Learning through Play

Fostering domain knowledge and domain general skills through the use of Minecraft in three classrooms

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Abstract

In this thesis I have explored how a game such as Minecraft can be implemented in schools to foster both domain knowledge and domain general skills. Games and education are two concepts one might not always associate with each other. However, it has been argued that the game, or play, can foster learning (Young et al, 2012). Using Minecraft as an example the game offers the possibility to create and build freely. It offers flexibility making it adaptable to various academic subjects while offering a virtual space for collaborative learning. As part of a research group, we went out in an elementary school and studied how 7th graders in three classrooms were using Minecraft in social studies and how it fostered both domain knowledge and domain general skills.

In order to understand how Minecraft can be used as a mediating tool for fostering domain knowledge and domain general skills I first posed the following problem:

> *How can Minecraft be used as a tool for acquisition and development of domain general skills and domain knowledge?*

To further explore this issue I listed three research question with each question covering how domain general skills were expressed, how domain knowledge manifested itself, and how they were integrated in Minecraft:

1. How are domain general skills expressed through the use of Minecraft in social studies?
2. How does domain knowledge manifest itself through the use of Minecraft in social studies?
3. How are domain general skills and domain knowledge integrated in Minecraft?

In light of the sociocultural approach, and the three different learning metaphors (Vygotsky, 1978; Rommetveit & Blakar, 1979; Wertsch, 1991; Sfard, 1998; Paavola & Hakkarainen, 2005), the thesis has looked at how collaborative learning inside a game promotes both domain knowledge and domain general skills. Group under the term 21st Century Skills, the thesis has explored how domain general skills and domain knowledge have been expressed and manifested through the use of Minecraft, and how they were integrated in the game.

The study has had a qualitative approach, where observation and interviews with focus groups were conducted. This type of triangulation has contributed to making the validity of the thesis strong. After having collected the data and transcribing it I analyzed it using interaction analysis and thematic analysis. The data analysis has been inspired by an abductive approach, meaning I have had interest in seeking domain general skills and knowledge and explain it through the sociocultural theory, but with thematic analysis I was also exploring how other themes, not directly related to the sociocultural approach could affect learning.

Based on the empirical findings and analysis the following themes where discovered:

1. Acquiring information
2. Creating historical buildings
3. Spatial abilities
4. Building together
5. Play versus learning
6. Domain knowledge and entertainment

The thematic categories have been the basis for the theoretical discussion that followed. The data indicated that domain knowledge framed the domain general skills, with collaboration being strong among the group members. Rarely did the group members work on their own, and if they did the teacher students was present acting as a sparring partner for the group members. For all groups it was important to depict the buildings in Minecraft as accurate as possible, and therefore much of the discussion in regards to problem solving and critical thinking were focused on how to accurately represent the buildings. This had an effect on the creativity, being less present that the other skills, at least during the reconstruction of the building. However at times when the groups had limited information, they would apply creative skills to generate their own ideas and present solutions that would still fit in with the rest of the building.

While the groups showed various domain general skills during the reconstruction, creativity was more prominent during the scripting of the play. During the scripting the groups own ideas were more present, with all groups employing modern language to showcase various scenarios in the factories. While one can argue, based on the acquisitional and participatory learning metaphor (Sfard, 1998) that the groups have showed weak references to learning material, the opposite could be argued based on the knowledge creation metaphor. Meaning,

the groups have grounded their role plays in domain knowledge, through building their factory which have set the stage for the role play, and have at the same time come up with their own ideas that depict a day at work that is based off the domain knowledge. From how learning is understood through the sociocultural approach Minecraft itself is not enough to promote learning, but at as mediating tool, the game offers both flexibility and space for the pupils to promote both domain general skills and domain knowledge.

Acknowledgements

As I am reaching the end of my academic journey, I must admit that this have been quite a ride. Through my five years at the University of Oslo I have met many wonderful people many of whom I have shared laughs and wisdoms with. My time here has given me many great moment which I will bring with me along my journey.

Working at the SMILE project has been both exciting and knowledgeable for which I deeply appreciate. I would like to express my gratitude to the team, and for being able to participate in the project. It has truly been great being able to study something I found to be both fun and highly relevant. I would also like to thank my supervisor Anders Mørch for his academic guidance and for providing me great feedback and inputs.

Having worked on most of the project in my own home away from other students, is not how I imagined the last semester would turn out. It has been an interesting time to say the least. During this time I would like to thank my two close friends for motivating me throughout the year, reading through my thesis and listening to my ideas about the project and everything else. You both have been deeply appreciated during this time.

I would also like to thank my dad for letting me call him anytime during the day and discuss with him my statements and ideas. I would also thank both my parents for supporting and encouraging me throughout this year.

Oslo, June, 2020

Sebastian

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1. Introduction

Games are becoming popular tools for teaching. Whether one is learning about decision making or statistics, games can offer the learner a visualization of both factual knowledge (domain knowledge) as well as overreaching skills such as critical thinking and problem solving (domain general skills). In contrast to more traditional learning methods, game based learning gives the learner a more active role in their own learning process. It is built on engagement and challenges to achieve the intended learning methods.

In recent decades there has been a growing focus on more collaborative and abstract skills (NOU 2015: 8, 2015). Grouped together under the term, 21st Century Skills, these skills are overreaching and can be applied to any domain. Creativity, innovation, problem solving and critical thinking are only some of many skills that are mentioned as necessary for the 21st century skills. These skills are not necessarily new, but it has been argued that these skills can help solve today's and future challenges (NOU2015:8; Trilling and Fadel, 2009). These skills are also seen as being important aspects to academic subjects at school as they can provide deeper insight on the subjects, while the subjects itself can provide concepts and contexts in which the students can practice these skills. With today's technology they can also be practiced, studied and analyzed in ways that were not possible before (Trilling & Fadel, 2009).

Promoting itself as a tool for teaching 21st Century Skills, Minecraft is being implemented across various schools (Minecraft Education Edition, 2020a). Like how a child plays on the playground, it is the imagination to build and destroy how they see fit that might be one of its driving forces for the game's popularity. Released in the last decade, the game is one of the most popular games among children, offering a virtual space to play and high level of flexibility (Mørch, Mifsud & Eie, 2019). Yet, challenges still exist mainly with how games like Minecraft are being perceived and how they can fit within the learning sphere. From a students' point of view the games might be perceived as more entertaining and less educational and the students might become distracted by its function. From a teacher's point of view the entertainment value might also pose a challenge as being difficult to combine with the learning goals.

1.2. Background for thesis

During the fall of 2019 I had my first hands on meeting with using Minecraft as a learning tool. Having read about how the game has been used to create everything from real life buildings to 1:1 sized cities I was excited to try something different in class. It was not my first meeting with Minecraft however. I have tried the game before, but quickly found it uninteresting partly because of its pixelated graphics and lack of clear goals. But this time was different. It was fun and exciting to walk around and visualize the assignment. And from an educational perspective it was exciting to study how a game like Minecraft could be used in educational settings. So when I found out that there was an ongoing research on the implementation of Minecraft in Social Studies, I quickly signed on.

1.2.1. Project SMILE

The thesis is part of a project called *Minecraft in Teacher Education: developing 21st Century Skills in Social Studies* (SMILE). The project is a collaborative project between educational institutions (A & B). The study seeks to understand how teacher students perceive knowledge on historical periods by modelling the environments in Minecraft, and recognize the value domain general skills can have in school subjects such as social studies (UiO, 2020). More specifically the project looks to address the following research questions:

- What are teacher students' perceptions of Minecraft for learning purposes?
- What are the challenges and opportunities for teachers' organization of Minecraft lessons into two distinct activities: generic- and domain specific skills- and knowledge practice?

The project is organized as an experimental study taking place over two years. Institution A is providing educational resources in form of master degree students in education acting as tutors for students in institution B and institution B will carry out a joint learning defined by an assignment. The project has undergone four iterations at institution B, and is now being brought out in a middle school classroom for the teacher students to practice the activity with middle school pupils.

1.3. Research question

In my thesis I intend to get an insight on how games can be used to develop and practice domain general skills and domain knowledge. Based on this information I pose the following problem:

> *How can Minecraft be used as a tool for acquisition and development of domain general skills and domain knowledge?*

To explore this problem I have listed three research question with each question focused on one part of the problem (domain general skills, domain knowledge, and Minecraft as a tool):

1. How are domain general skills expressed through the use of Minecraft in social studies?
2. How does domain knowledge manifest itself through the use of Minecraft in social studies?
3. How are domain general skills and domain knowledge integrated in Minecraft?

1.4. Relevance

The use of digital technology has become increasingly common in many areas in society, whether one is at home, at work or at school. Placed under the term digital skills for the national curriculum, students are expected to comprehend these skills and be able to use these in various subjects in school (UDIR, 2017). In this project I will be looking into how Minecraft is used in social studies for showcasing an understanding of domain knowledge, and how the pupils are expressing some of the 21st century skills that are relevant for the project. According to Trilling & Fadel (2009) virtual collaboration have been shown to have an effect on learning motivation as well as the development social and cross-cultural skills. From how learning has been understood under the sociocultural approach, collaboration plays an important role for the accumulation of knowledge. Whether it is between pupils and the teachers, or between the pupils themselves being able to discuss course material with others have been argued to affect the internalization of the material (Sfard, 1998; Wertsch, 1991).

1.5. Structure of thesis

The thesis begins with the introduction chapter (the one you are reading now) that is in short details introducing the project and the research questions. In chapter two I present a short description of Minecraft, its central features and an overview of Minecraft Education Edition and the differences between the versions. The chapter will also include a list of features that are brought up by the pupils in the data presentation chapter (chapter six). In chapter three I present the different theoretical approaches that I have used to explore my research questions, while in chapter four I will present a literature review over relevant studies and research. Chapter five describes the methods that have been used to both gather and analyze the data. In chapter six I present a selection of the empirical results and discuss the findings in chapter seven. Finally in chapter eight I present a summary and final remarks.

2. What is Minecraft?

Released back in 2011, Minecraft is a three dimensional sandbox game (Minecraft Wiki, 2020a). The game has no quests or goal, and instead gives the player great freedom to play however they like. The game worlds are generated by the game upon entering and as the player continues exploring it. The world is made out of cubes called blocks in the game that are meant to resemble various materials such as wood, wool, dirt and stone. Further each block is modeled after 1 m^3 physical construction blocks though the exact size of each block might vary. For example a wood block (figure 2.1a) is exactly 1 m^3, while another block, slab (figure 2.1b) has the same length and width as a wood block, but half the height.

a b

Figure 2.1: Screenshot of two different blocks in Minecraft.

