughts about using Minecraft in their lessons, and their thoughts about the project.

Our research was conducted in three different classes and two different grades: two 6th-grade classes and one 7th-grade class. Data collection happened within their classrooms, with their teachers collecting the data on our behalf, while we were available should anything happen. The school provided the necessary equipment for our data collection as every pupil at the school had their own computer, and because we used Minecraft Education everything required for the project was already installed.

3.2 Selection and recruitment

To gain access to participants, we used the gatekeeper approach to strategically reach our target audience. This approach involves that one person has a social connection on the inside, which can give access to informants (Gleiss & Sæther, 2021, pp.41-42). A problem that can occur when using the gatekeeper method is that the participants, in this case the pupils, can be hesitant to share their critical views because they can think that we will share the results with the "gatekeeper" who is letting us into the class (Gleiss & Sæther, 2021, pp.41-42). In an attempt to avoid this issue, we did not include any questions related to the teacher or any others who work at the school.

As one of us has worked at a school for several years already, we decided to ask the principal at that school if we could conduct research there, in fifth grade and up. After the principal approved our request to conduct research, we contacted the teachers in sixth and seventh grade, presented our project, and they allowed us to conduct our project in their classrooms. We then scheduled a meeting with them to discuss our project. During the meeting we discussed our research question, what we are looking for, and how to easily collect the data in a way that ensured the pupils' anonymity.

3.2.1 Picking a suitable game

When considering what game we wanted to use for our project we thought about multiple different games, e.g. *The Wolf Among Us, Portal, It Takes Two*, and other similar games. A common structure for these games is that the players are limited to a linear path from beginning to end. However, as most of these games cost money, take up a lot of space on the computer, and often require a third-party account, we decided not to use any of them. Minecraft Education was then brought to our attention, which is included in the Office365 package, and is something most schools have access to. This means that pupils can download Minecraft on their computer via the package and can get access with their school username and password. In the end we

settled for Minecraft Education as it would be the simplest option to avoid privacy concerns related to third-party accounts as well as monetary concerns, as they already have access to the game.

3.2.2 Pilot test

When we believed we had crafted a questionnaire capable of collecting the desired data, we conducted a pilot test with ten participants to assess the clarity of the questions and whether respondents were able to provide the desired answers. We recruited participants from our friend group, which means that the participants who tried the pilot test were around the age of 20. Therefore, it remained uncertain whether the questionnaire's target group would interpret the questions in the same manner as our friends who participated. In the end, we got some feedback and some suggestions for change. Some centered around changing questions to provide more clarity and others centered around adding response options to provide more accuracy.

We also conducted a pilot test in Minecraft to see if our task was understandable, and if the pupils would have enough time to build what they wanted to. However, we had limited time and got only one participant before starting our project in the 6th grade. Since our project would be conducted in the 6th grade a few weeks before the 7th grade, we assigned the same task the 6th graders would receive to the friend who pilot-tested. Their task was to create something in Minecraft related to "Transportations: important inventions".

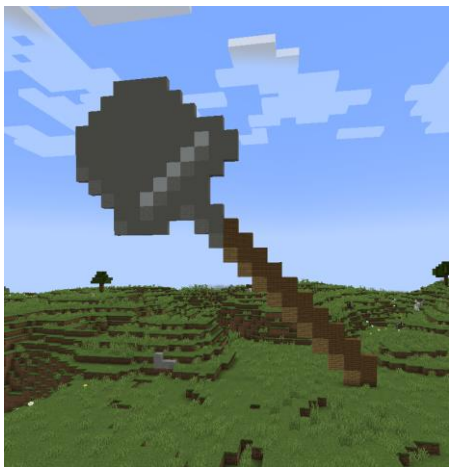

Figure 1: The misunderstood task

Our participant misunderstood the task and focused only on the important inventions rather than the transportation aspect. This error made us review our lesson plan provided to the teacher and engaged in a discussion with them to clarify the focus before proceeding.

It is important to note that if we had conducted our pilot tests on the target group, we would likely have received better feedback on how to improve our task and tailor it more towards their needs.

3.3 Lesson structure

At the lesson's start, the pupils completed a questionnaire about their previous gaming experience. Questionnaires give an opportunity to collect quantitative data which can give knowledge about a much broader selection of people compared to what qualitative data might give (Gleiss & Sæther, 2021). One important thing about a questionnaire is to make sure that it gives the researchers the information they want, while also being something that the participants can easily answer (Gleiss & Sæther, 2021). What type of answers a researcher gets will depend on the questions they ask, things such as how the questions are formulated, if the questions have open or closed alternatives to choose from, and even the order of the questions can all affect the result. After completing the questionnaire, the researcher then has to consider how to analyze the answers, what analysis to use will depend on the answers received, which were a result of the questions that were asked (Gleiss & Sæther, 2021).

The questions in the questionnaire were loosely modeled on the questions used in the national survey *Barn og Medier* (Medietilsynet, 2018; 2022), with some additional questions targeting the data we aimed to collect. We used a combination of both open and closed alternatives. The questionnaire could be split into about three equal parts where the first and second thirds had closed answers, while the final third had open answers. The first third had questions regarding how much they play games, how social they are when playing, and how many people around them play games. Here they would answer "yes", "no", or "I don't know". The second third had statements where the participants would answer on a Likert-scale how much they agree or disagree with it. The Likert-scale can be used in quantitative research to measure attitudes. It involves respondents selecting between different options on a scale, where the respondent answers what to what degree they agree with a given statement (Gleiss & Sæther, 2021, p.154). Our scale had five options that went from negative to positive with a neutral option in the middle. It also had a sixth option for those who did not know what to answer or did not understand the question. The final third had some open questions about what type of games they typically play, what they think about using games in school, and what games they would consider using in class.

As the pupils were going to make their own codenames for the project in the questionnaire, we asked the teacher to go through at the beginning of the class how they were going to make their own code. The formula for the code was that the pupils had to use the first two letters of their father's name, followed by the two first letters of their mother's name, ending the code with their own birth date.

The task was to build something connected to an earlier topic in their English course, so the sixth graders had to build something connected to transportation – important inventions, while the seventh grade had to build something connected to movie reviews. For the movie review they had watched *Home Alone* and so it was decided that they would build something from the movie.

When we made the teaching plan, we set some loose criteria we wanted the pupils to follow. We did not want to restrict them too much as we thought that by giving them a lot of freedom, we would be able to see bigger differences in how well their product was made. We landed on giving them two primary criteria: they had to use at least five different blocks, and they had to keep it realistic. What we meant with realistic is that it needed to be made in way where it could "exist" in reality. This was added as we also gave them the opportunity to add fantasy elements to their product, for example wings to a car to make it a flying car. The reason we allowed the fantasy element was because we hoped it would facilitate more creativity.

The pupils completed the task on a laptop, where some of the pupils used the touchpad, some used the touchscreen, and some used a mouse. All the pupils had access to the internet and their course book if they wanted to look up pictures of what they wanted to make. Nevertheless, they had to use their own abilities to put this into Minecraft the way they wanted.

Due to the limited time, we decided to make them build their project in creative mode, where they have access to unlimited blocks/resources and the ability to fly. In the main game mode, survival mode, they would have had to gather up all their resources to build something, so having access to all blocks saves a significant amount of time. The ability to fly is also beneficial as in they would usually (i.e. in survival mode) be limited to walking and jumping, and flying

can help save time when building projects that require some height. Additionally, flying is faster than walking so it saves time getting around. We thought that survival mode could let the pupils show off their skills much more, but due to the strict time schedule, we had everyone play in creative to ensure everyone completed the project in time. We believed that letting them play survival would result in them spending too much time trying to gather materials before being able to build what they wanted. We did argue that the resource gathering part might let the pupils show off more of their previous gaming experience as it would be even more difficult to complete everything within the given time frame, but we decided that the building part was the more important part of the project.

When the pupils had finished building their project in Minecraft, they filled out a document giving us information about what they had made. The document had questions about the project and it had them describe the product they had made. To describe the product, the pupils took screenshots of their products and put them into this document. Additionally, they wrote what exactly they had built so we knew what we were looking at in case they had built something we did not recognize. We made sure to show the teachers how to take screenshots in various ways beforehand so they could show the pupils. Having multiple screenshot options was also beneficial in case there were issues with one of them.

In addition to the information about what they had built, they gave us information about why they decided to create what they did. Additionally, they told us whether they had enough time to finish, what would they do if they had more time; would do anything differently, whether they had any issues making their product in Minecraft; whether they enjoyed the project, and lastly if they had anything else to comment on. This was the last segment of our project, following this we had to find a way to analyze all the data that was collected.

3.4 Data analysis and score system

3.4.1 Questionnaire

To see what kind of gaming experience they had we looked at what they had answered on select questions in the questionnaire. These were questions regarding how much they played, if people around them played, and if they felt they were able to use their experience in school.

Then, to see what attitudes they have towards games we looked at the statements that were made by using the Likert-scale. On the scale the different options from the respondents to choose from were don't know, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, and agree. Depending on what they picked here, they could score from 0-4 points on their attitudes towards video games. If they picked that they disagreed they would score zero points, somewhat disagree they would get one point, neither agree nor disagree would score them two points, somewhat agree would score them three points, and lastly agree would score them four points. We had one question where the score was reversed, which was about how much time they spend on video games. The statements we had made were statements regarding learning English from games, learning from games in general, and using games as a method for learning.

3.4.2 Document

We created a score system for the document the pupils provided us with. The first question in the document was about what they had built, and why they decided to do this. We did not give them any score on these questions, however when it came down to them reflecting if they had enough time and if they would do something different, they could score points. If the pupils wrote that they did not have enough time to finish, they scored zero points. If they said they did not have time to finish but got close to finishing, they scored one point. Lastly, if they said they finished, and the product looked complete, they scored two points. They were also asked if they had any issues playing Minecraft Education, such as movement, finding the correct blocks to build with, not figuring out what to build, etc. They did not get a score based on the answers for this question, but we wanted to see if there was a general understanding of how to play Minecraft, or if there were any issues that we were not aware of that would arise. A question asked later was if they enjoyed the project, if yes, why? And if not, why not? If they provided a negative answer, they would score zero points, a neutral answer would provide one point, and a positive answer would provide two points. Lastly, we had a question about whether there was

something else they would like to comment on. We assumed that the pupils would write longer answers, giving us more details about their thoughts. However, most of the answers provided consisted of one word, or one sentence, providing us with minimal data for analysis.

3.4.3 Minecraft Products

We made a score-based system to give each Minecraft product a score. The score system was created because we needed a method to evaluate the various products submitted. By applying the same criteria for every submission, we made sure to have a consistent scoring process across all the projects, ensuring fairness and equality in the evaluation. However, when developing these criteria, we know that they may not be perfect for evaluating Minecraft products. Nevertheless, we needed a framework to use for evaluation. There are probably multiple approaches to assess different projects, but we opted for this way. The scoring system ranged from zero to ten points. When we looked at the products, we both sat together and discussed them until we had an agreement about what score we would give them in each category.

There were four themes for scoring. The first theme was block-usage. The pupils had to use at least five blocks to earn points. If they used less than five blocks, they would receive zero points. Using exactly five blocks would earn them one point. Using five blocks and more variety would earn them two points. The next theme was to what extent they were able to follow the given theme that they worked with. If they built something within their theme, they would score a point, but if they decided to build something different, with no connection to their theme, they would not score a point. We had a criterion that their product should be realistic. For example, if they made a flying car, they would have to give the car a way to fly, such as giving it wings. They could score between 0-5 points on realism, depending on how realistic the product was. The last theme they could score points on was time evaluation, where we looked at if the pupils were able to finish the product they made or not. We scored their time evaluation by looking at what they said in their text. If they said no to whether they had enough time, they would score zero points. If they answered no, but we could see that they had made good progress on their building, they would score one point. If they wrote that they had enough time to complete their project, they would score two points.

3.4.4 Minecraft Product examples

Minecraft Transportation example 1

The first example presents a product that scored low. Looking at the pictures we see that they only used five blocks, and there is little variation in block type. This earns them one point in the block category. The pupil named this project “a one-room valentine restaurant in water”, a concept that does not match with the transportation theme they were supposed to follow. This results in a score of zero in the theme category. We concluded that this structure was not realistic, resulting in a score of zero for realism. Lastly, the pupil wrote in their document that they did not have the time to complete the project, earning them zero points in the category of time management. In total, this pupil scored one point.

Figure 2: A one-room valentine restaurant in water - inside

Figure 3: A one-room valentine restaurant in water - outside

For the next example we present a product which scored a low overall score, but unlike the previous example, this one followed the task's theme. This one was titled "bus in a mountain". When looking at the product (in the picture below), we are only able to count four different blocks in the structure that they have made, leading it to score zero points on block-usage. They have scored one point on following the theme, even though it is only a small portion of the bus. For realism we had to discuss if this can exist in the real world, and we decided to give it one point because it could have crashed to end up there. Lastly, the pupil said that they did not have enough time to finish, and so we decided to give zero points for time evaluation. This project scored two points.

Figure 4: Bus in a mountain

Minecraft Transportation example 2

For an example of something that had a score in the middle of our score system, we look at an ice cream truck. In terms of blocks used the pupil has used more than five, but they are all the same block type in different colors, leading us to only give the product one point for block-usage. For the theme, we have given it one point. For realism, we give it two points, as it looks like an ice cream truck, but lacks some elements to make it score higher in this category. It looks like it would fall forward as the wheels are placed too far back, fixing this could have given it a higher score. Additionally, having some windows on the side, could also have made it look more realistic. For time evaluation, the pupil said they finished the project within the given time, giving them two points in this category. In total the ice cream truck got six points.

Figure 5: Ice cream truck

Minecraft Transportation example 3

For the last example with the Transportation theme, we highlight something that scored a max score. This pupil wrote that they made a bus. Looking at the image we can see that they have used five different blocks, but also blocks from different categories, and not different colored blocks of the same type. They are able to create a lot of variety by using differently sized blocks in their project, making it more detailed. The pupil scored two points on block-usage. They have followed the given theme, scoring one point. For realism, we have given them five points. This is a picture where the bus has come to a complete stop as a pedestrian is crossing the road, giving it a strong sense of realism. The pupil wrote that they had enough time to finish their project, scoring them two points in this category. This resulted in max score, which is ten points.

Figure 6: Bus

Minecraft Home Alone example 1

For the first *Home Alone* example, we highlight a product that received a low score. In the screenshot, the pupil who created it claimed it is Kevin's house from the movie. However, it looked more like a ruin than a house. They used less than five different blocks, resulting in a score of zero points in this category. The pupil who created this house followed the theme, which was *Home Alone*, earning them one point. In terms of realism, we believe that this building could exist in the real world as an ongoing building project, scoring them two points. However, when evaluating their time management, the pupil received zero points. This was because they started on a project that would require more time to finish than the time they were allocated. In total, the pupil scored two points.

Figure 7: Kevin's house

Minecraft Home Alone example 2

In the given example, we can observe someone who has scored in the middle of our score system. Once again, we are looking at Kevins house from the movie Home Alone. When we look at block-usage, we can see that they have used more than five blocks. However, we did not give them the extra point here for using variation with the blocks, as they are using the same pattern repeatedly. They have followed the given theme, which gives them one point.

Following this we gave them three points on realism, as this house could be something that could exist in the real world, where they would finish building the house on a building site.

We gave them one extra point because of how the house structure is. When compared to the picture above this pupil has focused on finishing one side of the house, giving us a presentable house to look at. As for their ability to evaluate time, we can see that they have started on a project that is too big, which shows that they are not able to properly evaluate their time. They also wrote that they did not have enough time, and so we scored them zero points. In total this got six points.

Figure 8: Kevin's house

Minecraft Home Alone example 3

For our last example from the Home Alone projects, we have something that scored the max score. For block-usage we can see that they have used more than five different blocks, and they are using blocks from different categories. They have also used some of the smaller blocks to make curbs, and they have used small blocks on the car to make it have a more realistic effect. This scores them two points. When it comes to following the theme, we can see that the pupil has done that, scoring them one point. As for realism, this has scored five points, where this

could exist in the real world. The pupil said that they were able to finish the project in time, scoring them two points. In total this product got ten points.

Figure 9: Kevin's house + airport express

Figure 10: Airport express

3.5 Research quality

Reliability is a term that refers to whether the research is trustworthy (Gleiss & Sæther 2021, p.202). It is normal to ask two questions when looking at reliability:

1. **How can the collected data have been affected by the way it was collected?**
2. **Can the results be reproduced by other researchers?**

To answer the first question, researchers normally assess different research effects and biases that can occur. These may amount to questions regarding whether participants in the research have been affected by the researcher's presence; how questions are asked in an interview, or whether the coding of the data has been affected by the researchers' subjective approach (Gleiss & Sæther 2021, pp.202-203). To ensure reliability, it is important to explain exactly how the data was collected and analyzed. There are two perspectives on this, where one perspective hold as a criterion that repeating the research should produce the same results, and the other suggests that doing the research again might not always give the same results due to subjective differences (Gleiss & Sæther 2021, pp.202-203). We did not take any explicit steps to ensure the reliability of the various elements in our project. There is a possibility that some elements can affect the scores. In our situation there were multiple factors that make it difficult for others to replicate it exactly. Factors out of our control gave some of the pupils more time and others less time, and some worked together, despite the project being done individually. What this means is that we do not get to see the individual pupils perform within a given timeframe as we wanted, and instead we see pupils who worked together and got enough time to finish what they started. Overall, this affects the variability in the project and makes it harder to generalize the results. However, it is unlikely that the data would lead to different ideas and conclusions.

Validity relates to the quality of data interpretation by researchers and the conclusions drawn from it (Gleiss & Sæther, 2021, p.204). Did the researchers select a method and participants capable of addressing and responding to the research question? Upon analyzing our data, the pupils were sorted into groups based on their playtime. This resulted in some groups being larger than others, which could lead to a singular pupil having more impact than others when looking at the collected data. For instance, in one scenario, one group consisted of just a single pupil who would represent 100% of the scores in their group. Additionally, as the groups were small, even in the groups with multiple pupils, a singular pupil would impact the results significantly.

Some pupils got more time and others less, while some worked together. Additionally, the difference in tasks added a layer of complexity which could influence the performance of the pupils. This can affect the validity as the outcomes can be attributed to the extra time or the help from other pupils. This also makes it hard to generalize as it might not be representative of other pupils who complete the same project.

3.5.1 Ethical considerations

The researcher has ethical obligations towards research participants. Informed consent, confidentiality and anonymization are all crucial factors in order to avoid negative consequences for the participants involved in the study (Gleiss & Sæther, 2021, p.43).

Informed consent is a fundamental principle in research (Gleiss & Sæther, 2021, p.44). Participants should be able to say yes or no without facing any negative consequences, which means that the collection of data must be voluntary, informed, unambiguous and documented. Participants must be informed about how the data is collected, how and for how long personal information will be stored, and who has access to information about them. When participants have all the knowledge mentioned, they can be called informed. Participants in a research project must be able to express that they understand the information given to them and be informed that they can withdraw without any negative consequences. All information given to the participants must also be formulated in a way that is understandable by the target audience. Documentation of consent is usually done with a written consent form (Gleiss & Sæther, 2021, p.44). When participants of a research project are under the age of 15, they need consent from their parents to be able to participate in research (Gleiss & Sæther, 2021, p.44).

Considering that our research involved 6th and 7th graders, it is essential to recognize that children of this age might not fully understand everything written in the consent form and will still choose to participate in the project. Because we had children under the age of 15 participating, we needed the consent of the parents. Even if the parents gave written consent, the children could still refuse to participate. In our project, we tried to write a consent form understood by parents and participants. The form had information about what the project was about, and we gave both parents and participants the possibility to contact us if they had any questions at the end of the form (See appendix 1).

The second principle is confidentiality and anonymity. Confidentiality means that personal information provided by research participants is not made public. However, complete confidentiality is not possible, as there will be quotes from research participants in the published thesis. Confidentiality involves limiting who has access to the data and anonymizing research participants, making it impossible for other people to trace the information back to participants (Gleiss & Sæther, 2021, p.45). We did not need to contact Sikt for our project, as they stated that if we only process anonymous data, we would not need to notify them about our project (Sikt, 2024). In this scenario, the data we collected for our project is not traceable back to the participants, ensuring their anonymity.

The participants had to make a code that followed them through the entire project. This code was designed to keep participants anonymous throughout the project, ensuring that we would not be able to know who provided which response. For example, a code could look like this: BEOT21. The only ones who have access to the data that participants provided are the two of us who are writing the thesis together.

4 Findings

This chapter presents the analysis of the data we collected. As previously mentioned, scores have been given to the participants' answers in the questionnaire, their products, and the answers in their document. Further on, the scores were split into four categories, three of them representing the pupils' preconditions, and the last one representing their ability to perform in Minecraft. Additionally, the pupils were split into groups based on their playtime. The scores representing preconditions, and the score representing the product have been compared to each other. Also, the playtime was taken into account as this would also be seen as a precondition. To visualize the data, it has been put into graphs.

In the questionnaire the pupils were asked how much time they spent per day on average on playing games. They were then divided into groups based on their answer. Those who played 0-1 hours per day were assigned to group A, those who played 2-3 hours to group B, and so on. None of the pupils reported to playing 6-7 hours, however, some pupils reported playing 8+ hours per day and were therefore assigned to group E (rather than to F based going by the logic of the previous group). The pupils were assigned to groups based on playing time as there is reason to assume that more time spent on playing corresponds to more experience with games. We also assume that those with higher scores of playing hours also score higher on preconditions.

There will be a total of four different graphs for every section: Attitude towards the project (*Attitude to Project*), the product itself (*Product*), their previous experience (*Experience*), and their attitude towards games and using games in education (*Attitude to Games*). It should be noted that *Attitude to Project*, *Experience*, and *Attitude to Games* all belong to a "Precondition" group and will later be compared to the *Product* graph. The data has been split into three main sections: the sixth graders, the seventh graders, and both combined so results can be compared across grades. In the combined section the data will be looked at side by side as if the participants were two separate groups, and combined as if they were one large group. Each section is then split into two main parts. Part one delves into the four different categories and analyzes each graph individually. Part two compares the graphs in the *Precondition* group to the *Product* graph.

The main reason to keep the two groups separate was the big difference in time they were given. The sixth graders were given extra time due to some circumstances out of our control, while the seventh graders were given a strict two-hour timeframe. This extra time could allow the sixth graders to refine their projects much more. Evaluating both together could lead to biased comparisons or evaluations. Another reason to keep them separate was because they had different themes when completing the project. There could be differences in how easily a theme is understood which could then result in situations where some pupils are unable to build due to a lack of understanding, and not due to a lack of skill.

All the graphs presented follow the same system; Group A is green, Group B blue, Group C yellow, Group D orange, and Group E black. The scores will first be showed off next to each other, but due to the difference in potential max score they are also split into individual graphs to make it easier to see the difference within each category (e.g. *Attitude to Project* had a max score of 2, while *Attitude to Games* had a max score of 34).

4.1 Sixth graders

In the sixth-grade group there was a large variety of transport vehicles and almost all the pupils had been able to complete what they wanted to build. Most of the pupils had built something that followed our rule realism, while others had taken the creative liberty to do whatever and call it a car or a boat.

Appendix 6 shows how many pupils there were per group. There is a difference in participants per group, especially Group B with eight pupils and therefore four times the amount of Group D with only two. In total the sixth graders were 22 pupils.