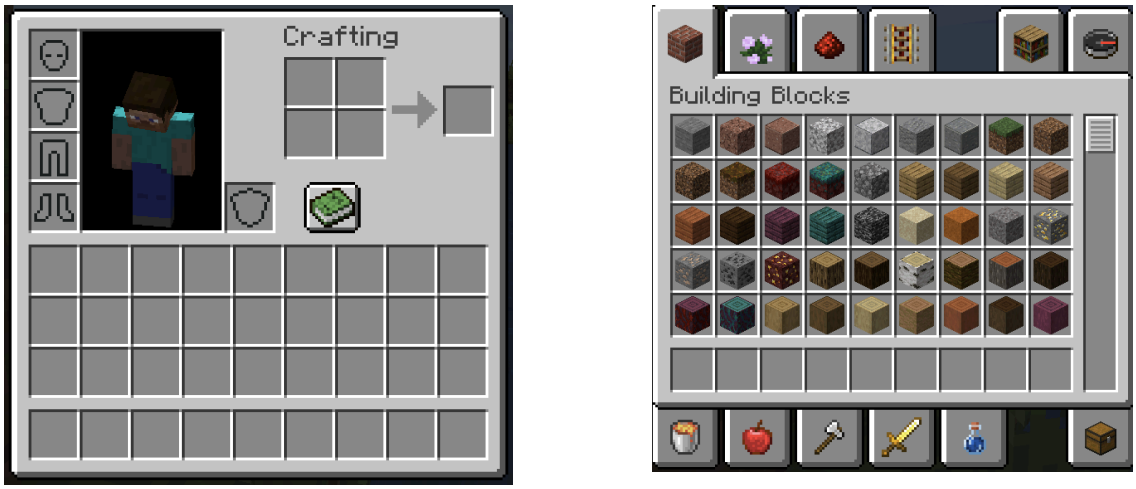
The game has four modes that one can play: survival, creative, adventure and spectator, with the two former being the game modes where the player can build and destroy blocks (Minecraft Wiki, 2020h). In survival mode the player has to gather all of the materials if they want to craft items and tools. The player also has a health and hunger bar that depletes either when the player is attacked or when the player is building or destroying blocks. In order to raise the bars the player has to find food either by growing crops or hunting animals. The second mode, creative mode, strips away the survival aspects such as hunger and health, and gives the user infinite access of any blocks. When destroying blocks, the blocks are destroyed immediately unlike in survival mode, and the player also has the ability to fly without having to use any item. The third mode adventure strips away the option to both directly place and destroy blocks. The player has the option to interact with objects in the game, such as opening doors, ride a horse, and craft items. They also have a to manage their hunger similar to survival mode. The fourth and last mode, spectator mode, allows the player to fly around the world map similar to creative mode and observe the world without interacting with it.

2.1. Education Edition

As mentioned in chapter 1, the version that was used in the study is Minecraft Education Edition. This version is quite similar to the original version, but it also contains features that are exclusive to it and meant to make it easier to use in classrooms (Minecraft Wiki, 2020e). An example is the ability to turn on and off functions, such as the ability to fly or start a fire, or deny blocks to be placed at certain areas. According to the founders of Minecraft the intention of Education Edition is to "*promote creativity, collaboration, and problem-solving"* among students *"in an immersive environment where the only limit is your imagination."* (Mojang, 2020). The idea behind this version is to help students develop domain general skills when used in many different subjects such as history and foreign language. Further, in this thesis, I will refer to the game as Minecraft, rather than the full name, Minecraft Education Edition, unless I discuss differences between them.

2.2. Gameplay

The core gameplay revolves around the player gathering blocks, by destroying objects such as trees, digging in the ground or mining in mountains either by using your hands or tools such as an axe, shovel or pickaxe (Minecraft Wiki, 2020a). By collecting these blocks the player can craft various items such as a table, a stove or a bed. When the player has collected blocks they will either appear in the hotbar, a selection bar that appears in the overworld or in the inventory list (figure 2.2a). From the inventory list the player can drag blocks to their hotbar, combine certain blocks and items into new items or blocks, and dress up the character. The inventory list has limited space and when it is full the player has to craft a chest to store more blocks and items. When playing in creative mode however, the inventory list looks a little bit different (figure 2.2b). From the inventory list the player has access to all blocks as well as the other functions mentioned.



a b

Figure 2.2: Screenshots showing the inventory menu when playing in survival mode (2a) and creative mode (2b). Note that creative mode inventory list has multiple tabs. The one showing is list of all blocks that are used for building. Below both inventory lists is the hotbar

Later in its release, multiplayer option was added giving players the option to play together over the internet. When playing together the players has the option to communicate with each other. A chat window exist in the game and tells the players if someone has sent a message, if someone is joining or leaving the game, or if one of the players has commenced any noticeable action, such as hunting an animal. By using the chat window the player can also enter commands, or cheats, that alter the gameplay, such as changing the game mode, or teleport in the game by entering coordinates (figure 2.3).

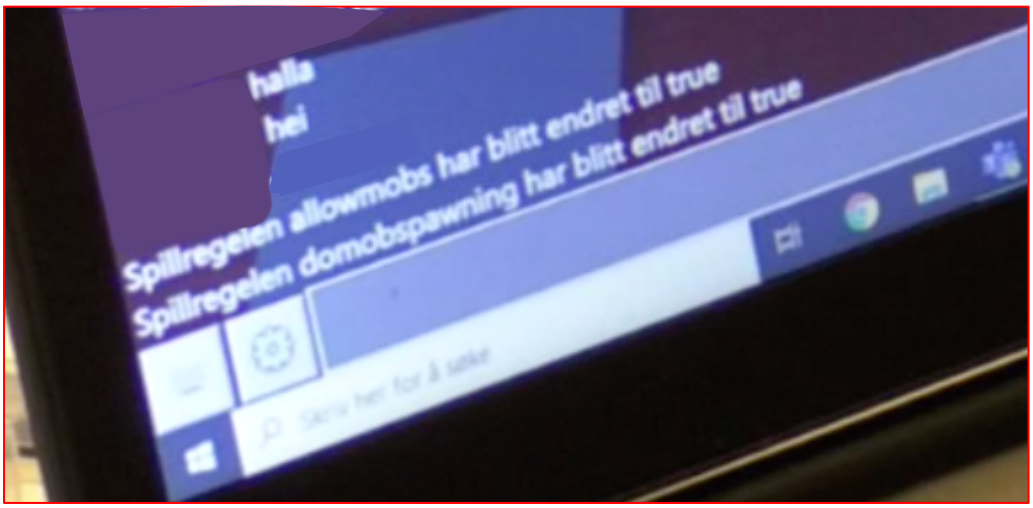


Figure 2.3: Screenshot of the chat window in Minecraft. Two players have greeted each, while another player has entered two commands

Besides the players themselves, the world is inhabited by entities called mobs (short for mobile). Mobs can be classified in one of three categories: passive, neutral, and hostile (Minecraft Wiki, 2020i). Passive mobs are mobs that do not attack the player and includes creatures such as: horses (figure 2.4), pigs, and chickens. Neutral mobs includes also animals, but these are only passive unless the player attacks them. Hostile mobs on the other hand are aggressive and will attack the player on sight. While both hostile mobs and neutral mobs appear when playing in survival mode, all mobs that appear in creative mode are passive. A fourth category of mobs exists, but only in the Education Edition. It consists of non-playable characters (NPCs) and agents that can be created either by teachers or students and can be used as a guide, a character in their creations or whatever the student would like.

Figure 2.4: Screenshot of a mob (horse) that appeared during the pupils' assignment

2.3. Notable functions and objects

In chapter 6 and 7, when presenting and discussing the data, several functions and objects are brought up. Instead of explaining them throughout those chapters I will instead list them here and have this part act as a glossary.

Items:

Elytra:

A cape like item that is the only source of flight in survival mode (Minecraft Wiki, 2020f). When wearing the cape the player can glide across the world. This item is not needed if the player wants to fly in creative mode.

Figure 2.5: A screenshot of a player wearing elytra

Firework rocket:

Used for creating decorative explosions (Minecraft Wiki, 2020g). If the player is flying with elytra when using the rockets, the player receives an extra boost.

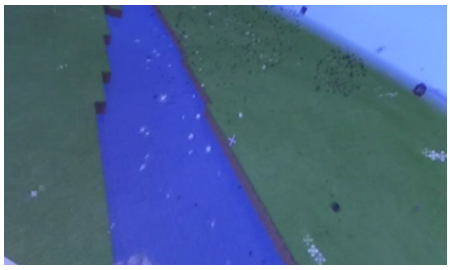


Figure 2.6: A screenshot of firework rocket having just exploded. After it explodes, colorful pixels appear across the screen

Commands:

- /gamemode S: switches game mode to Survival (Minecraft Wiki, 2020c). If the player wants to switch to creative mode or adventure mode, the player has to write C or A instead of S respectively. Switching to spectator mode is not possible using this command.
- /allowmobs true/false: when set to true, mobs will appear in the world (Minecraft Education Edition, 2020b). If set to false, mobs will not appear.
- /domobspawning true/false: same as above. When set to true mobs will appear, and when set to false mobs will not appear (Minecraft Wiki, 2020d).

3. Theoretical perspectives

Using games as a method for education is a fairly new approach in school, though the idea of learning with games is not new (Kapp, 2012). Like many other tools, how games are used in education can be understood from theoretical perspectives. The purpose of this chapter is to present perspectives and approaches on learning, that will be used to explain the project's research question. While the main approach to the thesis will primarily focus on the sociocultural perspective the thesis will also have a cognitive approach. Though the perspectives at first might seem quite different to each other, Sfard (1998) argue that the approaches in many cases are not that dissimilar of each other and that to fully understand how one learns, one needs to look at both the social perspective and the cognitive perspective. The chapter will start by discussing the different metaphors for learning in more depth, and introduce a third one. Further, the chapter will dive into the sociocultural perspective and discuss communication and collaborative activity, before ending the chapter with visual spatial learning, and creative learning.

3.1. Metaphors of learning

Sfard (1998) suggested two core metaphors for learning: the acquisition metaphor and the participation metaphor. Although the distinction between them is rough, the basic idea is that these metaphors underline different theories and models of learning. They highlight certain characteristics of learning, and though they are seen as distinctive to each other, many learning theories can be understood from the viewpoint of either metaphor (Sfard, 1998; Paavola & Hakkarainen, 2005).

The acquisition metaphor understands learning as a cognitive process, and views "the human mind as a container to be filled with certain materials and […] the learner becoming an owner of these materials" (Sfard, 1998, p. 5). Materials here is understood as knowledge, and learning involves accumulation of knowledge. Knowledge can either stand alone as a cognitive structure or they can be combined together to form richer cognitive structures. Further, the acquisition metaphor draws on the constructivist approach, which involves the learner creating mental models to make sense of the knowledge they are accumulating (Sfard, 1998).

The participation metaphor on the other hand, views learning as a social process between two or more individuals. The metaphor draws on social constructionism meaning that individuals learn in interaction with each other and construct meaning with each other (Sfard, 1998). Instead of the learner being a passive receipt of knowledge, in the case of the acquisition metaphor, the learner is actively constructing meaning with others. Learning happens in social settings between multiple individuals and that in turn shape cognitive understanding. Further, learning is seen as becoming part of a community, and that knowledge one gains does not exist individually in every person's mind, or on its own. Rather, knowledge exists as an aspect of participation in a community.

One common criticism that is often made is that the basic premise for both metaphors are not that separate of each other, and that learning in most scenarios consists of aspects from either metaphor (Sfard, 1998; Paavola & Hakkarainen, 2005). As stated above the acquisition metaphor sees the learner as being a passive recipient, while the participant metaphor views learning as a social process of participation in a community. While Sfard (1998) argued that the two metaphors highlights different aspects of learning, Paavola & Hakkarainen (2005) on the other hand highlighted issues with the metaphors. They problematize that learning theories in the acquisition metaphor views knowledge as a pre-made structure that an individual learner is guided through. On their views on the participation metaphor, they describe learning as becoming part of a community, and accumulating the accepted knowledge without any possibilities to transform the knowledge. In many ways Paavola & Hakkarainen (2005) laid out similar issues with both acquisition metaphor and participation metaphor. In both metaphors the learner has to accept pre-made structures for knowledge without the possibility of transforming or develop the knowledge any further. They highlight a lack of innovative focus, and introduce a third metaphor that draws on characteristics from both the acquisition metaphor and participation metaphor, called the knowledge creation metaphor. The knowledge creation metaphor views learning in terms of creating social structures and collaborative processes that supports knowledge advancement and innovation. The metaphor also places an importance of generating new ideas based of existing knowledge, as well as conceptual knowledge. Through social interaction a person internalizes the knowledge and makes it their own.