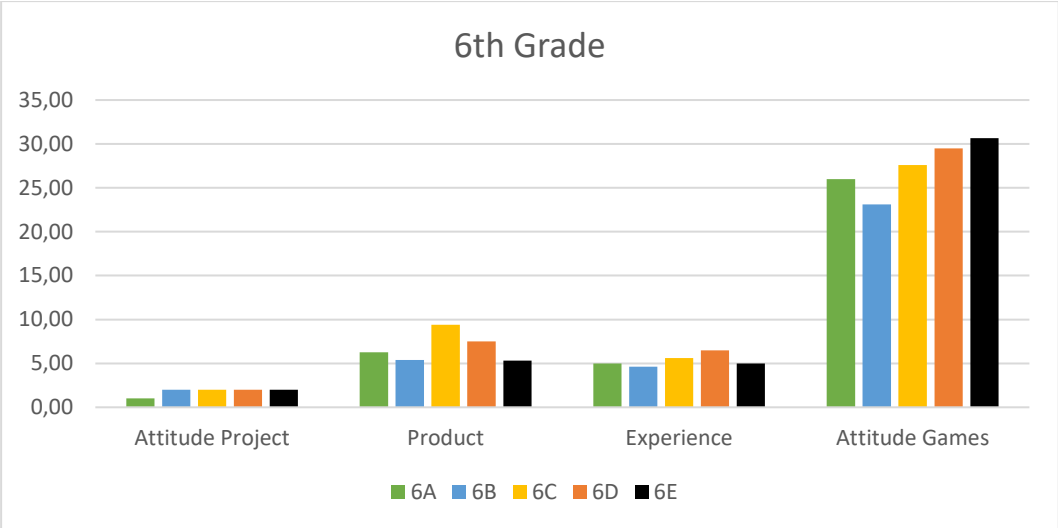

Figure 11: 6th grade all categories

As the graphs show, there are some notable differences within all categories. One of them is the score Group C got in the *Product* category, because it is higher compared to the others. Another one is Group B in the *Attitude to Games* category, as it is the lowest of them all. These differences will be addressed in the coming chapters.

4.1.1 Attitude to games

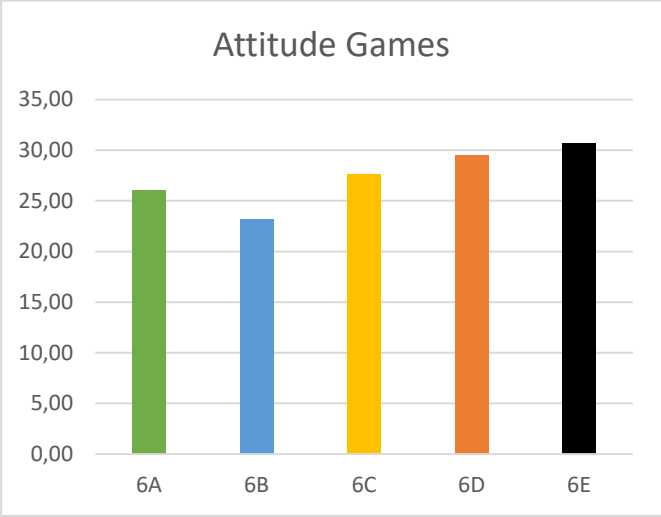

Figure 12: 6th grade Attitude to games

The graphs show that the pupils who play the most (Group D and E) also have the best attitudes towards games. Despite spending the least amount of time playing, Group A has a better *Attitude to Games* score than Group B. However, the time difference between Group A and Group B is only about an hour. Based on this there seems to be a trend where the more time you spend playing, the better your attitudes are towards games.

4.1.2 Experience

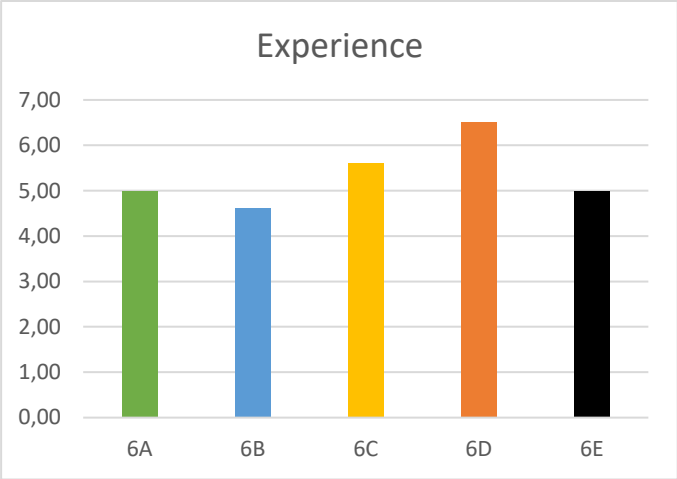

Figure 13: 6th grade Experience

Overall, the scores are close and hover around five points, with Group B being slightly lower and group C being slightly higher. Group D is above the 6-point score, making it stand out compared to the rest.

Had Group E been around the same score as Group D it would have been possible to say that there might be a connection between gaming experience and the amount of time pupils spend playing games. But with the highest scoring group being the one that spends the 2nd most amount of time playing games, there seems to be less of a connection as we might have thought. This becomes even more true when we take into consideration that Group A has a slightly higher score than Group B, which means that despite having more experience with games, those in Group A spend less time playing than those in Group B.

4.1.3 Attitude to project

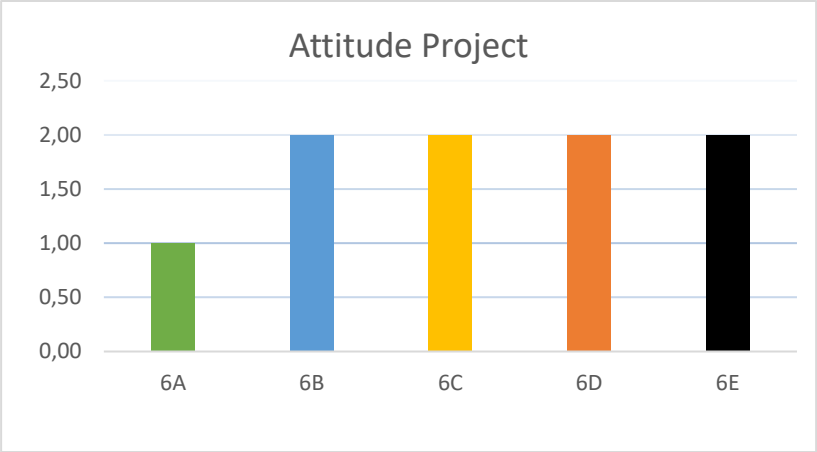

Figure 14: 6th grade Attitude to project

To measure the pupils' attitude towards the project they were asked whether they liked what we had asked them to do. The question was "Did you enjoy this project? If yes, why? If no, why not?". We gave them scores based on how they answered, where a negative answer would give zero points, while a positive would give two points and a neutral would give one point. In Group A two of the pupils gave negative responses, and those two were the only pupils in the entire class to say they did not like the project. All the others simply answered yes (counted as a positive response) or stated that they liked it.

There seems to be a connection between amount of time spent playing games and liking our project. It is possible to say that because the only ones who gave negative answers were the ones who spent the least amount of time playing. However, considering that Groups B through D all have the same score, it is also possible to say that there is no connection between playtime and attitude to project. This is because the difference in time spent between Group B and Group D is so large (1-2hr -> 8+hr), and the score is still the same.

Ultimately it is difficult to analyze any data from this as only two out of 22 pupils gave answers that could be considered as anything but positive. It is therefore likely that the phrasing of the question might have been difficult to understand; they simply did not care about giving a more detailed answer, or there were other factors that played an important role in why most of the pupils simply answered yes. It is also highly possible that they all liked the project and those two were the only ones who did not.

4.1.4 Minecraft product

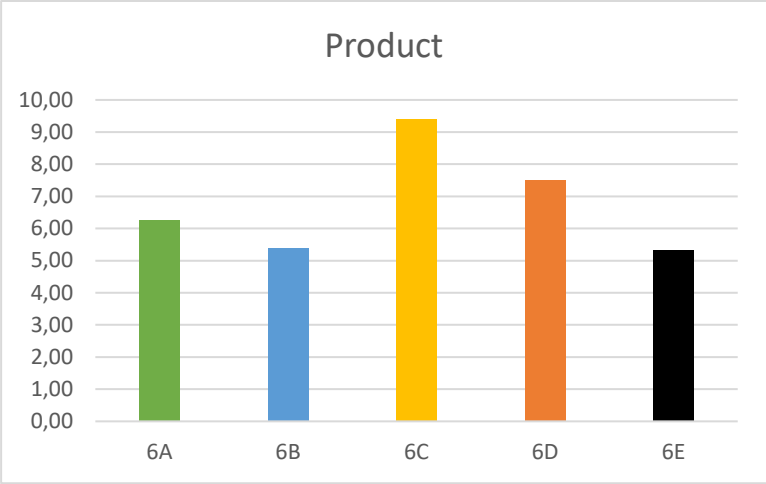

Figure 15: 6th grade Minecraft product

The average score is 6,6. However, Group C is contributing massively to that score, and Group D and Group A are only somewhat close. Group B and Group E are significantly lower compared to the average. Appendix 6 shows that three out of four perfect scores were in Group C.

Group E has a total score of 5.33, while Group B has a total score of 5.37, meaning that despite playing the most, Group E has the lowest score of them all. Appendix 6 shows that the highest score in Group E was a seven, and one of the pupils only got three points, which is one of the lowest scores overall. Based on this it is difficult to say whether there is a connection between playtime and ability to create a product in Minecraft.

4.1.5 Sixth grade: Comparing Preconditions to Product Outcomes

The graphs have shown that pupils belonging to Groups A and B have low Precondition scores as well as low Product scores. Groups D and E have high *Precondition* scores, but only Group D did well in Product category, where Group E got the lowest score out of all the groups. Group C had a medium to high score in the *Precondition* group and had the highest score out of them all in the *Product* score.

Groups A and B got low scores in all the categories belonging to the *Precondition group*, as well as getting a low score on their *Product*. This can indicate a lack of preparedness or foundational skills that affected their performance in making the product. This suggests that

preconditions had an influence on the final outcome for these groups. Groups D and E both have high *Precondition* scores, but their outcomes in the *Product* category differ significantly. Group D performs well, which suggests that good initial conditions, such as good foundational skills, translate into high performance. However, Group E got the lowest score out of all the groups in the *Product* category despite the high *Precondition* score. This discrepancy might indicate that there are other factors at play that hinder the potential performance. Group C with medium to high *Precondition* scores achieved the highest *Product* score. This could suggest that their level of preparedness was particularly suited for the task. However, there could also have been other factors that enhanced their performance.

As previously mentioned, there was an assumption that a high playtime would equate to more experience with games, which would then lead to a high score in the *Precondition* group. Based on these observations, there seems to be some truth to this as the groups with higher playtimes generally got higher *Precondition* scores. However, these observations also suggest that a higher *Precondition* score does not necessarily equate to a high *Product* score. In the end, it seems that the pupils in Group C with a moderate amount of playtime were best suited to fully utilize their experience and put it into practice.

4.1.6 Open questions

The questionnaire included eight open-ended questions where the pupils could provide their own answers.

Question 1: "What kind of gaming experience do you get to use in school?"

Only those who answered yes to the question: "Do you get to use any previous gaming experience in school?" were able to answer this question. Out of twelve pupils, four stated that they get to apply their English knowledge that they acquired from gaming in school. Six participants mentioned they get to use their previous Minecraft experience in school, which could either be connected to us choosing Minecraft, or that they have been playing a lot of Minecraft in their spare time.

Question 2: "What do you think about using games as a method of learning?"

Most responses were brief, with answers like "yes!", "it is good", and "fun". Some answers also added a reason for their thoughts, and most of them said that games were good because you could learn more English. However, there were a few standout responses that caught our attention. One respondent remarked, "It is fun and better for me as I have a bit more restlessness in my body" while another stated, "Could be great to use for pupils that have problems understanding topics in a normal way, where they could play a game and learn it in another way". Clearly, some pupils are conscious of how people learn in different ways and can therefore benefit from alternative learning methods.

One pupil stated clearly that they do not think games help with anything "Stupid, it does not help you with anything I think". This can indicate that there are some pupils who might only see games as a form of entertainment and not as something educational.

Question 3: "What games do you like to play? Maximum 3 games" and **Question 4:** "Why do you enjoy playing the games you mentioned?"

Most responses centered around *Fortnite*, *Roblox* and *Minecraft*. The primary reason for playing these games was their enjoyment and the general preference for gaming. In addition to mentioning the fun aspect, some pupils highlighted the social aspect, saying that they enjoyed playing these games with friends. One pupil stated, "I like games because they are social, this game makes me a better friend with my big brother", and another said, "I can also play with my friends".

Question 5: "Do you have an example of something you learned through using video games in school?"

Out of 22 respondents, ten said either no, or that they did not know. Answers that said they had learned something include learning how to build different buildings in Minecraft and developing more knowledge of different languages. Some participants mentioned that they learned more English by using games, while others mentioned they had used Duolingo in class and therefore practiced other languages on the side.

Question 6: “Do you face any challenges when using video games in class?”

14 participants stated that they did not encounter any challenges. The remaining eight listed various difficulties, such as “it can be hard to build, “the games are not always working”, and “if I do not understand what I am supposed to do, I ask the teacher”. There were also two responses that stood out, where they expressed that they do not feel seen. We do not know why these pupils expressed that they do not feel seen, but there are issues that can arise when using video games in class that could have resulted in these pupils having those feelings. One thing to note is that both pupils who expressed these feelings are ones who have said they played more than 8hrs a day. A potential issue is that teachers lack the game knowledge to assist their pupils, which could result in moments where the pupils feel overlooked because they did not get the assistance they needed. They could also be unintentionally, or deliberately, overlooked because the teacher knows that they play a lot in their spare time and assumes they know enough to not need assistance.

Question 7: “Which games would you choose to use in English class in school?” and **Question 8:** “Why did you choose this game?”

It was mentioned that the pupils were going to use *Minecraft* in the current lesson before distributing the questionnaire, which may have influenced the responses. 15 out of 22 pupils chose *Minecraft* as their answer. Other popular games were *Roblox* and *Fortnite*. The reasons for selecting these games included “it is fun”, “you can learn from it”, and “everyone in the class likes it”. Some of the answers also included reasons for using *Minecraft*, however, they all had the same argument related to being able to build things “You can build stuff”, “We can build things from England”. There was one answer that argued for the use of *Roblox* because “When you play *Roblox* you can only speak English”.

The answers we received in this category indicate that the pupils enjoy using video games in class, and that they have some idea of what games could be good in an English class. However, many of the responses boiled down to a game being “good” because it is “fun” Based on these answers, it seems that they view games primarily as entertainment and something they do for fun, and where educational purposes are sidelined or even forgotten about.

4.2 Seventh graders

In the seventh grade, most of the pupils had built Kevin's house, and it was apparent that many of pupils did not have enough time. Several pupils had started making a house that was too big and as such had only built the front, or even just a rough outline. In some cases, it was clear by the little they had made that they could have been able to build something better given more time. In other cases, the structure was so rough and incomplete that unless we had known what they intended to build (which we knew due to the document) we would never have been able to guess what it was.

Appendix 7 shows how many there were in each group, where there are two things to take notice of. First, Group D consists of only a single participant, which means that their opinions and results have significantly more influence on the overall score compared to a participant in Group C, where a participants score only accounts for an eighth of the overall score. Further, the 2nd smallest group is half the size of the 2nd largest group, Group B has three participants while Group A has six participants. While not as big of a difference compared to Groups C and D, it still means that someone in a group with fewer participants has a larger influence on the score. In total the seventh graders were 18 pupils.

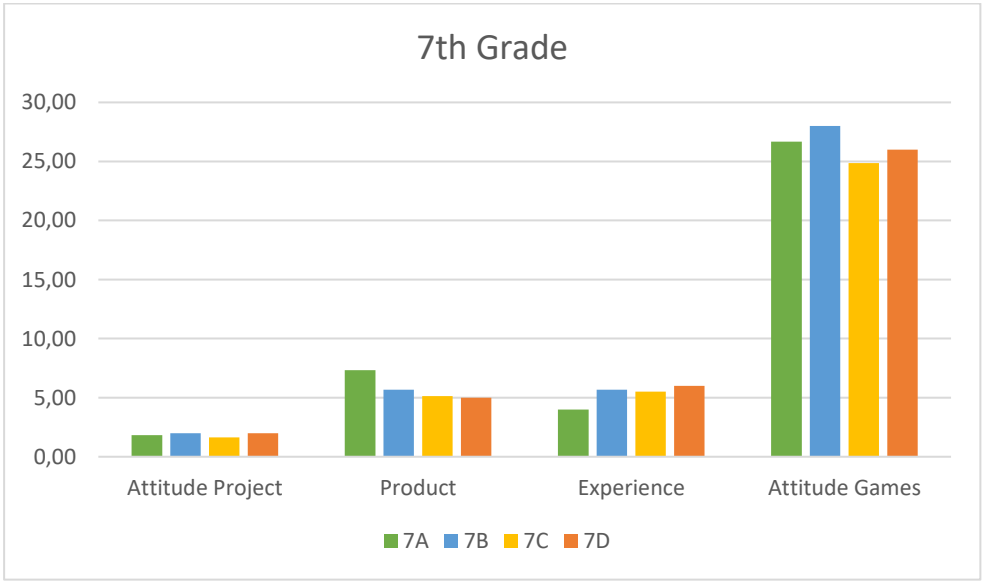

Figure 16: 7th grade all categories

For the seventh graders we can see some differences in all the categories. The thing to note is that Group A has the highest score in the "*Product*" category, and both Group A and B have the highest scores in the "*Attitude to Games*" category.

4.2.1 Attitude to games

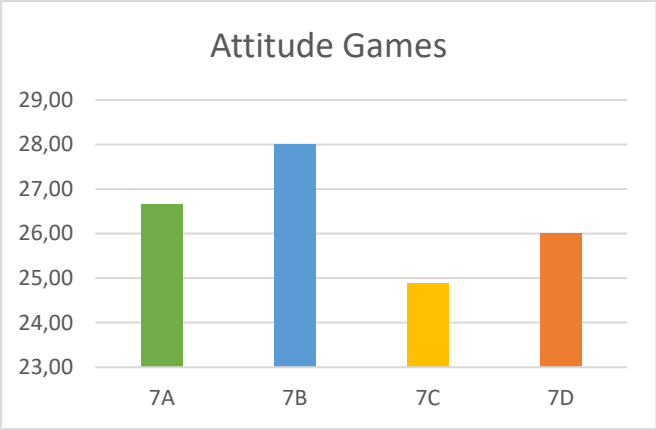

Figure 17: 7th grade Attitude to games

This graph shows that those who play the most have the lowest scores towards using games in education and learning from games. This indicates that there is a connection between lower playtimes and better attitudes towards using games in school, and that higher playtimes do not equate to better attitudes to games.

In Group C there are a couple of pupils with very low scores, some of lowest amongst all participants in both sixth and seventh grade. While Group C has the largest number of participants, it is still only eight, meaning that large deviations from the average score will heavily influence the overall score.

4.2.2 Experience

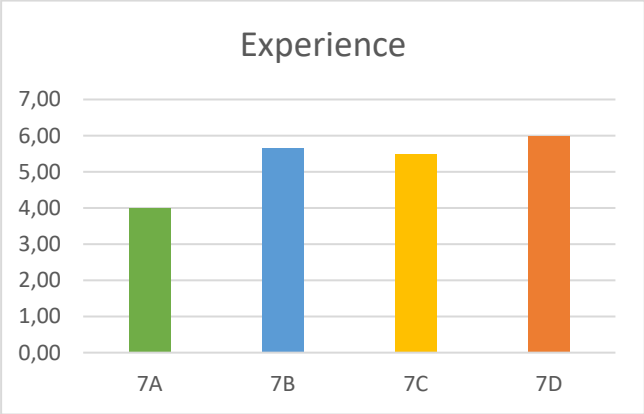

Figure 18: 7th grade Experience

There is a small decrease in score going from Group B to C, but we must also take into consideration that Group B only has three participants while Group C has eight. The scores of

Groups B through D are close, but there is a small increase from those with a lower playtime to those with a higher playtime. This implies that those who spend more time playing have more experience with games.

4.2.3 Attitude to project

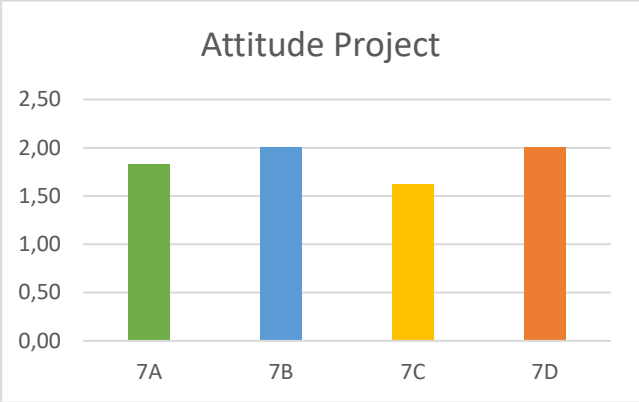

Figure 19: 7th grade Attitude to project

The scores fluctuate between 1.5 and 2. There does not appear to be an immediate relation between playtime and whether they liked our project or not. Had Group A been the only group with a lower score we could have made a conclusion based on low playtime and enjoying the project, but since Group C also a low score, it is even lower than Group A, we cannot make that conclusion.

Based on these scores it is difficult to make any sort of conclusion. The expected result was that lower playtime would result in lower scores; however, this does not seem to be the case. To make a conclusion one would also expect some sort of trend, for example: those with lower playtime have lower scores, or the opposite; those with higher playtime have lower scores. In this graph there is no trend and so the only conclusion we can make is that there is no connection between playtime and liking our project.

4.2.4 Minecraft product

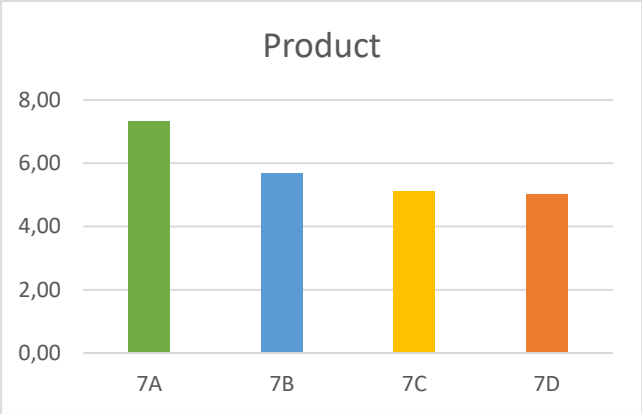

Figure 20: 7th grade Product

What we see here is that those with lower playtimes were able to get higher scores on their products. The scores decrease as the playtimes get higher, indicating that there seems to be an inverse connection with playtime and ability to make a high scoring product.

It should be noted that Group D only consists of a single participant, which means that their abilities, or lack of abilities, determine the full score. We can speculate about that one participant being an exception, and that if we had more participants in that group, they would simply be one of lower scoring ones. In the end however, we only have one score to base our conclusion on.

4.2.5 Seventh grade: Comparing Preconditions to Product Outcomes

Group A has medium *Precondition* scores, but the highest *Product* score. Group B has medium to high *Precondition* scores and a medium *Product* score. Groups C and D have *Precondition* scores that are slightly lower than Group A and they have *Product* scores that are lower than Group B.

Group A achieving the highest *Product* score, despite the medium *Precondition* scores, can indicate abilities to perform well in spite of their initial conditions. This could be due to efficient learning strategies, strong adaptability, or other favorable conditions that facilitated strong performance. Group B had good *Precondition* scores, yet only a medium *Product* score. This could indicate that they were unable to capitalize on their potential, which could be due to a

variety of factors, such as complacency, inability to applicate their skills, or other challenges encountered during the project. Groups C and D have *Precondition* scores on the lower end, and then get low *Product* scores. This suggests that they are unable to improve upon their conditions through the project. Lower *Product* scores can indicate a systematic issue in how these groups approach or execute tasks, or how they face more significant challenges.

The relationship between playtime and *Product* scores suggests that there is a balance where medium to low playtimes are beneficial for high *Product* scores. Group A with medium *Precondition* scores seem to have struck this balance and were able to fully capitalize on what experience they have to do well on the task. A potential reason for this could be that the pupils in Group A set out to do smaller tasks because they did not feel confident enough to do any larger tasks. This implies that those with higher playtimes had too much confidence in their abilities and set out to complete tasks that they did not have the skill level to complete.

4.2.6 Open questions

Question 1: "What kind of gaming experience do you get to use in school?"

To get access to this question, the pupils had answer yes to the question "Do you get to use any previous gaming experience in school?" There were only eight pupils who answered yes, and five out of these eight wrote that they got to use their *Minecraft* experience, while the remaining three wrote that they get to use their English knowledge taught from games.

Question 2. "What do you think about using games as a method of learning?"