3.2. Sociocultural approach

3.2.1. Communication

Learning as seen from the sociocultural perspective builds on social constructivism and is inherently social (Vygotsky, 1978). However, it should be noted that the sociocultural perspective does not completely ignore the cognitive aspect of learning, but rather states that learning is something that first happens in interaction between individuals, before becoming internalized by individuals. According to Wertsch (1991) "The basic goal of a sociocultural approach to mind is to create an account of human mental processes that recognizes the essential relationship between these processes and their cultural, historical, and institutional settings" (p. 6). When trying to understand these settings, we are using mental functioning, such as perception, memory, imagination, and reasoning among others. While mental processes, play an important role in the sociocultural approach Wertsch (1991) also highlighted actions as an important function. When an action is given priority humans are viewed as active learners. They are in contact with, as well as creating, their surroundings and themselves through their actions. This may give the learner more direct control of the learning environment. While Wertsch (1991) implied that there existed multiple types of action he himself gave priority to mediated action and mediating artefacts.

3.2.2. Mediating artefact

Mediation can be defined as a process or variable that is used to reach a goal or outcome (Wertsch, 1991). Vygotsky (1978) argued that learning is not as simple as a stimulus and response reaction, but that there is a third variable between what is being learned (object) and the learner (subject) (figure 3.1).

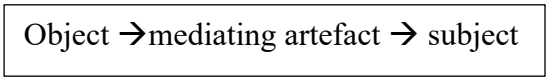


Figure 3.1: The role of the mediating artefact

According to Wertsch (1991) one of the key aspects of the sociocultural approach is the usage of tools and signs as mediating artefacts. Artefacts can be understood as historical and culturally developed human made objects. While tools can be described as physical human made objects such as computers and books, signs on the other hand are artefacts such as symbols, and language, one uses in interaction with other (Wertsch, 1991). According to

Vygotsky (1978) both tools and signs are created and shaped by society and therefore can be considered important cultural artifacts developed over time. Wertsch (1991) stated that human action employs mediational means and that they shape the action in essential ways. Meaning, how an individual decides to act in a learning situation is to some extent shaped by the artefact. Whether it is using words and physical tools that are suited for someone who is learning a new concept, or using more advanced terms and words without the presence of tools. Thus, how individuals decides to act is rooted partly in a type of meaning making decision through their interaction with their environment.

3.2.3. Scaffolding

Wood, Bruner & Ross (1978) introduced the concept of scaffolding as a contribution to Vygotsky's Zone of Proximal Development (ZPD). The ZPD is central to the sociocultural approach and is defined as the distance between an individual's current level of development, what the individual is capable of performing on their own, and the higher level of development that the individual has the potential of reaching, through solving problems under guidance or collaboration with someone who is more knowledgeable (Wertsch, 1991). Operating in the ZPD is also referred to as an experience of flow, a concept referring to an act in which the learner becomes immersed in the task they are performing (Csikszentmihalyi, 1996).

Building upon ZPD with scaffolding, Wood et al (1978) defined scaffolding as a "process that enables a child or a novice to solve a problem, carry out a task or achieve a goal which would be beyond his unassisted efforts." (p. 90). Scaffolding is essentially a procedure in which the learner is assisted when learning something new, with the assistance gradually disappearing. Such assistance could come from more knowledgeable people such as a teacher or student, digital tools or linguistic tools.

3.2.4. Intersubjectivity

Baker (2006) argued that through the usage of words and expressions one is able to showcase a culture or a joint understanding of a phenomenon. Language can be understood as an important tool of communication to structure individuals' thoughts and opinions on subjects. Trying to explain communication between people Rommetveit & Blakar (1973) introduced the concept of intersubjectivity. They defined intersubjectivity as a temporarily shared social

space between individuals interacting with each other. It is a space of joint understanding, where two or more people share the same understanding of a concept, or task. It is not an overlap of two different worlds however. The intersubjective space is not rigid, and can change as the participants gain more information. Even though the participants have a shared understanding of the a concept, they might still associate the concept to other ideas individually. By bringing new ideas to the group, the participants have the possibility to alter the space and the shared understanding. In order to achieve intersubjectivity the dialogue has to be taken for granted. Meaning that the speaker has to leave certain elements out of the conversation, which in turn invites the listener to step in and make sense of it, creating an intersubjective space as a result (Fugelli, Lahn & Mørch, 2013). Rommetveit & Blakar (1973) called this process shared prolepsis and defined it as a communicative act in which the speaker leave out certain information from a conversation, but which enters the conversation indirectly. This can be triggered by vague statements, incomplete sentences, or hints. Essential here is the idea that language is a social phenomenon (Rommetveit & Blakar, 1973). One understands each other by having the same contextual understanding. This understanding is created, retained and expanded through intersubjectivity.

On their view on language Rommetveit & Blakar (1973) introduced the concept of semantic associative network to try to explain why people use the words and expressions that they use. They defined the concept as a mental categorization process that one uses to create an understanding of the situation. How individuals understand and relate to words and expressions vary from person to person, but are also rooted in historical and cultural background, meaning that words are fluid and can change from being viewed negatively at one point in history to being viewed positively. This is not only based on the individual, but also on the historical and cultural setting.

3.3. CSCL

Computer Supported Collaborative Learning (or CSCL for short) is a theoretical approach that covers multiple perspectives on technical-enhanced learning in collaboration (Koschmann, 1996; Suthers, 2006). The approach explores how technological artefacts, such as computers are being used by multiple individuals in collaborative learning scenarios. While part of the approach's focus area looks into how people learn with computers it also dives into group meaning making and how individuals through collaboration share their understanding

and meaning of a concept (Stahl, Koschmann & Suthers, 2006). Koschmann (2002) defined CSCL as being concerned with the "practices of meaning making in the context of joint activity and how these practices are mediated through designed artifacts" (p. 18). According to Feltovich et al (in Koschmann, 1996) one of the benefits of collaborative work is that it makes it possible to successfully learn more complex concepts which they refer to as advanced learning. They state that when groups are discussing how to solve a problem there will be multiple understandings to it. Because the members of the group are interpreting the problem different to each other they might also better cover the complexity of the problem (Feltovich et al, in Koschmann, 1996). The members see different aspects of the problem and they connect it to knowledge they possess which might be different to each other. The issue with multiple understandings also highlight a second benefit: that knowledge is flexible (Feltovich et al, in Koschmann, 1996). Knowledge is not structured to only be useful in one domain, but can be used in multiple. It can also be combined to form richer structure as a result that the group members seeks to form a joint understanding. Through the collaboration process individuals make proposals and renegotiate their understandings to create a shared understanding of the concept. The shared understanding is not fixed and can be shaped as the group receive new information. Part of CSCL's design goal is to create artefacts and environments that supports or enhances practices of group meaning making. Stahl et al (2006) emphasized several activities underlining CSCL: knowledge sharing, interaction between the learners, negotiation between them, and joint meaning-making that is established as a result of negotiation in the group. Central to these activities is what Suthers (2006) referred to as intersubjective learning.

3.3.1. Intersubjectivity in CSCL

Suthers (2006) defined intersubjectivity as "a simultaneous process of mutual constitution that may involve disagreement as well as agreement about shared information" (p. 317). In many situations where learning can occur group members might interact with each other not with the intention to learn, but rather to make sense of a situation. This process of creating a joint understanding is what Suthers (2006) referred to as intersubjective meaning making. When the group members engage in a intersubjective meaning making situation they engage in activities that may lead to collaborative learning. Further, they do so on multiple levels: by solving problems or challenges, maintaining interpersonal relations, and/or by affirming their identity in a community. Because they participate in communities, they might agree on

solutions or ideas they otherwise would not have done on their own, based on one or more of the levels mentioned above.

According to Suthers (2006) intersubjective meaning making are potentially found in any and every kind of joint human activity, also in activities involving computational technology. Further, he state that there are two distinct understandings in which technology is applied to support collaborative learning. One as a medium and the other as a constraint.
The first understanding, technology as a medium to support collaborative learning, treats technology as a communication channel in a manner that is neutral to learning (Suthers, 2006). By understanding and using computer technology as a computer-mediated communication (CMC) group members are able to communicate with each other when they are not located at the same place (synchronous distance interaction) and at different times (asynchronous interaction). For this reason people might resort to CMC. Suthers (2006) on the other hand state that both forms of interaction can be used in combination with each other, such as CMC being used in a way that augments gestural and verbal communication. Further, he states that CMC is not sufficient to replicate face to face (FTF) interaction as there is no genuine learning discourse as learning is made completely up to the group members.

The second understanding, technology as constraining the learner, is often applied to education as a way of limiting options available to the learner (Suthers, 2006). By limiting options available to the user one is also reducing socio-cognitive load as well as implementing a learning agenda. As mentioned, maintaining intersubjectivity in a group consists of multiple levels: problem solving, maintain interpersonal relations and/or by affirming their identity in the group. By diverting cognitive resources to tasks that are irrelevant to learning, learning might be hindered. To resolve this, computational technology might be designed to structure part of the activity so that learners can focus their cognitive and social resources on aspects that are relevant to learning. The technology can take different forms such as full automatization or constraining actions the group members can make to reduce the need to make decisions. However, issues with this arise when lies in the lack of flexibility it gives the user. When the technology provides full automatization, there is little space for understanding how it works, and constraining the user's actions creates little room for meaning making and intersubjectivity among the group because what one can do and not, is based around the technology and what it offers.

In order to better understand intersubjectivity in CSCL, Suthers (2006) proposed a third understanding which is a combination of the former two. Communication is central in intersubjective meaning making and constrain is essential in keeping a learning trajectory. In order to mediate and encourage acts of intersubjectivity and meaning making, CSCL systems should be designed in a way that leverages the limitations of the technology rather than using it in a way that it is not suited for, or using it in similar ways to other methods in which those methods might be a better option.

When looking at collaborative activities using technological artefacts Mørch et al (2019) developed a model which gives an overview of the different metaphors for learning and sociocultural perspectives. Though it is a little modified to better fit this thesis, the premise is the same (table 3.1). The columns in the table are connected through three themes (introduction, reconstruction, and transformation) and are either theoretically motivated (column 2), based on empirical findings (column 1 & 4), or informed by both theory and data (column 3).

Table 3.1: Collaborative knowledge adaption for integrating virtual worlds in classroom practice

	Activity	**Metaphors for learning**	**Intersubjectivity**	**Type of skill**
Introduction	Gathering relevant information	Acquisition	*Vague:* Centered around avid local historians; Students with different prior experience and the teacher	Domain knowledge
Reconstruction	Collaborative activity in Minecraft and roleplay scripting	Participation	*Fragmented or focused:* Building vs. role-play scripting	Generic (primary) and Domain knowledge (secondary)
Transformation	Role-playing and video recording	Knowledge creation	*Focused:* Enactment of a historical event	Domain knowledge (primary)

			while immersed in a virtual world	and Generic (secondary)

3.4. Visual-spatial learner

Traditionally the educational domain has placed an emphasis on verbal teaching where the teacher either as a one-way dialogue speaks to the students, or the teacher and the students collectively interact during the lessons (Mann, 2005). Typically verbal teaching in school falls under sequential learning, a type of learning method where the content that is to be taught happens in steps or sequences. For example in math the teacher might start the lesson by teaching a formula and make sure that the students understands the formula, before giving an example or task that the students are going to solve. Though this type of teaching method has worked for most students not everyone perceives and understand the material the same way. Some might need to see the problem first before being given the formula. For those that needs to visualize the concept in order to grasp it, the visual spatial learning might be a better method (Mann, 2005).

Visual spatial learning contra to sequential learning has a more holistic approach where the learning material or concept is visualized by the learner either mentally or externally (Mann, 2005). Learners who prefer the visual spatial learning method looks at all of the parts of the concept and perceives the interrelatedness between them. Learning and thinking spatially involves being able to view the concept or what is to be learned visually and understand it by looking at the shape, size and location of the concept in relation to other objects (Sinton, 2014). Central to spatial thinking is the concept of space which can be defined as the shape, size and position of one or more objects (Sinton, 2014**)**. An example where one could use spatial thinking to understand a concept or problem could be fractions. To better understand how much 2/3 is or that it is the same size as 7/10 one could visualize the fractions as a round object such as pizza or cake (see figure 2 and 3).