14 pupils responded positively to the question, saying that they think it is a good thing. There were several brief positive answers such as "Good", "I think it's good because it's fun" and, "So good!". However, unlike the sixth graders where most of the positive answers were brief and exclusively positive, several of the positive seventh grade answers were a bit more grounded with answers such as "Good, but not at all the time", "I think it's an okay way of learning", "Good, sometimes" and, "I think it's okay, but sometimes it's boring". This shows that even though they enjoy playing games, they do not always enjoy using it in class. There are many reasons for why this could be the case, but based on their answers a simple assumption could be that the times they have used games they felt they did not learn much, or they found it boring. Besides the positive answers, there were a few that caught our attention, such as "I like

to play video games, but not at school" and "I feel a bit more motivated, and it is probably necessary, as life becomes increasingly digitalized". The reasons for why they only like playing at home could be one of many, but our assumption is that they only see games as entertainment and therefore do not see the educational value that could come from video games. The second answer shows a pupil who is aware of what is going on in society and think that games can be beneficial due to the increased digitalization.

Question 3: "What games do you like to play? Maximum 3 games" and **Question 4:** "Why do you enjoy playing the games you mentioned?"

There was a lot of variation in what games the seventh graders enjoy playing, however, most of them included at least one of the following: *Minecraft, Roblox,* or *Fortnite.* The reason for picking these games was that the games were fun to play, and that you can play them with friends.

Question 5. "Do you have an example of something you learned through using video games in school?"

Seven pupils responded that they have learned English. Other answers include learning how to build, learning how to play *Minecraft,* and learning how to work together. Two pupils only said "History" without any elaboration on what game they played for that to happen. There was also a pupil who answered that they had become better at using a computer, and another who answered that they had become better at coding.

Question 6. "Do you face any challenges when using video games in class?"

16 pupils wrote that they do not face challenges when using video games in the classroom. However, several of the no answers also added that they do not know if they have any problems "No, I don't think so", "No, not really", "No, not that I know of". There were two pupils who answered that they do have problems, one simply answered "Yes", while the other explained that they struggled to download *Minecraft* "I can't get into "Optional software", so I cannot download *Minecraft*".

We find it interesting that there were so few who answered that they have no problems, partially because the sixth graders had several problems that we assumed would also happen in the seventh grade, and partially because our experience tells us otherwise. However, as many of them point out, they do not know if they have any problems. What this could mean is that whenever they do get one, they are able to solve it themselves, or they are able to ask for assistance which is able to solve it for them. It could also mean that the preparations from the teacher's side is so good that they are able to prevent any problems before they arise.

Question 7: "Which games would you choose to use in English class in school?" and **Question 8:** "Why did you choose this game?"

The seventh graders wanted to primarily use *Minecraft* and *Roblox*. Other answers include *Fortnite* and *Toca Boca*. The arguments for using most of the games were that they are all in English or require you to use English as part of playing the game. We assume that this refers to the fact that *Minecraft*, *Roblox*, and *Fortnite* can all be played online with friends and/or strangers, and so when playing with strangers, the best way to communicate is often in English. It is also common to look up guides for these types of games, which are usually made in English. Another reason was that the games were fun, which coincides with the fact that the most popular games to play amongst the seventh graders in their spare time are also the ones that the pupils want to play in class.

Our understanding is that the pupils seem to understand, at least to some extent, that they can learn English by playing games, and that they can benefit from interacting with content in English. However, even though they seem to understand that they can learn English implicitly by playing games, their main priority still seems to be playing games for fun instead of playing games for learning.

4.3 Comparing the findings

As mentioned, one of the main reasons to keep the results from sixth graders and seventh graders separate was due the difference in time they got to complete the project. The reason why we decided to compare the classes against each other was to see if there were any common trends that would appear, even though they worked with different topics and time restrictions. Could the different preconditions that were measured have been impacted by the fact that the classes had two different topics? In the following chapter there are two graphs per section. The

first graph shows all the different groups next to each other. The second graph shows the scores as if the time difference was not taken into consideration and combines the sixth and seventh graders into larger groups.

It should be noted that the seventh graders did not have anyone in the 8+hr group and so in the first graph there will only be one E Group, 6E, while in the second graph the sixth graders would stand for 100% of the overall score.

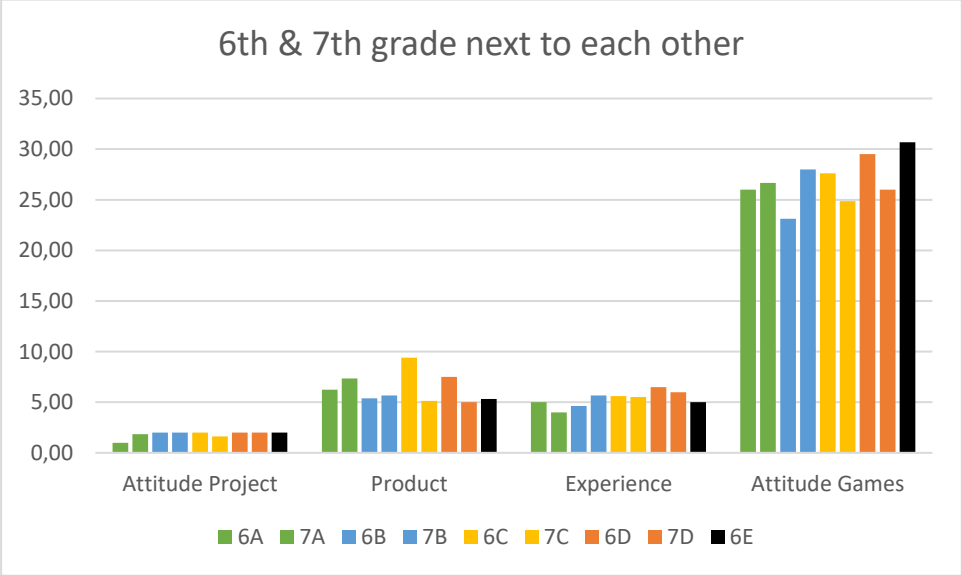

Figure 21: 6+7 all categories side by side

Color is still being used to sort them from low playtime to high playtime, however it has not been used different colors to differentiate between sixth and seventh graders. The system is consistent so that the sixth graders will be on the left side and the seventh graders on the right.

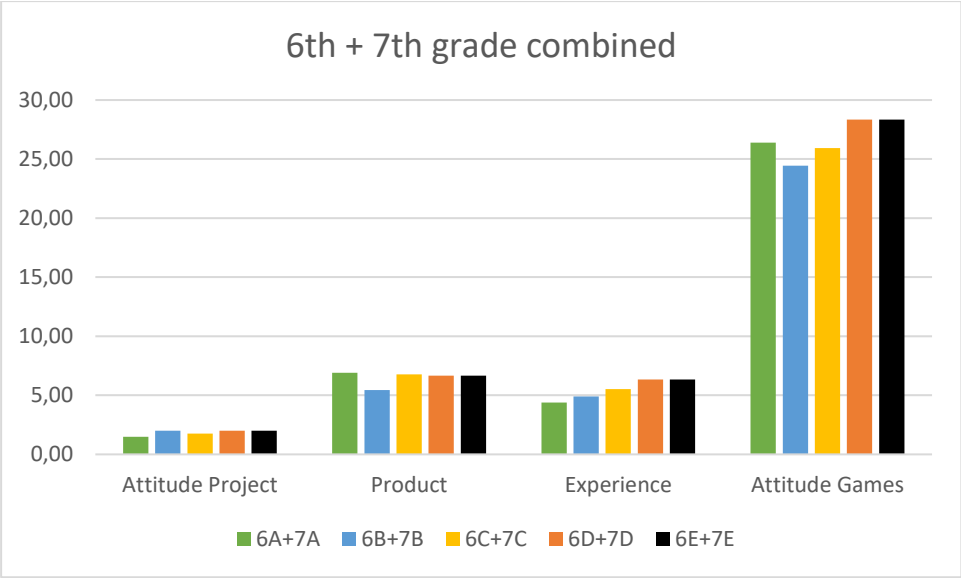

Figure 22: 6+7 all categories combined

This shows what the scores would look like if, instead of separating them into sixth and seventh graders, they were treated as a large "participants" group and only separated by playtime.

It should be noted that there is a large difference in the number of participants per group. Groups A, B, and C have 10-13 participants each, while Groups D and E only have three participants each. This means that the former groups have three to four times as many participants compared to the latter.

4.3.1 Attitude to games

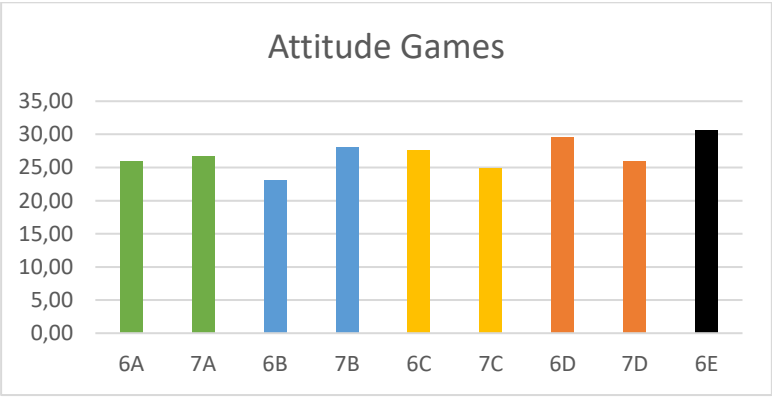

Figure 23: 6+7 Attitude to games side by side

There are differences within the various playtime groups. Group B has the largest difference of about five points, while Groups C and D have differences of about three points.

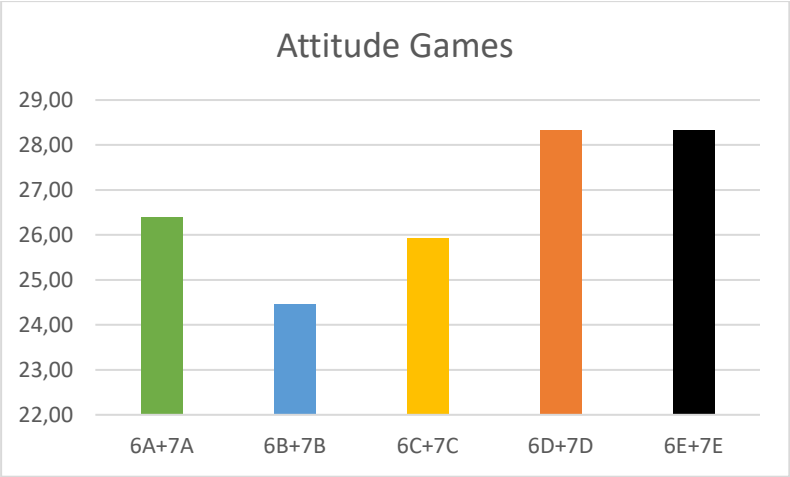

Figure 24: 6+7 Attitude to games combined

The difference between Group B and C is slightly less than two points, while the difference between Group C and D is just above two points.

Previous individual graphs suggested that the Group B score would be higher. For example, the seventh graders *Attitude to Games* graph showed Group B having the highest score.

4.3.2 Experience

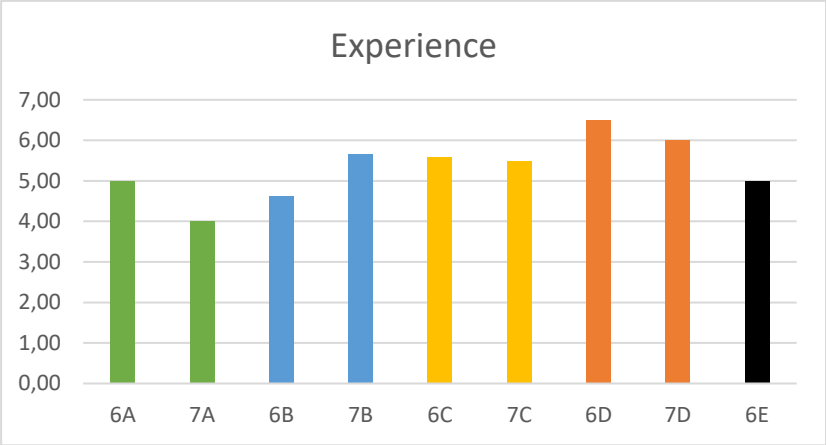

Figure 25: 6+7 Experience side by side

There are some slight differences within the various playtime groups, but nothing that is worth mentioning. Overall, it shows that the experience amongst all the pupils is varied, and that one cannot make assumptions about individual pupils based on playtime.