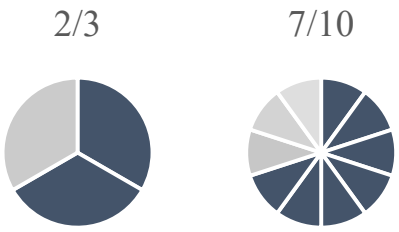


Figure 3.2: Visualizing fractions

Mann (2005) argued for a bigger focus on spatial learning because it fosters skills such as creativity, problem solving, an abstract thinking. However a bigger focus on spatial learning might require a change of culture in the educational domain. Forbus & Uttal (2019) point out that spatial learning has not been emphasized in all educational areas partly because there are challenges in creating and assessing multiple representations of space. Still, they argued that spatial thinking is important and a part in early learning, and with the use of modern digital technology many of the challenges can be overcome.

3.5. Creative learning

When trying to define creativity Sawyer (2012) outlined two approaches: the individualistic and sociocultural approach. Looking at creativity from the individualistic approach, creativity can be understood as a new mental combination that is expressed in the world. The individualistic approach, also known as "little c" creativity views creativity as something new, a combination of thoughts and concepts that are expressed in the world. The idea only has to be seen as new to the individual and not everyone else. Traditionally, creativity, has been viewed as being opposed to learning because learning has been understood as acquiring existing knowledge (Sawyer, 2012). However, newer understanding of learning argues that creativity and creative learning emerges from learning environments and that learning is always a creative process. Ferrari, Cachia & Punie (2009) defined creativity in a similar way. They described creativity as a skill that can be fostered and that everybody can develop it. They argued that creativity is going to play an increasing role in society and that teachers and other educational actors have the possibility to foster creative thinking among young individuals. They introduce the concept of creative learning, which they describe as any learning that involves the student's understanding of a concept that goes beyond existing

concept. Bernard (in Sefton-Green et al, 2011) defined creative learning as a form of mediated activity in which imagination and development of knowledge play important roles. Furthermore, creative learning involves participation and is developed in relation between people engaged in collaborative activities in which they develop their thoughts together. Nixon and Comber (in Sefton-Green et al, 2011) shared a similar notion and discussed creativity as part of place-based education in which teaching and learning are designed to focus on exploring space. They argued that space as focus for learning allows students to imagine what they know and go beyond existing facts. Wiggins (in Sefton-Green et al, 2011) compared creative learning to video games and state that creative learning does not demand much teaching "as long as there are clear challenges, good feedback, and choices for the learner ."(p. 321). Further, he argued that a student rarely is learning when they only have to sit in a classroom and listen to the teacher. Rather, learning happens when the students have the chance to apply what was taught in an setting and make sense of it.

4. Literature review

In this chapter I will present previous research and literature on the topics related to domain general skills and technological tools in used in education. First I will present literature and research on fostering domain general skills, before presenting literature and research on the use of games and simulators in regards to education. Finally I will present previous research on the use of blocks to teach domain general skills.

4.1. Fostering domain-general skills in the 21st century

Today, we live in a society that is changing quickly. More and more jobs are becoming digitalized and automatized and people are being educated into jobs that does not yet exists (NOU2015:8). Knowledge only in one domain is no longer enough. Students need to be able to use acquired knowledge across multiple domains (Trilling & Fadel, 2009). Education's role in preparing students to contribute to society has become one of the century's biggest challenges. In large parts schools need to educate students in domain-general skills that can be used across a variety of domains. Domain general skills, also known as 21st Century skills are a set of skills that can be applied in many domains. Trilling & Fadel (2009) divide 21st Century Skills into three groups: 1) learning and innovation skills, 2) digital literacy skills, and 3) career and life skills. In this project the focus will be on the first group. The first group includes skills such as critical thinking and problem solving, communication and collaboration, and creativity and innovation. Though not directly referred to as 21st Century skills, these domain general skills have been given priority in the overall part (overordnet del) in the new curriculum where they have been listed under core values for education (UDIR, 2017).

According to Sawyer (2012), students often combine domain general skills and domain knowledge when they learn. For example, in social studies the subject itself might serve as the framework for a task which students use skills such as creativity and problem solving in order to showcase and act out the domain knowledge. He argued that although there exist domain general creative strategies, creativity itself is primarily domain specific as it is grounded in understandings of domain knowledge. Instead of teaching creativity in general, he suggests an approach to domain knowledge that prepare the students to be more creative using that knowledge. Baer ((1998) in Sawyer, 2012) researched the creativity of products that were generated from four different domains: poems, short stories, collages, and math puzzles.

These products were made from people who had no training in these domains, and he argued that if creativity was domain general then the level of creativity of the products in the various domains would correlate highly. However, he concluded that there were no correlation between creativity in the four domains. Understanding creativity as grounded in domain knowledge presents an understanding of creativity in which the students play a more active role and where they can build their own experience on the domain knowledge. Further, this approach to creativity presents an understanding of learning in which the students play a more active role and where they can create their own ideas based on the domain knowledge. The challenge here, however, according to Sawyer (2012) is making sure that students masters the domain knowledge to a sufficient degree, so that they are prepared to be creative in using the knowledge, and not simply memorizing it.

In their study, Mørch et al (2019) suggested that Minecraft might be a useful tool for developing domain general skills, but not without challenges. Among others, they reported that the combination of domain general skills and domain knowledge did not happen seamlessly because they tend to belong in different realms (school knowledge vs. out of school experience). In their study, teacher students were tasked with building a model of the Norwegian parliament and creating and perform a role play of a political decision-making process inside the building. The building process itself was based on the students having to use domain general skills, such as creativity and problem solving, while the role play was based on domain knowledge because the students had to gather relevant knowledge on political decision-making. Even though the students noted that teaching domain general skills through Minecraft was useful, they still perceived it as a threat to domain knowledge (Mørch et al 2019). They also noted that the integration between them were insufficient, and suggested that further work ought to harness the integration, from both the teachers' side and the students: teachers trying harder to leverage the students' prior experiences and students making earnest efforts to learn subject specific skills while "playing" Minecraft.

4.1.1 The use of games in education

How can the goals of games support the learning aspect? According to Young et al (2012) having a game that achieves a good balance of informality (flexibility) and formality (boundaries) can help engage students in collaborative learning and help make sense of shared knowledge emerging as the gameplay develops. Games in general can have a positive effect on a wide range of learning outcomes, but presently there is limited evidence on how games

can be used to enhance learning in educational settings. One aspect they note however, is that the game's objective should correspond or be aligned with the learning and not be forced to be used in a way that it is not meant to be used. This can distract the students and creates a contradiction when the students' goals are at odds with the instructional goal. By basing the instructional goal on the goals of the game, or the other way around, the barrier can be reduced. For example, in World of Warcraft, the players can create potions, drinks that might have certain effects on the avatar. Young et al (2012) state that by modifying the creation of potions so that it would rely on basic understandings of physical chemistry the game would provide information that would be useful for playing the game and at the same time transferable to chemical experiments in a school setting. To achieve this synergy affect is not without its costs. It would require that commercial companies are willing to change the games to include elements of traditional school subjects, which may not work as a market strategy when selling a game to young people. Another point Young et al (2012) make is to not let the gameplay be the sole focus of games in education. They state that much of the learning may come from those situations where students approach affinity groups such as blogs, wikis, videos, or discussion forums that support the game and the gameplay. For example, Minecraft has fan made wikis, which go into some detail on many aspects of the game while forums centered around Minecraft might offer "mods" or software modules that can be added to the game to enhance the game experience. This type of "metagame learning" is as important as learning through gameplay according to Young et al (2012) because it offers deeper insight into games, what they offer, and how they can be played and redesigned. They also note that games cannot be used as the only tool for education. The teacher must still be present to facilitate and guide the students during gameplay to ensure that information they provide can be used in the context of the game and that it is generalizable. In regards to what Young et al refer to as metacognitive skills they note that games themselves might be able to spur 21st Century skills such as critical thinking (are certain websites more reliable?), creative thinking (e.g., using "mods" when recreating historical buildings in a block-based game) and problem-solving skills (are there misconception of historical context in video games and why?). Especially during collaborative gameplay, the students might take on different roles and therefore have different type of interaction with the game. Because students interact with the game differently one should have multiple learning outcomes to ensure that most students touch on some of them. Players also need to be made aware of the skills and strategies they are using (Young et al, 2012; Kapp, 2012).

In their study on the use of a mobile game in classroom to teach students algebra, Kluge and Dolonen (2014) noted that students enjoyed playing the game even though algebra and mathematics is often characterized as boring. The game was designed to hide typical symbols used in algebra and replace them with their own student friendly symbols. Kluge & Dolonen (2014) referred to this type of learning method, which hides learning in the gameplay, as stealth learning. Even though they stated that this type of method can be quite effective, they also noted that the design made it difficult for the students to transfer what they learned in the game over to academic subjects such as math. Kluge & Dolonen (2014) argue that "interaction with technology can stimulate productive sensemaking in the learning of mathematics and other subjects." (p. 109). Along with other resources in learning situations, such as teachers' scaffolding, the use of technology can play a constructive role for students to learn various concepts. Students create meaning in collaboration mediated by technological artefacts (Stahl, et al 2006). Furthermore, according to a sociocultural perspective, when students create meaning by using technological artefacts in a learning setting, the technological artefacts cannot be analyzed isolated from the context. Its usage is dynamically developed in the context while it is being used, i.e. the context and the tool is reciprocally related. How the students choose to interact with a specific tool has to be understood in the same context because it sets the framework for interaction between the student and the technological artefact.

4.1.2 Learning by simulation

Vygotsky (1978) proposed that play is an important factor in a child's development because during play the child establishes barriers that allows it freedom to act only limited by creativity and the constraints of the barriers. In their study on how trauma teams can practice performing diagnostic work when examining patients in an emergency room (ER) at a hospital, Krange, Moen & Ludvigsen (2012) concluded that highly specialized simulation can act as an arena for training communication skills. When the new patients arrive, the situation can often be both chaotic and unknown to the hospital workers, and they must quickly examine and evaluate the situation by studying the patient and her situation. By using a computer-based simulation, the team members have a safe place where they can practice communication skills in different problem solving scenarios of the kind mentioned above. Further, Krange et al (2012), noted that the doctors and nurses that were studied managed to share knowledge on the patient between each other, and consecutively use this information to decide further procedure on the patient.

Mørch, Hartley & Caruso (2015) stated that roleplaying is a technique used for teaching communication and problem solving skills by letting them take on different roles with different viewpoints, such as a teacher, welfare client or bus driver. The participants are collaborating in a joint activity when role playing such as building something together or resolving an issue. Furthermore, the participants in the role play learn in different ways: learning when adopting a specific role, seeing a situation from another person's point of view (perspective taking), and switching roles to learn all facets of a game. With only the joint activity as a framework for roleplaying the students are free to develop the story as they prefer. In their study of teaching interpersonal problem solving skills using roleplay in the 3D virtual world Second Life, Mørch et al (2015) suggested that interpersonal problem solving skills can best be taught in a setting that supports collaborative learning such as small group settings. While roleplaying itself involves semiformal game elements such as roles, rules and guidelines, that can be beneficial for students, placing it in a virtual environment adds another game element, namely tools. Both Mørch et al (2015) and Caruso, Mørch & Thomassen (2014), informed by a sociocultural perspective, note that Second Life offers tools for communication and collaboration that can lead to a stronger sense of group cohesion. Further, Caruso et al (2014) also stated that in their study of roleplaying in Second Life the participants enacted their roles less consciously than in the real world, implying that the threshold for participation and engagement is lower than in face to face situations. This was most likely attributed to the fact that they were not influenced by distractions such as the feeling of embarrassment that may occur in a classroom, which is a result of using avatars to represent personality (Caruso et al., 2014).

4.2. Block building games

When trying to address how creativity is promoted in preschools in China, Tobin, Hayashi & Zhang (in Sefton-Green et al, 2011) make use of block playing in a classroom. The game consisted of given a set of blocks and asking them to work together to solve an assignment using the blocks. The reason behind it was for the students to use their imagination and creativity in collaborative settings to build what they wanted. In a study conducted by Caldera et al. (1999) on block play is used to teach visual-spatial skills. The children were given the task to reproduce a visual structure using blocks and the next day tasked with building whatever they wanted using the same set of blocks. The authors noted that the first task

showed effect on visual-spatial and analyzing skills, whereas the second day task showed effect on the children's creative thinking. Games such as Minecraft can be considered a digital block playing game (Mørch & Thomassen, 2016). The player has the option, either alone or with peers, of using basic building blocks to build and destroy visual structures similar to building with Lego.

5. Methods

In the following chapter I will discuss and reflect on the method and tools that have been chosen for this project. Even though I have not directly gathered all the data material, I still had the opportunity to participate in the field. As such I have written down field notes about parts of the data that have been interesting, light of the research questions, which made it easier for me to look back on the data. I will also discuss the different tools that were chosen, both their benefits, challenges of using them, and the analytical choices that have been made.

5.1. Research design

The purpose of design-based research (DBR) lies in making changes in the field during multiple iterations and document the effects (Barab & Squire, 2004). I entered the project in the first iteration of the study, but I have no intention of comparing multiple iterations, as it is outside the scope of my thesis. Instead I will compare the data collected in one setting (a school). In this regard, the study might resemble an exploratory study. Exploratory study can be described as a design that is suitable when one enters a field that has received little research, often with an inductive approach (Befring, 2015). The use games with the intention of integrating domain general skills and domain knowledge has not been implemented in large scale across Norwegian schools. As such, one could argue that exploratory design or study is a befitting term for my project. Exploratory design is similar to design-based research in that they both try to understand a phenomenon in its natural setting (Barab & Squire, 2004; Befring, 2015). A difference is that exploratory studies do not need to follow from multiple iterations and changes between them.

Design research was created to address several issues that are central to learning (Collins, Joseph & Bielaczyc, 2009). Among them was the need to address theoretical questions about the nature of learning in context, and the need for a research approach to learning that is based in the real world rather than a laboratory. Design experiments, the first term used for DBR, were first developed with the intention of carrying out a formative research in order to test and refine educational designs based on theoretical ideas obtained from earlier research. It was described by Collins et al (2009) in the following way. Firstly, the researcher will enter a field and create the first iteration of the design. After collecting data and analyzing it, the design will be revised and a new round starts. By studying the design in the real world and refining it based on the data gathered, it is possible to gradually develop a learning design that

closer represent a natural learning environment. However, certain challenges must be overcome (Collins et al, 2009). As design-based research are studied in a natural learning environment such as a classroom there is a lot of things happening. There are many variables that both directly and indirectly affect learning and many of which cannot be controlled. Therefore the focus is not to identify variables and measure relationships with quantitative methods. The focus is on the process of development. Researchers often end up with large amounts of data which can be time consuming to go through, and another set of measures must be taken to handle the data.

5.2. Choice of method

According to Kleven (2011) research begins with a question or curiosity, before the researcher works towards answering, or at least highlight this question using scientific method. The choice of method one makes is the approach one believes is the most suitable to answer the question. However, finding the most suitable method to answer the research question, not only gives information on the field of interest, but can also give insight into the complexity of the related domain (Grønmo, 2016). For example, when looking at my project, using the most suitable approach does not only answer my research question, but can also give me insight into the complexity of learning in social context and collaboration through technology mediated artefacts in a classroom setting. As my research is focused on trying to understand a phenomenon, the qualitative approach can be argued to be the most suitable approach.

5.3. Qualitative method

Qualitative method refers to a set of data collection methods with premise of understanding a phenomenon in depth (Grønmo, 2016). It differs from quantitative method, which consist of data collection tools focused on trying to understand the scope of a phenomenon by measurement. Depending on what the researcher wants to achieve with the research both methods can be valuable, either by itself or in combination. In addition to quantitative and qualitative methods, there exists a third method, mixed methods, which combines both qualitative and quantitative methods. It has been argued that this type of method can give a better understanding for a phenomenon in the learning domain, because studying learning often yields data that has both quantitative and qualitative aspects (Grønmo, 2016).

Because this project seeks to understand a process of how Minecraft can be used in a social studies topic (domain knowledge) and which the pupils use experiences from other subjects (domain general skills), it was determined that qualitative approach is the more suitable.

5.3.1 Observation

Bryman (2016) suggests different types of observation: participating, non-participating, structured and unstructured. Participating observation is primarily associated with qualitative research. By conducting a participating observation the researcher immerses itself in the setting where the research is conducted. Non-participating suggests that the researcher is in a social setting where the person is not interacting with the participants. Structured observation on the other hand is a technique in which the researcher explicitly formulates rules and sets up a plan for how the observation will be done. The rules are meant to direct the observer towards aspects of behavior that they are supposed to be looking for. Structured observation are usually non participating. Lastly, unstructured observation is focused on recording as much data as possible on the participants' behavior. In this project what has primarily been used is non-participating structured observation. In qualitative research this could be beneficial if one seeks to understand a social phenomenon in a natural setting, because interaction with the participants could disrupt the data (Bryman, 2016; Kleven, 2011). In my project, this has involved studying small groups using Minecraft in some detail of analyzing interaction with a video recording of their screen. The pupils worked in groups of four and were tasked to reconstruct a building in Minecraft along a river meant to represent a real life river that functioned as an industrial site during the 1800s. Two groups were separated from the rest of the class and placed in smaller rooms (observed groups), where the project team had set up cameras to record their computer screens. By recording the content on the screen and capturing the dialog between the students while solving the assignment, we might be able to capture data to show collaboration and display creativity among the students, as well as their application of domain knowledge. In addition, it can give an insight what other computational tools the pupils use to supplement Minecraft. For example, some of the students searched both their notes on OneNote and the web for sources for how their building looked outside and inside and what type of building material they should use. One of the cameras was moved within the room every half hour to capture different perspectives. The other camera lacked a handle and had to be placed in one place. Because the camera could not be moved, participatory observation was used instead. This was done to find out what the other students were doing on their computers and what they were thinking while working. To

avoid disturbing the activity, researchers' participation was kept to a minimum and most of the observation was non-participatory. Non participatory observation was also the approach taken toward the other groups that were not filmed by me , as I was walking around, observing non-intrusively and writing field notes.

One weakness with observation as method is that the presence of the researcher can affect the interaction between the pupils and between the pupils and the game (Kleven, 2011; Dalland, 2017). This weakness is also called the Hawthorne effect, and appears when close observation of groups increases group productivity (Eriksson-Zetterquist et al, 2015). The participants can feel pressured to do well because they know they are being watched or interact less during collaboration for fear of saying something wrong. Whether the participants feel comfortable either with participatory observation or without depends on the field that is being studied and is something the researcher should keep in mind (Dalland, 2017; Johannesen, Tufte & Christiansen, 2011). Another challenge is that the researcher cannot observe everything. Sometimes multiple things can happen at the same time and it becomes be difficult to pay attention to everything. Video recording provides a solution to this issue. Furthermore, video recording makes it is possible to rewind and replay and thus gain more information from the observation. Also, if there are multiple researchers participating in data analysis, which was the case here, one can capture multiple perspectives and discursive views and making the analysis of the data is as objective (shared understanding within the group) as possible. Recordings also makes it possible to discover both visual and auditory clues that were not discovered earlier (Dalland, 2017). As two different groups were observed with video recordings, it also became possible to compare the data to find similarities and differences. Video recordings also makes it possible to leave the room to observe other groups in parallel, which has another advantage that the students might forget that they are being observed and continue to act natural. According to Jordan & Henderson (1995) video cameras that are placed in one location in the room can quickly be forgotten by the members and will then have a low impact on the interaction between them. At the same time, it is easy with video recording to end up with a large amount of data, which can make it difficult to carry out the subsequent steps required such as transcribing the video footage.

5.3.2. Interview

Conversation is an important tool for work among individuals (Dalland, 2017). Further, entering in conversation with someone means to use human resources to gain knowledge and

understand a situation or phenomena. According to Kvale & Brinkmann (2015) interview knowledge is established during conversation between the interviewer and the interviewees. The reason why interview is one of the most common means of collecting qualitative data is because the researcher wants to understand a phenomenon verbally by interacting with the informants (Dalland, 2017). In this case, interview is being used to get an insight into the students own understanding towards the usage of Minecraft in social studies.

In this research, interview with a focus group have been used. Using a focus group is a method of interviewing that involves more than interviewee (Bryman, 2016). Though it shares similarities with group interviews there are certain distinctions. First, focus groups interviews explores a specific theme in depth contrary to group interviews who may span a wide variety of themes. In our case for example we are focused on understanding how Minecraft fosters both domain general skills and knowledge. Secondly, whereas group interviews are carried out so that researchers can save time and money by performing interviews with a large number of people, focus groups explores how group members discuss topics as members of a group.

According to Bryman (2016) the questioning structures of interviews with focus groups can vary from open ended questions, to a more structured form. In our case the interviews took a more middle road approach. The interviews were based on an interview guide created by the project group. The aim of the interview guide were to start or steer the conversation but not limit it. The questions were based around domain general skills practice, but the conversation were adjusted to the student's own level of understanding. For example, instead of using words such as problem solving we asked if something was difficult. Moreover, we could ask if something was difficult to them, or if they ran into problems or issues along the way and further ask how they solved it, or if they solved it. The reason we chose words that were more suited to their level of understandings was to not create a distance between participants and researchers. One of the positive aspects of informal interview is that one can go into depth, i.e., follow up a topic the informant has much knowledge about despite not being in the interview guide, if one of the answers is of interest (Dalland, 2017). Because the interview was done with a whole group it makes it possible for the group members to elaborate on their answers without the researcher having to take an initiative. This can lead to natural conversations between the members. Challenges, however, is that not all groups members talk during the interview (Grønmo, 2016). In this case observation both without and with

recording could be useful. This can capture data on the participants both visual and auditory to get useful data on activity on all participants. Another challenge, is that to get useful data on a subject, the pupils must know the subject well. In focus group interviews this becomes visible because the students might have different levels of skill. Here, observation can be useful in combination with interview because it can capture data that shows the participants level of skill , during the assignment, that the interview might not be able to capture.

5.4 Analysis

There are several ways to interpret data: deductively, inductively and abductively (Bryman, 2016). Deductive or 'top down' approach is a method of interpretation in which the researchers own theoretical interest acts as the frame for the interpretation of the data. The interpretation might at one hand be more closely associated with the research question, but as a result is more difficult to connect with other data that can affect the research question. The second one the inductive, or 'bottom up' approach interprets data independent of the research question and theoretical framework. These interpretation might have little relation to the research question. The data that is interpreted inductively will have a high reliability because the data is not looked upon through the lens of a theoretical framework. However, when using the inductive approach, researchers should not completely let go of their theoretical frameworks because the researcher's interpretation does not exist in the data, but rather are interpreted by the researcher based on some assumption (Braun & Clarke, 2006). The interpretation is not grounded in theoretical framework, but is based on ideas and presumptions by the researcher. The third approach, abductive approach, share similarities with the inductive approach in that the researchers interest frames the analytical process (Bryman, 2016). However, whereas the inductive approach concludes with a hypothesis or a theory that is generalizable, the abductive approach concludes with the likeliest explanation for the data. According to Dey (in Seale et al, 2004) abduction is to move from an idea of something to a different and possibly more developed idea. This happens through first framing the idea in light of a theoretical framework and later interpret the ideas in light of new ideas. In this project the abductive approach has been used. The research questions have affected the type of data I am looking for, signs of domain general skills and domain knowledge. However I am not certain whether the results will yield a positive or negative outcome, or if the data will reveal something different of the research question.