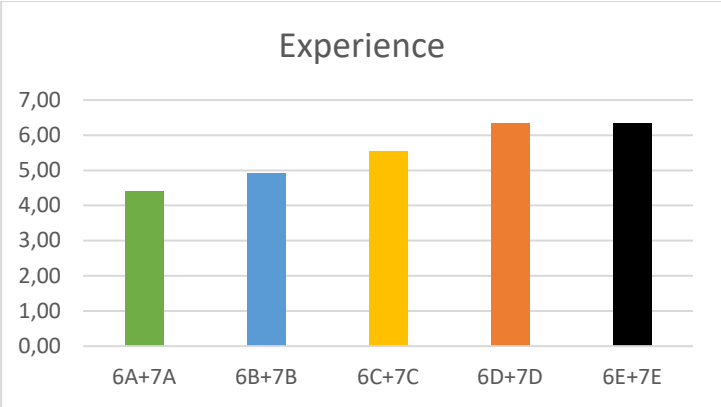

Figure 26: 6+7 Experience combined

The combined graph shows a steady increase in experience as the playtime increases. The difference from the lowest to the highest is about two points.

4.3.3 Attitude to project

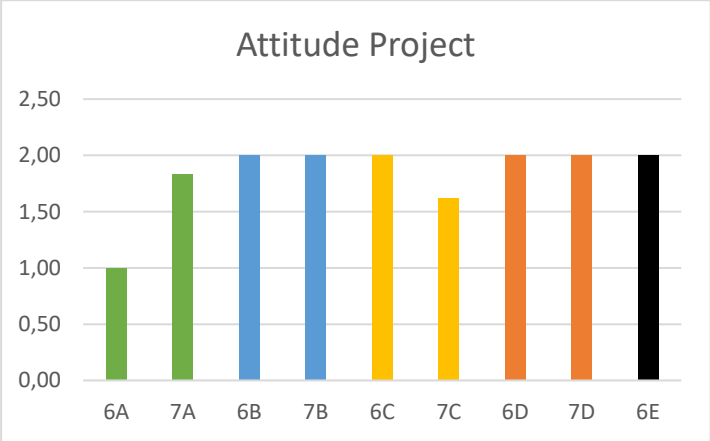

Figure 27: 6+7 Attitude to project side by side

As shown in the graph above there are only three groups with scores below the max score of two points, both A Groups and one C Group. This shows that most of the participants in both classes had a positive attitude towards the project.

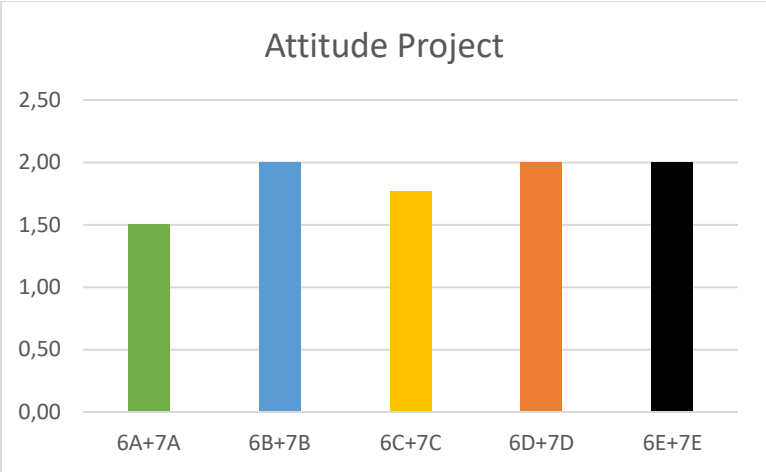

Figure 28: 6+7 Attitude to project combined

The graphs indicate that those with lower playtimes have lower interest in our project.

As mentioned earlier, it should be noted that Groups A, B, and C all have three to four times the number of participants compared to Groups D and E. While this ultimately does not change the conclusions we make, it is still important to keep in mind.

The difficulty of analyzing something like this is that despite knowing that some groups have significantly fewer participants than others, we have no way of doing anything with that information other than just mentioning it. We cannot change the way we analyze the data or manipulate the data in any to "make up" for the difference.

4.3.4 Minecraft product

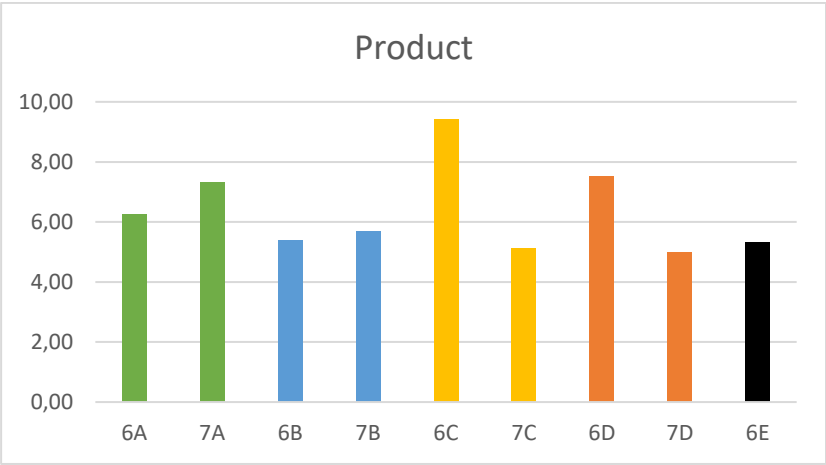

Figure 29: 6+7 Product side by side

The biggest difference in score belongs to Group C, with Group D also having a somewhat large difference.

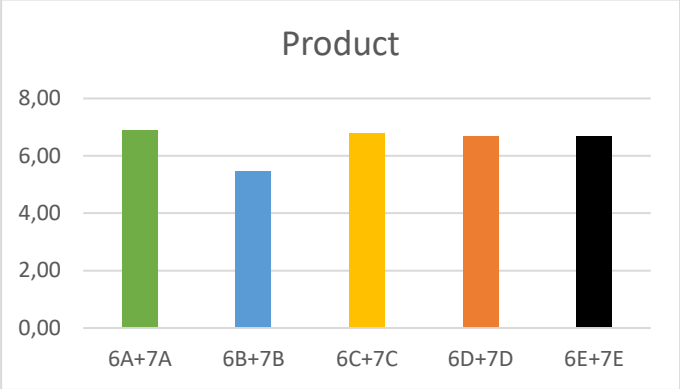

Figure 30: 6+7 Product combined

Despite the large differences we saw in the other graph, now it seems that they all have the same score. Groups D and E have 6.67, C has 6.77, and A has 6.90, meaning that A has the highest score. The differences are barely noticeable and could potentially be neglected for being so small. Group B stands out by having one point less than the others.

Had the scores, despite the tiny increases, gone from low to high then we could potentially have pointed out how increased playtime results in better scores, but even the small differences are in favor of the lower playtimes. Group B also makes it difficult to make a conclusion as it is on the side of the lower playtimes yet has a notably lower score compared to any of the others.

4.3.5 Comparing Preconditions to Product Outcomes

Overall, it seems that the *Precondition* scores are similar across the groups, with some indication that those with higher playtimes also have higher *Precondition* scores. This indication can be seen in all the *Precondition* group categories, as the ones with lower playtimes tend to have lower scores compared to those with higher playtimes. The opposite is true for the *Product* category, as those with lower playtimes have higher scores. As mentioned previously, the difference between the groups in the *Product* category is potentially negligible, and Group B makes it difficult to make any conclusions. Ultimately, this shows that regardless of whether they had high or low *Precondition* scores, they were all able to create products on a similar level.

4.3.6 Open-ended questions

Both groups showed a preference for the same games, *Minecraft*, *Roblox,* and *Fortnite*, both on the question regarding what games they play at home, and on the question about what game they would play in class. Both groups seem to have some understanding of what it means to learn from a game, and there were some answers that could imply an understanding of what it means to learn implicitly. However, the focus was the same; entertainment and social interaction, with learning coming in second. Additionally, there was a lot of positivity to using games in the classroom, but as mentioned earlier: fun first, learning second. It seems that unless the game is considered a "learning game" then most pupils struggle to understand the purpose of playing anything else.

While both grades reported few challenges with using video games in class, the 7th grade seemed to have fewer difficulties compared to the 6th grade. Where the 7th graders showed more reflection in their answers, the 6th graders had more brief answers. Furthermore, the 7th graders focused more on the educational value when arguing for what games to use compared to the 6th graders who focused more on the fun and enjoyment. Moreover, some responses from the 7th graders indicated a greater awareness of the increasing digitalization that is going on and the importance of incorporating digital tools into school.

Overall, there are not that many differences between the two groups as they both preferred the same games, recognized the value of learning potential, and had generally positive attitudes towards using games in school. There were some differences in their reflections on learning from games and their awareness of digitalization, however, these differences were subtle and limited to a small number of pupils.

5 Discussion and conclusion

As the digital landscape continues to evolve, it is crucial to continuously assess preconceived ideas regarding younger generations' abilities in the digital landscape. Our research has been an attempt to highlight a need for nuances in this area, as terms such as *the Digital Native* has created expectations that might not hold true upon closer inspection. Through our project we aimed to gather some insight into the experience pupils come to school with, by asking them questions related to gaming at home. We assumed that if the pupils had family and friends who were gamers, they would be more likely to have experience with gaming themselves. We also assumed that the more time they spent playing at home, the better they would perform in game-based lessons in school. Our data shows that this might not necessarily be the case, and that even those with less experience could perform as well as, if not better than, those with more experience. By using the term *preconditions* we wanted to highlight the fact that pupils come to school with many different backgrounds, and that this includes their digital knowledge and gaming experiences. There is considerable lack of research on how pupils' backgrounds affect their learning in game-based lessons. Had there been more research and knowledge about which parts of pupil's gaming experience can be considered a precondition for learning in game-based lessons, we could have tailored our questions towards these preconditions, which could lead to obtaining better and more measurable data.

Our general hypothesis was that there would be a connection between precondition scores and product scores. However, we found that was not necessarily the case. High or low *precondition* scores did not consistently affect the *product* score. Some pupils made high scoring Minecraft products, despite low *precondition* scores, and vice versa. Also, while some students had consistently high or low scores on both, others did not. There may be other factors that we have not identified or explored that could influence the pupils' performance in the project. Based on our data, these unknown factors can make further research on pupils' preconditions challenging, as anything could potentially affect them, such as time of day or the pupils' mood. Our project was not completely successful, as we did not get the data we wished we could retrieve. Partly, this was due to the questions in the questionnaire, which we in retrospect see could have been phrased differently, which could have yielded richer and more varied data. Alternatively, we could have created another task for them to solve in Minecraft, where the pupils would have

had the opportunity to show more of their individual capabilities. Also, our scoring system could have been improved upon to analyze the data more objectively.

When conducting our project, we found that not all pupils have the same abilities to create a product in Minecraft. There are many reasons for why this could be the case, as there is a range of factors that could have affected the pupils' performance, and through our project we were not able to identify the specific cause for difference in abilities. However, our data does highlight that there are differences within the group of pupils that participated. The two grades did get a different amount of time due to various circumstances, but even among those who spent the same amount there are large differences in overall quality of the completed product. For example, among the seventh graders there are those who only built a basic foundation for a house, where others completed the entire house and added details. This is a reminder of the fact that we cannot expect all pupils to be at the same level, and that there is a need to differentiate the instruction so everyone can perform at a level that is suitable for them. If we as teachers expect everyone to be digitally competent, or at least have experience with games, we might not take these differences into account when creating lessons, which would create issues for those who would need extra assistance. Thus, despite modest findings, we have found support for the need to nuance the idea that all young people today are digitally competent. The concept of digital natives, referring to those who, as a result of being born with steady access to digital tools, are considered to be fundamentally different compared to those who gained access to digital tools later in life, does not take into account how much experience matters. When failing to consider the differences within the larger mass of young people, the term is simply too general and loses its explanatory power (Helsper & Eynon, 2010). In our project, the differences between pupils were evident even when creating a product in Minecraft. While the differences were small and could potentially be caused by a range of factors, it still highlights the fact that not all pupils are the same and that assumptions regarding their digital abilities should take this into account.