5.4.1. Interaction analysis

Interaction analysis is an interdisciplinary method used to study the interaction between individuals (Jordan & Henderson, 1995). Activities that were being analyzed were not only the verbal interaction, but also nonverbal interaction, such as body language and communication involving (physical) tools or artefacts. By using interaction analysis, the researcher gathers data about the social interactions between the participants. This also involves the tools and artefacts the individuals use while talking, such as video games and computers in order to study how physical tools affect the interaction between the participants, and vice versa. With interaction analysis, I have studied the social interaction obtained from two data sets: video observation and the interview. It could also be relevant to investigate in more detail how computational artifacts were not only used but also developed while interacting in the game. Jordan and Henderson (1995) stated that video recording is a useful tool for studying interaction because the researcher has the possibility to play, go backward or forward or slow down, study data at a later time, and discover new data they originally did not spot in the first place. This type of in-depth analysis of interaction could be difficult to do without video recording because a researcher rarely manages to capture everything that happens in a complex learning environment unaided. However, there are also some limitations of using a recording device. As we have recorded the pupils' use of Minecraft, I found that body language was poorly captured. We have been able to capture the pupil's movement within the game, and how they use the camera controls inside the game. For example if one of the pupils were to communicate verbally what the others were supposed to be doing, for example build the roof they would also be moving their camera within the game towards the roof. The pupils could also be moving their character to a spot if they wanted someone to build there. So, in one way this gives a form of computational communication in that they are using the tools in-Minecraft such as camera angles and movement along with verbal communication when interaction with each other. As interaction outside of Minecraft mainly have been verbal body language may have had little impact on the interaction in Minecraft. The researcher can both consciously and unconsciously interpret data based on what one wishes to discover. In this project there have been more than one researcher who have been analyzing and interpreting the data which can strengthen the analysis of the data to be less subjective in that the group of researchers aimed for a shared understanding.

5.4.2. Thematic analysis

According to Braun & Clarke (2006) qualitative analytical methods come in two types. The first type is the methods that are based on a theoretical or epistemological assumption. Interaction analysis for example, is a method that is based on a socio-constructivist or sociocultural perspective because it is about studying a social situation, an interaction between individuals. The other type are methods with few or none theoretical or epistemological assumptions, as they are purely data driven. Thematic analysis falls into the second category.

Thematic analysis can be used to discover patterns or themes that are present in the data. At the same time however, it is important to remember to have an objective view on the data and note down patterns that may seem interesting as you study the material. In my project, thematic analysis is of interest to discover patterns in the data material with regards to the use of Minecraft to understand better how it is used as mediating artefact for interaction. It is both relevant for the interview data, in which the students can bring up their own thought and ideas concerning the assignment and the use of Minecraft, and observation data, two discover patterns not directly associated with interaction between the members

The two analytical tools that I have used have similarities and differences, which could be valuable when trying to explain activities in a complex learning environment (Braun & Clarke, 2006; Jordan & Henderson, 1995). Both analytical methods have the intention to discover patters, either in relation to collaboration (interaction analysis) or patterns in the interview data and body language and tool use (thematic analysis). While interaction analysis has the intent of researching patterns of social interaction, thematic analysis can be used to discover other types of patterns not directly connected to social interaction, but still influential for understanding the learning situation.

One of the questions regarding thematic analysis that I found difficult is what exactly counts as a theme, and what size it needs to be. Because I am dealing with multiple data sets gathered from a classroom there are many dimensions of themes, and I am not able to control them. Therefore, the size of a theme might differ among the themes and be less present in one data set than in another. On the other hand, quantifiable measure is not the only thing a theme is dependent on. One should also look at the overall research question and see whether the theme captures something of relevance to the research question. Collaborative work might

differ considerably between two groups and if a researcher spots a theme in one group that can be connected to collaborative work that is less visible in the other, it might still be relevant to bring up in the analysis because it says something about the collaborative work in both groups that upon closer scrutiny will vary among the groups. A common misconception in thematic analysis, according to Braun & Clarke (2006) is the idea that themes exists in the data and will be discovered and understood in the same way by different researchers using different theoretical interest. As Ely et al (1997 (in Braun & Clarke, 2006)) note:

> The language of 'themes emerging': Can be misunderstood to mean themes 'reside' in the data, and if we just look hard enough they will 'emerge' like Venus on the half shell. If themes 'reside' anywhere they 'reside' in our heads from thinking about our data and creating links as we understand them. (p. 7)

After having gathered the data, I categorized them into six groups: acquiring knowledge, creating historical buildings, spatial abilities, building together, play versus learning, and domain knowledge and entertainment.

According to Braun & Clarke (2006) because thematic analysis can be quite time consuming when dealing with large sets of data it could be wise to start noting down data that are interesting that show up during the data gathering process. By doing that it becomes easier for the researcher to go back on the material and study it closer. It also gives the researcher a point of comparison when looking at other data sets to see if the same themes are visible. Analyzing involves a constant moving back, forward and between data sets, thematizing extracts from the material and further analyzing the content. Writing is an integral part of analyzing and should therefore begin when obtaining data by writing down points of interest.

5.5. Reliability

According to Bryman (2016) reliability is about whether the results of a study can be achieved again if one wishes to repeat the project. The term is often used when trying to decide if the variables one is measuring are consistent. Reliability is a critical point in quantitative science, but researchers have also argued that reliability in qualitative research is important as well even though it presents certain challenges (Bryman, 2016).

Challenges that may happen when discussing reliability and validity is partly connected to the definition itself; whether the results of a study can be repeated. Unlike quantitative research, one is not necessarily trying to discover the size of the phenomenon, but rather trying to explain if and, perhaps, why or how a phenomenon happens. In this project's research question, I am seeking to discover how Minecraft can work as a mediating artefact for learning and how domain knowledge and domain general skills are manifested in the game. Challenges I might run into lies in how I decide to interpret what is domain knowledge. In order to strengthen the projects reliability, I have chosen to use video and sound recording to capture the interaction between the students and the game in Minecraft. By using a recording device during the observation, it has become easier for me to verify the data I have collected and used. It should be noted that the data material should be treated with a critical view. The recording captures the interaction inside the game and the verbal communication and not interaction outside the game. On the other hand, student's task involved using Minecraft to build, and therefore the data that is most likely relevant is data about what happens inside the game. The students were also using other software such as web browsers to gather relevant data. They also had gathered data beforehand that were stored on OneNote. This was tried to be captured with the video recorder or a sound recorder by me or someone else asking the other pupils that were not filmed what they were doing. As mentioned before, participating observation can be disturbing for the participants, but in this case, this was seen as being necessary to capture data on the other members and strengthen the reliability. Activities that may contribute to learning might be visible but also invisible. In order to capture mental signs, such as thought and ideas participatory observation was being used. I also noticed that the little use of participatory observation made the participants calm because I had established a relation to the participants. Of course, I am aware that mine and other researcher's participation influenced the students, but this did not last long.

5.6. Validity

Validity is looking into the results from a study and discuss if there is a positive correlation between the phenomenon that is being researched and the results and data of it. (Silverman, 2014; Johannessen et al, 2015). Central to this are the methods that has been chosen and whether they can be considered to the best methods to answer the research question. As mentioned, I have used observation with recording to understand how students interact during Minecraft, and interview to get a clearer understanding of group members' thoughts and ideas

on using Minecraft. To strengthen the projects' validity triangulation between observation and interview has been used.

Sometimes in research one needs to combine multiple types of data gathering methods to get a better understanding of the phenomenon one is studying (Bryman, 2016). Often, it can appear that a method one chooses does not generate much data and one might need to use another method that captures data differently. Triangulation of data could also be useful when the methods one is using compensates for each other's weaknesses (Dalland, 2017; Bryman, 2016). As mentioned above there are challenges both when one is using interview and observation to gather data. Especially when interviewing a whole group, one could end up with challenges such as not everyone speaking or just nodding or repeating what someone else said. This weakness could be compensated with a video observation because it can capture the pupils and how they have reacted and behaved during the activity. In my project the students were not filmed, but sound was captured which can give an insight to the members' interaction with each other. What was not being captured with the recording such as what the students were thinking, could be captured during the interview when they were explicitly being asked what they were thinking or they could get into a conversation with each other and they naturally give an insight to what they were thinking. Of course, it is also rare that a researcher manages to capture everything about learning as learning is a complex concept that also involves variables that cannot be controlled.

5.7. Ethical considerations

According to Kvale & Brinkmann (2015) a researcher should be aware that ethical challenges are possible in the project from the start until the end. Ethics is a term to describe the principals and guidelines one should keep in mind when evaluating whether what one is doing is right or wrong (Johannessen et al, 2011). Given that I have used both interview and observation I sit with data that in theory can be connected directly to the participants. Because I have used these methods and have researched a vulnerable group. The students and their parents have received in writing what the research is regarding and what it means to participate. For example, it is stated that participation is optional, and that one can resign whenever they feel like. It is also stated that the pupils themselves are not being filmed, but the computer screens. Even though the students were not filmed, full anonymity cannot be achieved unless the recordings are being edited to a level in which the participants, the area

and their voices are not recognizable anymore. The parents, as well as the students have also been informed that the material will be transcribed before being deleted which will raise the level of anonymity. Only data that is relevant to the research question will be transcribed. Names, and other sensitive information that might appear in the data through conversation between the students will not be saved, neither will the participants names as they will be given fictional ones. This type of editing is demanding, and regarding my data I would like to refer to Derry et al (2010). Alongside being transcribed, the data material is also being stored in virtual desktops that has no access to the internet. According to Derry et al (2010) confidentiality can be achieved in many ways for example by limiting access to the video or personal information about the participants and the school. Even with consensus from the parents it is still important to remember that the children are aware of the projects and its purpose and they also give their own consensus to be observed and interviewed.

6. Analysis

In this chapter the empirical data will be presented. In order to systematize and analyze the material, the data has been categorized using the thematic analysis method (Braun & Clarke, 2006). As the data has not been translated, I'll present the material in Norwegian. Words and sentences that are of interest will be written in English with the Norwegian words and sentences written in parentheses. The data will also be presented using two different formats, because I have been focused with capturing different aspects of the collaborative work. With the observational data, I am looking into how the group members collaborate and the action they perform, while with the interview data I have been focused on gaining an insight on their own thoughts and views regarding the assignment. Because the organization of the students' task consisted of three stages of the collaborative knowledge adaption model (Mørch et al, 2019): domain knowledge introduction, reconstruction (building in Minecraft and writing script), and roleplay, the themes were initially framed accordingly. The themes are placed in either the introduction stage, reconstruction stage or the transformation stage, as seen in the table below. Outside the overall organization of the themes, the model has not affected the analytical process. Rather, the model is being used in order to better understand my research question by letting the data as much as possible "talk for itself."

Table 6.2: List of themes

Introduction	**Reconstruction**	**Transformation**
Acquiring information	Creating historical buildings Spatial abilities Building together Play versus learning	Domain knowledge and entertainment

To anonymize the participants' real names, I came up with fictional names for members of each group as shown in the table below and which group they belong to:

Table 6.3: List of fictional names for each group

Group 1	**Group 2**	**Group 3**
Daniel	Geir	Mikkel
Anna	Jon	Kris
Iris	Lisa	Thea
Nils	Gro	Kim

6.1. Introduction

The first stage includes themes that looks into preparatory work that are needed before the pupils can begin with Minecraft. I was not present during this stage, and data from the interviews will be used for substantiating my claims of the learning activities carried out during this stage. However, some of the information gathered also took place during the second stage, where I have video material. As such, there will also be data presented here that comes from the later observation, and some of the data that is presented here will also be mentioned in other themes as a way to connect the them.

6.1.1. Acquiring information

Before the students could build in Minecraft and carry out their role play they had to gather information on the looks and function of their buildings. Both factual information, on what was produced in each building, as well as the measurements and visuals (pictures and drawings) on how the buildings looked like during the industrial age were needed. From one of the groups we interviewed, group 3, we learn that the class were visited by a group of senior citizens who were avid local historians (local experts on how the industrial revolution had impacted their community during the historical time). When asked how they found information on their building, the group of pupils answered:

Excerpt 1: Acquiring information from pros

00:00:13-4	Kris:	"*Vi spurte han der proffen da åssen det var"*
	Interviewer:	*"De pensjonistene liksom? De som kom hit? Dere spurte han spørsmål også lagde dere noe?"*
	Kris:	*"Ja"*
	Thea:	*"Også fant vi litt på, vi fikk et sånt før vi begynte med det så gikk vi gjennom åssen det var og sånt. Det var noen som drev og forklarte om alle de forskjellige tingene."*

One of the group members, Kris said they asked the "pro" (proffen). Trying to understand who the "pro" was, we asked if it was the senior citizens the group had listened to and if they asked them any questions. Kris answered yes, while another group member, Thea, elaborated on the answer and said that they partly made it up, implying that not everything about their building was based on facts. She also mentioned that they received general information up

front by someone else who came to their class who went through the material and explained everything. It is not made clear who Thea referred to, but looking at the excerpts below from group 1 it could be presumed that she referred to the teacher students who visited them.

Excerpts 2-7: Finding information online

Unlike group 3 group 1 did not refer to the senior citizens. Instead the group cited various online sources and teacher students throughout the interview as sources for their building:

00:25:19-8	Daniel:	*"Vi brukte Google også søkte vi på 'Strømmen Trevarefabrikk' også kom det opp bilder også fant vi målene til det også bygde vi [..]"*
00:26:19-7	Daniel:	*"Vi brukte Google Maps søkte på det også så vi på hvor vinduene var, også ødela vi hull i veggen der og så [plasserte] vi vinduer der det skulle være vinduer"*

In the excerpt above Daniel mentioned using Google and Google Maps to search for images and measurements such as the windows. Later in the interview when the group were asked on how they found information for their role play the group again mentioned the web, and teacher students:

00:28:42-9	Daniel:	*"Nettet. Eller jeg fant på det da. Jeg fant på rollespillet. Fordi det stod at det begynte å brenne.*
00:28:57-8	Interviewer:	*"Åssen vet du at det begynte å brenne i Trevarefabrikken?"*
	Daniel:	*"Det stod på en nettside. Jeg tror det var Wikipedia. Da stod det at det begynte å brenne, også hadde vi folk som stod her og snakket om det."*

Similar to group 3 Daniel and group 1 indicated that their role play was partly made up. Daniel told the interviewer that he used the fire in the factory as inspiration for the roleplay. Asking how the group knew that it started to burn in the factory, Daniel mentioned two specific sources: Wikipedia and some people who came and talked about the factory. Following up on who those people were, another group member Anna answered:

00:29:14-2 Anna: *"Det var [Skole A]. Vi fikk bildene og målene*

Daniel: *"Så vi tok sånn cirka det vi trodde skjedde i den fabrikken"*

Anna: *"Også fikk vi mål på [fabrikken]. Vi kopierte et ark, men vi har det ikke nå siden vi vet ikke hvor det ble av, men det var tegningen pluss at de skrev målene så da fikk vi sett hvordan det egentlig skulle se ut"*

The people Anna referred to were most likely the same people Thea referred to in excerpt 1. Anna also explained that they lost their sheet, which could have been the reason for why they went online to find the measurements.

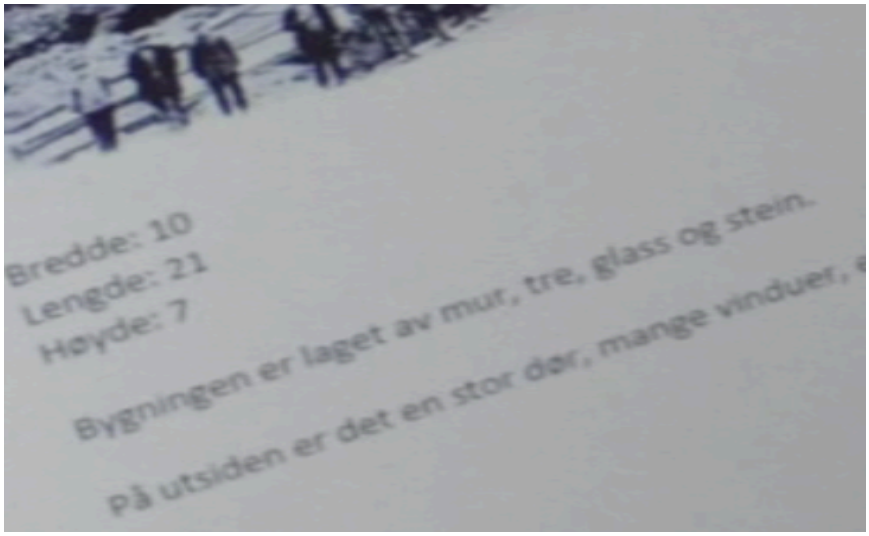


Figure 6.1: A screenshot showing measurements, materials and visuals for a factory.

Another reason for why the group gathered multiple sources might be that the group found it demanding to build the factory as seen in the excerpt below. When asked what they felt required more domain knowledge (scripting the role play or building the factory) the group answered the factory because they had to decide whether they should use newer images or older ones as reference:

00:32:51-9 Daniel: *"Fordi man må finne ut hvordan det ser ut, hvordan det så ut da og hvordan det ser ut nå og visste ikke om vi skulle ta hvordan det så ut da eller hvordan det ser ut nå"*

Excerpts 8-10: The teacher's role in enabling domain knowledge acquisition

When we interviewed group 2, the group gave a short answer to the question on how they found information, mentioning that they had a visit by someone who knew it well, without explaining who they were. When later asked how they developed their role play script one of the group members, Jon, gave a similar answer as the other groups above:

00:05:19-6	Jon:	*"Vi tok jo litt fra Skjærvasaga også tenkte vi litt selv, kom på litt forskjellig"*

Similar to the other groups, this group had information about their factory on paper, but also made something up. However, not all information was gathered prior to building the factories. During the observation of group 2, the teacher student was present and helped the pupils acquire domain knowledge for their role play as seen in the excerpt below:

00:38:14-3 (Geir's screen)

Participants:	**Verbal:**
Lærerstudent:	Må dere ha med noe historie om bygget?
Lisa:	Nei, det vet jeg ikke
Geir:	Nei, jeg tror ikke det. Fordi vi fant ingenting

The excerpt above was taken near the end of the reconstruction stage. The group had completed their factory and began working on the script when the teacher student asked the group if they need any history on their factory included. Later after recess, the teacher student suggested that the pupils should include history on the factory and where the wood comes from:

00:10:33-3 (Gro's screen)

Partcipants:	**Verbal:**
Lærerstudent:	Vet dere hvor sagbruket er? Er det her i [område A]
Lisa:	Det er på [område B].
Lærerstudent:	[område B]?
Lisa:	Ja
Lærerstudent:	For da kan dere si at dere er her i [område B] og at trærne dere får inn kommer fra skogen i området kanskje. At dere får med inn litt historie om hvor trærne kommer fra, at dere lager planker
Lisa:	Trærne kommer fra skogen i nærheten?

Lærerstudent:	Mhm, da får dere litt historie inn. (..) Brukte de elva for å frakte trærne, vet dere det?
Geir:	Det vet jeg ikke
Jon:	Hva da?
Lærerstudent:	Om de brukte elven til å frakte trærne
Lisa:	Jeg så noe om det, men jeg husker ikke om det var til her eller til noe annet
Lærerstudent:	Jeg kan finne ut av det

In the excerpt both Lisa and Geir told the teacher student that they were unsure if the river was used to carry the trees from the forest nearby, prompting the teacher student to look it up for them.

Looking at all three groups, it seemed that only group 1 and 3 had acquired historical information on their building prior to the reconstruction stage. Group 3 were the most positive towards the senior citizens, asking one of them questions and used that information to also come up with their own ideas. Group 1 cited multiple sources naming both online sites and visitation from teacher students. They mentioned in the interview that building the factory demanded more domain knowledge than scripting the role play which could be a reason why they gathered multiple sources. The group also used the acquired domain knowledge to come up with their own ideas for the role play similar to group 3. Group 2 on the other hand could not find any historical information on their building and were under the assumption that they were not supposed to have any information included in their role play. The teacher student in this group played a role helping the students gather historical information. The fact that they could not find any historical information might be an explanation for why they came up with their own ideas when scripting the role play. Based on what we observed with group 1, who found both factual and visual information online, certain information might have been easier to find online for some buildings than others.

6.2. Reconstruction

After having acquired knowledge of the buildings, the next stage was reconstructing the building in Minecraft and writing the script of the role play. As noted in the previous section, the division into stages were not followed in detail for all the groups; some of the groups continued gathering information for their building and role play, while others had already completed the script.

6.2.1. Creating historical buildings

Excerpt 11: Creative decision making

The first theme revolves around using the tools and functions in Minecraft to recreate the historical buildings. The excerpt below is taken from group 1. In the excerpt the group was outside the building working on the terrace:

00:46:50-8

Participants:	**Verbal:**
Daniel:	Var det noe mer? Var det noe bord eller noe sånt?
Iris:	Jeg vet ikke
Daniel:	Jeg bygger det ((Plasserer trappeblokker på terrassen, en gjerdeblokk mellom de og en gulvblokk oppå gjerdeblokken))
Iris:	Må du gjøre det der med alle? ((Fjerner gressblokker rundt terrassen og legger ned steinblokker. Erstatter så noen av steinblokkene med grusblokker))
Daniel:	Nei bare en av de. (..) Så det ser mer realistisk ut
Nils:	Lager du restaurant? ((Plasserer trappeblokker, gjerdeblokker og gulvblokker utenfor terrassen))
Daniel:	Det er ikke restaurant, det er sånn ::
Nils:	Du må ha siden på stolene
Daniel:	Åja med skilt
Iris:	Må man ha sånn? ((Plasserer skiltblokker ved trappeblokkene))
Daniel:	Det er litt sånn bedre stoler
Nils:	Det er bedre stoler for da ser det ordentlig stoler

The conversation began with Daniel asking Iris if there was anything else that was needed to be built. Iris responded saying that she was unsure. Daniel then told her that he would build a table. He started placing four stairs blocks, two on each side of the terrace with space between where he placed a fence block and a floor block on top of the fence block to resemble a table and a seating area (figure 6.2). After this Daniel left the terrace and started to remove grass blocks and replace them with stone blocks before removing some of these blocks with gravel blocks (figure 6.3). According to Daniel this created a more realistic look. He then proceeded to create a seating area outside the terrace by placing stair blocks facing each other and a table (figure 6.4). Nils then arrived outside the terrace and asked Daniel if he was building an outdoor restaurant. Daniel tried to correct him, but was abrupted by Nils who said that the

chairs needed armrests (sider). Iris asked if that is truly necessary, to which both Nils and Daniel said that armrests makes the stair blocks look like real chairs (ordentlig stoler).