The differences in pupils' digital abilities might necessitate the use of differentiated instruction in a similar way to how it is used in other settings. However, creating more adapted lessons would require a better insight into individual pupils' abilities and preconditions, and ideally

into the out-of-school gaming habits of the pupils., As such, educators and researchers must somehow venture into the private realms of pupils, which from a research point of view is a complicated terrain. Firstly, there is the issue of privacy and ethical considerations, as studying what children do in their spare time can be sensitive. In our study, we did not want to ask the pupils questions that would put them in vulnerable situations, such as enquiring about socioeconomic factors. It seems evident that differences in pupils' home environment, including access to digital technologies, can lead to a diverse range of gaming experiences. As researchers, we must always take these sensitive concerns into consideration, although they may complicate the data collection process (Creswell & Gutterman, 2021; Gleiss & Sæther, 2021).

In our case, however, socioeconomic factors involving access to technology was less of an issue, as Minecraft Education in principle should be provided by all schools in possession of an Office365 license. Pupils may download the game on their school computer and play it while they are at school. To play it at home they have to login through their school organization at. Further, they are required to have a stable internet connection, as they need to be connected to the organization that are providing them with the game. Minecraft (not the Education version) itself is a game that is available on all modern platforms, which means that the requirement for playing it is low, as the only hindrance is the initial purchase. Statistics from Medietilsynet (2022) show that 98% of all children and adolescents aged 9-18 have access to phones, with access to other consoles not being lower than 50%. This makes the socioeconomic factor minimal and reduces the number of preconditions that could affect the project. However, there is still the possibility that some of the pupils did not have access to Minecraft at home as they might not have access to a platform that supports Minecraft Education (i.e. Windows or Mac).

The choice of Minecraft Education was thus partly due to availability and practicality, as we expected that most schools have access to it through the Office365 package. Another important reason for the choice of Minecraft was that we found many elements in it that coincide with what Gee (2003) characterizes as a "good game" and that can be connected to the curriculum. We also found Minecraft suitable for practicing differentiated instruction. In our project, we gave every pupil the same task, letting them to work at their own speed. This allowed those

who already knew how to play the game beforehand to start the task straight away, while those who was unsure could try different things before starting to build their project. As Gee (2003) points out, allowing pupils to engage at their own pace enables exploration, experimentation, and personalized learning.

That said, Minecraft was not the ideal game to use when exploring the pupils' preconditions connected to game-based learning. We originally did not want to use Minecraft Education as we wanted to use games that have a linear path from beginning to end. Linear pathed games often involve more obvious learning curves, with a clear beginning, middle and end, and where players are able to learn the mechanics in the beginning and develop them throughout the game until the end. Additionally, linear games more often emphasize storytelling and hence expose the player more to English through both written text and audio. Minecraft is a non-linear game where the player can do whatever they want from the start, which makes it difficult to distinguish when the game starts and when it ends. Also, Minecraft has little storytelling, little text to read, and the sounds are mostly random background noises that do not carry verbal meaning. The main problem with using Minecraft, however, was the fact that so many of the pupils already had experience with playing it, either at home, at school, or both. This means that part of their skills and abilities in constructing objects in Minecraft relied on the experience they had gotten before we conducted the project. In effect, this means that it was not only their general previous gaming experience that affected the results, but also the gaming experience with Minecraft specifically. Had we used a game they were unfamiliar with we assume there could have been more differences to be seen, which in turn could have been used to fully examine how preconditions can influence game-based learning setups.

A game like *World of Warcraft* (WoW), for instance, would have shown the differences in pupils' game literacy and general preconditions to a much larger degree, as this game contains mechanics and in-game features that are more difficult for new players to grasp intuitively. By means of example, one may imagine that Pupil A has barely played any games before and has to spend time understanding basic game mechanics, such as movement, camera control, and menus. Pupil B, on the other hand, has played a lot of games, but none similar to WoW. Pupil B quickly understands the basic game mechanics but has to spend time understanding specific

mechanics related to WoW. Pupil C has played many games similar to WoW and is able to use previous knowledge about these games to integrate them into WoW and skip ahead into the more advanced parts of the game. Pupil A lacks basic game literacy and this is shown when he has to spend time learning the simple game mechanics that Pupil B and Pupil C readily grasp. This can hinder Pupil A's enjoyment of the game, and potentially also affect his motivation for continued play, since he has to spend time understanding game mechanics that others already know. Pupil A's lack of gaming experience shows how these matter in ensuring that he keeps playing the game. As known, pupils learn when they play games (Gee, 2003; Skaug et al., 2020; Zagal, 2008), but if they lose the motivation to continue, they will not learn as much as they could have. Pupil B is more game literate than Pupil A, as she is able to transfer her experience from other games to understand the basic mechanics. She can jump straight into the game and start learning the required mechanics that are specific to the game. This shows that she has good preconditions for playing the game as she does not have to spend understanding the mechanics that she is expected to know. The game will now be challenging from the start, requiring her to learn the specific mechanics that she needs to complete the game. Also, as she learns more about the game it will continue to challenge her by making her utilize her new knowledge. This means that she can focus on the parts that make her learn, which is beneficial for game-based lessons. Pupil C shows a high level of game literacy as he quickly understands the basic mechanics and is able to use knowledge from similar games to skip ahead and progress faster. Pupils with pre-existing gaming skills can complete game-based school tasks more quickly, as they spend less time learning new game mechanics. Conversely, those without such skills may progress more slowly and need more time to understand the mechanics, putting them at a disadvantage compared to their more experienced peers. The disparity highlights the importance of providing support to help all pupils develop the required literacy for game-based learning, ensuring that it benefits every pupil, regardless of initial skill level.

In this imagined classroom setting, a positive side to the individual variation is that more game literate pupils could help others. Yet, the variation could also result in a bad learning environment where difference in skills nurtures negative reactions among the pupils. Some games require players to complete things in a certain order, which means that players like Pupil C may lose interest in the game as they have to spend time doing things they already understand. Conversely, if they do get through the early parts, then they often get far ahead compared to others, which can create even more differences within the classroom. Here we see that despite

strong gaming experience, the experience works against them and can potentially create unwanted situations.

An obvious way to help pupils understand what they are supposed to do once they start playing the given game and include all pupils, is to showcase how the game while explaining the game mechanics, such as walking, jumping, and interacting with objects before they start. This can be conducted either by an experienced teacher, or by a skilled pupil, who, rather than potentially threatening the teacher's authority or causing other disruptions in the classroom, should be regarded as a resource in games-based learning. Another way to help even out the differences between individual pupils could be by giving them multiple games to choose from. These games would require different levels of skills and cover various genres. For example, one game might be suitable for pupils who have never played games before, while another could be better for those who have more experience with gaming. Additionally, a pupil more experienced in simulation games could pick a game from that genre, while another might be more interested in first-person shooter games. By offering the pupils a variety of games with various difficulties and genres, pupils who lack experience can play video games targeted at their level, while those who are more experienced do not have to play games they find boring.

Throughout the project we identified that there was a lack of research connected to preconditions and their role in game-based learning. Based on the data we have collected, the answer to our research question that pupils' preconditions did not matter. We found that when using Minecraft in a game-based English lesson, the pupils' preconditions had little to no influence on their abilities to create the products they wanted to create. Utilizing two different classes with different themes made it difficult to generalize the findings. Also, generalizing was made more difficult by the differences in time the pupils got to complete the project. Additionally, the small sample size we had gave some pupils a larger influence on the scores, compared to other pupils who were part of larger groups and therefore had less of an impact. Utilizing the same tasks, with larger sample sizes, with the same amount of time would ensure that the data could be generalized more accurately. Overall, even though our findings indicate that preconditions had little to no influence on their creations, this finding can in itself be interesting as it could indicate that preconditions have little to say in game-based lessons.

Further, this means that pupils can perform at equal levels in game-based lessons regardless of what preconditions they come to school with.

Future research should look at pupils' preconditions for gaming in more detail. This would entail a comprehensive mapping of all the factors that comprise both pupils' game literacy as well as socioeconomic and motivational aspects. Game-based learning provides a fresh approach to learning that could be well adapted to the preferences and motivations of 21st century pupils, and it would be a pity to not take this learning opportunity seriously. Effort should be put into studying classroom conditions, teacher attitudes and practical arrangements in order to make this part of the teachers' repertoire. There is also a need for further research into how popular games, such as *Minecraft, Roblox* and *Fortnite* can be integrated purposefully in teaching, as these games appeal to the pupils and represent a large part of their everyday textual encounters. Games are also texts, and should be engaged with and examined with the same critical awareness as other types of texts that surround us. This is particularly relevant with games that implicitly present particular world views, for instance related to gender, conflict, or violence. The English curriculum highlights cultural understanding, communication, and identity, looking to provide pupils with the skills needed for both local and global interaction (Kunnskapsdepartementet, 2019). Using games in the classroom, connecting it to relevant topics and curriculum goals, can help create a learning environment that aligns with the pupils' interests while developing their English skills and competences.

6 References

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Appendix

Appendix 1 – Samtykkeskjema

Vil du delta i et forskningsprosjekt om dataspilling?

Dette er en forespørsel til deg om å delta i et forskningsprosjekt som handler om hvordan elever bruker sine tidligere spillerfaringer i undervisning. Vi spør deg om å delta siden du er en elev på et trinn mellom 5.-10. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg. Dette brevet skal også leses av dine foresatte, som på neste side må underskrive om de samtykker i at du deltar i prosjektet. Om du eller dine foresatte har flere spørsmål kan de kontakte oss på epost (se under).

Formål

Formålet med vårt prosjekt er å undersøke hvordan tidligere datasapillerfaringer kan knyttes til elevers læringsutbytte ved bruk av dataspill i skolen. Norske skoler blir stadig mer digitale, og det er en økende interesse for å ta i bruk dataspill i undervisningen som en metode for å lære. Mange elever spiller mye dataspill i fritiden, og vi ønsker å se nærmere på hvordan den enkelte elevs dataspillerfaringer kan sies å påvirke læringsutbyttet når dataspill brukes i undervisningen.

Prosjektet utgjør vår masteroppgave ved grunnskolelærerutdaningen 5.-10. trinn i engelsk, ved UiT Norges Arktiske Universitet i Tromsø. UiT Norges Arktiske Universitet i Tromsø er ansvarlig for prosjektet.

Hva innebærer det for deg å delta?

Om du ønsker å delta i prosjektet, innebærer det at du først svarer på en spørreundersøkelse om dine tidligere dataspillerfaringer. Du skal deretter gjennomføre en byggeoppgave i Minecraft Education knyttet til et tema i engelskundervisningen. Til slutt skal du skrive et notat om hva du har laget.

Frivillig deltakelse

Du bestemmer selv om du vil være med i prosjektet. Hvis du velger å delta, er det helt i orden å ombestemme seg senere og velge å ikke være med. Dersom dette skjer kan du kontakte læreren din. Vi vil da slette all informasjon du har delt med oss via spørreundersøkelsen, det du har bygget, og det du har skrevet. Du vil være helt anonym for oss under hele gjennomføringen av prosjektet.

Du vil ikke bli vurdert på noen måte i prosjektet, og det vil ikke påvirke karakteren din i engelskfaget eller andre fag.

Samtykkeerklæring fra foresatte

Jeg har mottatt og forstått informasjon angående forskningsprosjekt om dataspillerfaring. Jeg samtykker til at mitt barn deltar i prosjektet som innebærer at de svarer på en spørreundersøkelse, bygger et produkt i Minecraft Education, og skriver litt om hva de har bygget.

Jeg samtykker til at mine barns opplysninger behandles frem til prosjektet er avsluttet 1. juni 2024.

(Signert av foresatte, dato)

Med vennlig hilsen

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Appendix 2 – Teaching plan 6th grade

UNDERVISNINGSOPPLEGG MASTERPROSJEKT.

SØRG FOR AT ALLE ELEVER SOM DELTAR HAR LEVERT SAMTYKKESKJEMA

Med tanke på at dette er et prosjekt som går ut på tidligere spillerfaringer, ser vi at det ikke blir hjulpet til i timen med mindre det er SUPER behov. Eneste plassen vi tillater åpen hjelp er til å ta bilder/lime inn bilder. Hvis dere velger å hjelpe elevene, gjerne noter hvordan og hvorfor.

Vær tydelig på at elevene bare har 2 timer til sammen på hele opplegget. Slik at tiden må brukes godt.

Oppstart:

Presenter at i dag og neste engelsktime blir det gjennomgang av et opplegg som er laget av studenter som skal samle inn data. Gå gjennom rekkefølgen av opplegget, hvor det starter med en spørreundersøkelse, og når de er ferdig med å svare på den går de over på oppgaven i Minecraft hvor de skal begynne på den. Når de er ferdige med oppgaven i Minecraft skal de ta bilder av det de har laget, og lime inn i et dokument som ligger ute hvor de også skal svare på spørsmål.

Gå gjennom eksempel om hvordan koden skal lages, slik at det ikke oppstår misforståelse, og vær bevisst på at elevene må huske koden sin, med tanke på at koden skal følge elevene fra start til slutt.

Forklar hva som skal lages i Minecraft. Presenter tema og kriterier for produktet, deretter forklar at det skal tas bilder som skal inn i et dokument hvor de også skal svare på noen spørsmål. Grunnen til at det er viktig at elevene husker koden fra spørreundersøkelsen er at den også skal inn i dokumentet.

For å ta bilder kan elevene bruke WIN+SHIFT+S (win = knappen med windowslogoen) Etter å ha trykket denne kombinasjonen får de opp en mulighet til å markere et område på skjermen de har lyst til å ta bilde av.

Etter de har markert det de har lyst til å ta bilde av kan de gå inn i dokumentet for å bruke CTRL+V for å sette inn bildet. Gjerne ta flere bilder fra ulike vinkler. Dersom elever ikke får til, spør lærer om hjelp, eller oss.

START

https://nettskjema.no/a/spillerfaring6

Deretter, gi elevene linken til spørreundersøkelsen, hvor de skal svare på en del spørsmål knyttet til deres tidligere spillerfaringer. Når de er ferdige med spørreundersøkelsen tar de opp Minecraft og starter på hovedoppgaven hvor de skal bygge noe innenfor gitt tema. Når elevene er ferdige med det de har bygget i Minecraft, tar elevene bilder av dette og limer inn i dokumentet de skal levere inn i ettertid, i dokumentet ligger det også noen spørsmål som de skal svare på. Her skal det svares på ENGELSK, og prøv å svar med hele setninger, og ikke bare to ord.

Temaet i Minecraft 6. Trinn er:

Transportations, important inventions.

Elevene skal bygge noe som de knytter til temaet.

Kriterier:

Bruk minimum 5 forskjellige blocks

Prøv å gjør det realistisk. Eksempel her kan være dersom de lager en bil, så må det prøves å lage en mulighet til å gå inn i den. Dersom de lager en bil som flyr, må den for eksempel ha vinger/motor/annet som hjelper den med å fly og er i luften.

Bruk tiden, ikke bare lag en firkant og si dette er en firkantet bil, men prøv å få med detaljer dersom det er mulig.

Hvis elevene ønsker det, har de muligheten til å inkludere fantasielementer. Vi ønsker å få innsikt i deres tidligere erfaringer med spill, og dersom de føler at de kan være mer kreative ved å bruke fantasien, oppfordrer vi dem til å gjøre det.

Appendix 3 – Teaching plan 7th grade

UNDERVISNINGSOPPLEGG MASTERPROSJEKT.

SØRG FOR AT ALLE ELEVER SOM DELTAR HAR LEVERT SAMTYKKESKJEMA

Med tanke på at dette er et prosjekt som går ut på tidligere spillerfaringer, ser vi at det ikke blir hjulpet til i timen med mindre det er SUPER behov. Eneste plassen vi tillater åpen hjelp er til å ta bilder/lime inn bilder. Hvis dere velger å hjelpe elevene, gjerne noter hvordan og hvorfor.

Vær tydelig på at elevene bare har 2 timer til sammen på hele opplegget. Slik at tiden må brukes godt.

Oppstart:

Presenter at i dag og neste engelsktime blir det gjennomgang av et opplegg som er laget av studenter som skal samle inn data. Gå gjennom rekkefølgen av opplegget, hvor det starter med en spørreundersøkelse, og når de er ferdig med å svare på den går de over på oppgaven i Minecraft hvor de skal begynne på den. Når de er ferdige med oppgaven i Minecraft skal de ta bilder av det de har laget, og lime inn i et dokument som ligger ute hvor de også skal svare på spørsmål.

Gå gjennom eksempel om hvordan koden skal lages, slik at det ikke oppstår misforståelse, og vær bevisst på at elevene må huske koden sin, med tanke på at koden skal følge elevene fra start til slutt.

Forklar hva som skal lages i Minecraft. Presenter tema og kriterier for produktet, deretter forklar at det skal tas bilder som skal inn i et dokument hvor de også skal svare på noen spørsmål. Grunnen til at det er viktig at elevene husker koden fra spørreundersøkelsen er at den også skal inn i dokumentet.

For å ta bilder kan elevene trykke CTRL + PrtSc samtidig (PrtSc knappen finner de oppe til høyre på tastaturet). Deretter åpner de Word dokumentet sitt og limer det inn med å bruke CTRL + V. Gjerne ta flere bilder fra ulike vinkler. Dersom elever ikke får til, spør lærer om hjelp, eller oss.

START

https://nettskjema.no/a/spillerfaring7

Deretter, gi elevene linken til spørreundersøkelsen, hvor de skal svare på en del spørsmål knyttet til deres tidligere spillerfaringer. Når de er ferdige med spørreundersøkelsen tar de opp Minecraft og starter på hovedoppgaven hvor de skal bygge noe innenfor gitt tema. Når elevene er ferdige med det de har bygget i Minecraft, tar elevene bilder av dette og limer inn i dokumentet de skal levere inn i ettertid, i dokumentet ligger det også noen spørsmål som de skal svare på. Her skal det svares på ENGELSK, og prøv å svar med hele setninger, og ikke bare to ord.

Temaet i Minecraft 7. Trinn er:

Film – Home alone

Elevene skal bygge noe som de knytter til temaet.

Eksempel: En scene fra filmen (huset de bor i, en felle, personer).

Kriterier:

Bruk minimum 5 forskjellige blocks

Prøv å gjør det realistisk om mulig, dersom de lager et hus for eksempel, skal det være mulighet til å gå inn i huset.

Vi oppfordrer elevene til å være kreative med tanke på hva slags scener de prøver å gjennskape. Det trenger ikke å være perfekt, eller å være ferdigstilt, med tanke på at i dokumentet skal de skrive om hva de ville gjort annerledes dersom de hadde mer tid, og om de ble ferdig.

Appendix 4 – Questionnaire

Spørreundersøkelse om spillerfaringer

Skriv inn koden din:

Bruk de to første bokstavene i moren din sitt navn, og de to første bokstavene i faren din sitt navn, legg til datoen til din egen bursdag på slutten. For eksempel heter mor Kristin, og far heter Petter, og bursdagen din er 6. april, ville koden vært KRPE06.

Er du gutt eller jente?

- Gutt
- Jente

Spiller du dataspill?

På PC, mobil eller spillkonsoll (Xbox, PlayStation, Nintendo, eller lignende).

- Ja
- Nei

Har du foreldre som spiller dataspill regelmessig?

- Ja
- Nei
- Vet ikke

Har du søsken som spiller dataspill regelmessig?

- Ja
- Nei
- Vet ikke

Gamer du sammen med venner?

- Aldri
- Sjelden
- Av og til

Ofte

Alltid

Vet ikke

Hvordan spiller du sammen med vennene dine?

Over internett

Drar på besøk

Får besøk

Spiller ikke sammen med venner

Hvor mange timer bruker du gjennomsnittlig hver dag på gaming?

Gjennomsnittlig betyr hvor lenge du vanligvis spiller spill hver dag. Hvis du spiller 2 timer en dag og 4 timer den neste, blir gjennomsnittet 3 timer per dag. Det er omtrent midt imellom 2 og 4 timer!

0-1

2-3

3-4

4-5

6-7

Mer enn 8 timer per dag

Påstander

Jeg lærer mye av gaming

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Jeg bruker for mye tid på gaming

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Gaming gjør meg flinkere i engelsk

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Jeg føler jeg må spille spill for å kunne være med venner

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Gaming er sosialt

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Jeg føler jeg lærer engelsk gjennom å spille dataspill

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Jeg synes timene er artigere når vi bruker dataspill i undervisningen

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Jeg føler de som gamer er flinkere i engelsk

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Jeg følger mer med i timen når vi bruker dataspill

Uenig

Delvis uenig

Verken enig eller uenig

Delvis enig

Enig

Vet ikke

Får du bruk for tidligere spillerfaring i skolen?

Ja

Nei

Vet ikke

Hva slags type spillerfaring får du bruk for i skolen?

Dette elementet vises kun dersom alternativet «Ja» er valgt i spørsmålet «Får du bruk for tidligere spillerfaring i skolen?»

Hva tenker du om å bruke spill som en arbeidsmetode?

Arbeidsmetode betyr måten man arbeider for å lære noe.

Hvilke spill liker du å spille? Maks 3 spill

Hvorfor liker du å spille spillene du har nevnt?

Har du et eksempel på noe du har lært gjennom å bruke dataspill på skolen?

Har du noen utfordringer når du skal bruke dataspill i timene?

For eksempel: Får ikke til å spille spillet, forstår ikke hva man skal gjøre, hva meningen med spillet er,

annet.

Hvilke spill ville du ha valgt til å bruke i engelsktimene på skolen?

Hvorfor valgte du dette spillet?

Generert: 2024-04-29 12:59:12.

Appendix 5 – Feedback document

Code:

What did you create in Minecraft Education?

Why did you create this in Minecraft Education?

Did you have enough time to finish your project?

If you had more time to build, would you do something different?

Did you have any issues with playing Minecraft Education? (This can be movement, finding the correct blocks, not figuring out how to build what you wanted, or more)

Did you enjoy this project? If yes, why? If no, why not?

Anything else you would like to comment on?

Insert pictures below:

Appendix 6 – 6th graders

We have replaced the codes with 6TH GRADE.

	Playtime	Attitude Project	Product	Experience	Attitude Games
6th GRADE	0-1	2	1	6	25
6th GRADE	0-1	0	10	4	30
6th GRADE	0-1	2	8	5	23
6th GRADE	0-1	0	6	5	26
6th GRADE	2-3	2	2	3	20
6th GRADE	2-3	2	6	7	19
6th GRADE	2-3	2	6	5	24
6th GRADE	2-3	2	2	6	20
6th GRADE	2-3	2	7	2	29
6th GRADE	2-3	2	6	4	34
6th GRADE	2-3	2	7	4	13
6th GRADE	2-3	2	7	6	26
6th GRADE	3-4	2	10	4	23
6th GRADE	3-4	2	10	6	29
6th GRADE	3-4	2	10	7	34
6th GRADE	3-4	2	8	5	24
6th GRADE	3-4	2	9	6	28
6th GRADE	4-5	2	8	6	25
6th GRADE	4-5	2	7	7	34
6th GRADE	8+	2	3	2	28
6th GRADE	8+	2	6	6	32
6th GRADE	8+	2	7	7	32

Appendix 7 – 7th Graders

We have replaced the code with 7th GRADE.

	Playtime	Attitude Project	Product	Experience	Attitude Games
7th GRADE	0-1	2	7	4	31
7th GRADE	0-1	2	8	3	30
7th GRADE	0-1	2	10	6	30
7th GRADE	0-1	2	9	5	20
7th GRADE	0-1	2	8	4	25
7th GRADE	0-1	1	2	2	24
7th GRADE	2-3	2	2	5	32
7th GRADE	2-3	2	9	6	27
7th GRADE	2-3	2	6	6	25
7th GRADE	3-4	2	4	5	23
7th GRADE	3-4	2	3	7	26
7th GRADE	3-4	0	4	4	14
7th GRADE	3-4	2	8	6	31
7th GRADE	3-4	2	2	6	30
7th GRADE	3-4	2	9	6	28
7th GRADE	3-4	2	6	5	27
7th GRADE	3-4	1	5	5	20
7th GRADE	4-5	2	5	6	26