Figure 6.2: The terrace consisted of a fence block and a floor block put on top meant to resemble a table and two stair blocks facing the table

Figure 6.3: The group has combined stone blocks and gravel blocks to make the ground look more realistic

Figure 6.4: A stair block with a sign post that makes the stairs look like real chairs

Excerpt 12: Ignoring functionality

The second excerpt is taken from group 2. The group had just begun building their factory building when they started discussing whether or not they should use blocks that resembled materials the building was made of or use blocks that resembled the factory's colors:

00:18:16-2 (Geir's screen)

Participants:	**Verbal:**
Jon:	Skulle vi ha rødt på toppen her?
Geir:	Skal vi bruke rød terracotta? ((Inne på verktøymenyen i Minecraft, skriver 'rød' i søkerfeltet))
Jon:	Eller rødt tre?
Geir:	Eller red betong
Lærerstudent:	Husk [hvordan] det så ut da. (..) Var det tre eller betong?
Geir:	Jeg tror det var tre. Er det noe rødt tre her? ((Skriver 'tre' i søkerfeltet))
Lærerstudent:	Du kan bruke rød ull også for så vidt hvis dere vil ha rød. (..) Men er alle enige om at det skal være rød eller?
Jon:	Ja, det var det på bilde ((Geir plasserer 'rød ull' i hotbar))

In the excerpt Jon and Geir listed various red blocks that they could place atop the white part of their building (figure 6.5). The teacher student then reminded the students that they must remember what material the building consists of. Geir believed it was red wood and asked if there were any red wood blocks. The teacher also suggested that they could use red wool, but only if everybody in the group has agreed that color is the most important to get accurately, to which Jon answered yes and referred to a picture they had.

Figure 6.5: Screenshot of group 2's building in its early phase

Looking at the excerpts from both groups it is clear that they chose blocks that made the buildings resemble the real-life buildings they were assigned. Group 1 accomplished this by repurposing existing objects (fence block and floor block) into a new object type (table). For group 2, it meant ignoring the functionality of the building block and instead find blocks of the right color (Figure 6.1).

6.2.2. Spatial abilities

Excerpt 13: Window placement

The excerpt below is taken from group 2's observation at the beginning of the reconstruction stage. After having finished the structure of their building, two of the group members began working on the windows:

00:23:22-9 (Jon's screen)

Participant:	**Verbal:**
Geir:	[..] Er det vinduer der?
Jon:	Det er vinduer på siden
Geir:	Ja, det er vinduer på ullen
Jon:	Da skal det være glass
Geir:	Tynt eller tjukt? ((Jon er inne på verktøylista. Søker opp glass og plasserer glassblokk og glassruta i hotbar))
Jon:	Ta vanlig ((Fjerner tynt glass fra hotbar))
Geir:	Sånn tjukt?
Jon:	Ja. (..) Hvor er det den ligger da? ((Går ut av Minecraft og inn på OneNote))
Geir:	Burde vi kanskje ta en blokk [..] rød da?
Jon:	Tror du kan ta det som det er. (..) Hvis du tar vinduene i midten (.1). Hvis vi har seks mellomrom

Geir:	Seks mellomrom?
Jon:	Det er ikke så mange vinduer på bildet
Geir:	Skal jeg ta den andre siden?
Jon:	La oss se hvordan det skal se ut først
Geir:	Vi tar seks mellomrom?
Jon:	Eller fem
Geir:	Er det på den femte eller på den sjette?

In the beginning Jon and Geir were discussing the type of glass they should use, a thick glass block or a thinner glass pane (glassrute), before discussing the distance between the windows. From their image (figure 6.7) it is clear how many windows there were on the large part of the building, with four windows on one side. However, when looking at their building (figure 6.7 they had almost the double number of windows on both sides, with seven windows all together (the original had four windows, see figure 6.6). From group 1 we learned that the groups received measurements and visuals (excerpt 6). However, it seemed they only received measurements for the factory itself (figure 6.1.) and not for smaller details such as the windows and the distance between them. For group 2 this might have led to issues in spatial reasoning as seen in the excerpt when Jon and Geir were discussing how many blocks they should have between each windows.

Figure 6.6: Screenshot of groups 2's image of their building

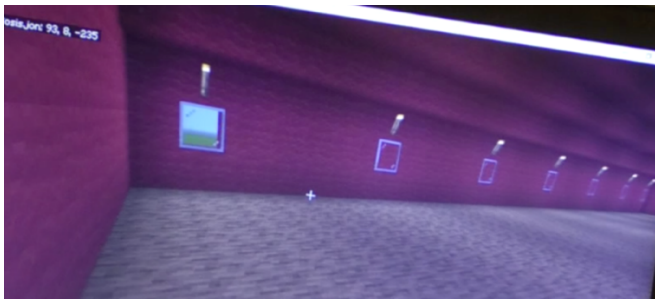


Figure 6.7: Screenshot of the group 2's building shows almost twice as many windows on one side (seven vs. four windows), with the other side also having the same amount

6.2.3. Building together

Excerpts 14-15: Dividing tasks between the members

During the reconstruction stage the students had to build their factory as well as script their role play. When interviewing group 1 on how they divided the tasks between each other Daniel gave the following answer:

00:31:03-4	Daniel:	*"Det snakket vi om underveis. Først så begynte vi å bygge huset, så spurte jeg om de kunne bygge de forskjellige tingene. Så når de begynte å bygge de forskjellige tingene så gikk det bare litt. Så sa jeg 'vi tar verandaen' også tok vi verandaen"*

In his answer Daniel said that they all started building before splitting the process into subtasks that were initiated by him. The excerpt below shows an example on what one of the members built during the reconstruction stage:

00:00:19-8

Participant:	**Verbal:**
Nils:	Det taket her er stygt
Iris:	Kunne du ikke ødelegge da?
Nils:	Jeg ødelegger ikke, jeg bygger
Daniel:	Ikke ødelegg taket ((Nils flyr opp mot taket))

Right after the group came back from their first recess they had a small discussion on the roof, with Nils, Iris and Daniel mentioning two central features in Minecraft: destruction and building. Nils called the roof ugly leading to Iris suggesting that he could destroy it. Nils rejected the idea and said that he instead will continue to build on it.

Excerpts 16-18: Cooperation during building

In similar style to group 1 group 2 also had subtasks where the members built different parts of the building. When asking how they split the tasks the group answered:

00:02:03-1	Geir:	*"Vi begynte samtidig, men vi bygde forskjellig"*
00:02:06-4	Interviewer:	*"Hva bygde du?"*
	Jon:	*"Taket"*
	Geir:	*"Jeg og Jon tok hver vår side*
	Lisa:	*"Gulvet"*

Similar to group 1 the members in group 2 began building at the same time with Geir and Jon building the roof and Lisa building the floor. Another question the group were asked was if they found anything to be difficult:

00:02:23-1 Lisa: *"De tok jo det som var litt vanskelig"*

In Lisa's response she implied that expertise affected the work and what subtasks they performed. Who it is she was referring to is unclear, but looking at the excerpt below it can be assumed that she was referring to Geir and Jon:

Excerpts 19-20: Scaffolding during building

00:22:22-3 (Jon's screen)

Participant:	**Verbal:**
Geir:	Hvilken greie skal gulvet være?
Jon:	Sånn vanlig tre kanskje?
Geir:	Vanlig tre?
Jon:	Sånn 'oak' tre ((Inne på verktøymenyen. Skriver 'tre' i søkerfeltet))
Lærerstudent:	Men skal dere fordele litt eller sånn at noen bygger litt dører og vinduer?
Lisa:	Det kan de gjøre for det kan ikke jeg
Geir:	Dører?
Jon:	Hvis dere ser på bildene
Geir:	Skal vi ha redstone dører
Jon:	Ok
Lisa:	Men skulle vi ha tregulv?
Gro:	Ja, jeg finner det
Lisa:	Hvilket tre da?
Gro:	Eik tre
Lærerstudent:	Men hvis [Lisa og Gro] kanskje får bygget tregulvet i og med at de ikke er like erfarne som dere og så begynner dere med taket og sånt
Jon:	Hvor er det gulvet er på bildet? ((Jon åpner OneNote))
Lærerstudent:	Hvis dere begynner med taket og vinduene så kan de begynne med tregulvet i og med at dere er mer erfarne

In the first part of the excerpt, only Jon and Geir were discussing with each other. The teacher students advised that the group should split the building process into subtasks so that someone could build the doors and windows as well. Lisa replied that "they" (de) could do it because she did not know how. Again it is uncertain exactly who she is referring to, but it is plausible that "they" is Jon and Geir, as the teacher also commented on the girls having less experience that the guys.

Also in group 1 scaffolding appeared as seen from the excerpt below where Anna is discussing with the teacher student on how to interpret an image the group has in OneNote:

00:42:35-7

Participant:	**Verbal:**
Anna:	Jeg prøver å finne ut hvor vinduene skal være, men det er veldig vanskelig [..]
Lærerstudent:	Hva er det for problem? (..) Er det fordi det ikke er bilde?
Anna:	Jo, jeg får det sikkert til å se hvor det er, men det bare føles rart. (..) [..] når jeg ser på det bildet på OneNote så ser det ut som de er ganske nære hverandre. At det ikke er så mye forskjell mellom den her og den her. (..) Men når jeg er inne på Minecraft så blir det så mye forskjell mellom begge to
Lærerstudent:	Men det er vinduene på den siden vi skal se på?
Anna:	Ja, for nå tror jeg at det skal være vindu på hver av de. (..) Den, den der og den der. (..) At det er et vindu der, der og der
Lærerstudent:	Men alle de er på samme vegg er de ikke? (..) Alle er på den ytterste veggen?
Anna:	Jeg er ikke helt sikker, for at det ser ut som det er et vindu der og det er ikke noe oppå
Lærerstudent:	Ja, så den er kanskje bak der så det er bare to vinduer
Anna:	Så er de to vinduer her, under de to. (..) Men nå skjønner jeg ikke. (..) Ja da har den sikkert blitt laget her da (.1) Også lurer jeg på om det der er feil kanskje
Lærerstudent:	Åja, den er litt stor
Anna:	Nei nå bygger jeg bare (.1) Sånn, så må jeg bare se hvordan det skal være. (..) Det er sikkert en blokk mellom

Similar to group 2 in excerpt 12 group 1 had difficulties interpreting the sizes of the windows. In the excerpt Anna discusses the image with the teacher student before concluding that some of it may have already been built. Anna's struggle with the images in OneNote might be a reason for why they used Google Maps to see where the windows were placed (excerpt 2 & 3).

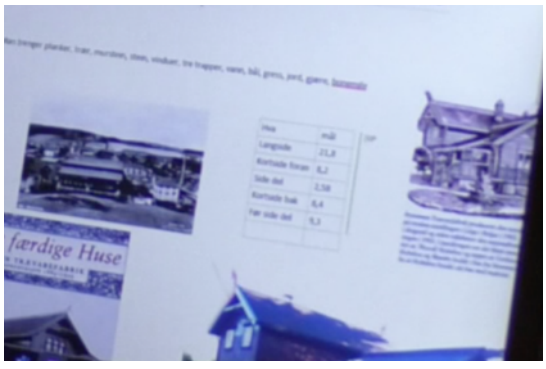


Figure 6.8: Screenshot of group 1's historical images of their building in OneNote

6.2.4. Play versus learning

Another theme that was apparent during the building process were related to Minecraft's own gameplay and items that were irrelevant to the task. Towards the end of the reconstruction stage several groups starts to disturb each other by using items and writing commands.

Excerpts 21-22: Playing around with items

In the excerpt below group 2 logged onto the game after a break. They had almost completed their building when some of the group members started flying around looking at other groups' buildings and discussing items not directly related to the task:

00:07:47-0 (Geir's screen)

Participant:	**Verbal:**
Geir:	Hvem er det her sitt (.2) Hvordan tok du på elytra? ((Starter opp spillet og blir kastet ut. Starter opp spillet igjen ved en annen bygning))
Jon:	Jeg tror ikke det er meningen
Geir:	Jeg skal også ta på elytra. ((Inne på verktøymenyen. Skriver 'elytra' i søkefeltet))
Geir:	Åssen er det man skyter ut rakett? ((Legger til rakett i hotbar))
Lisa:	Se hvor lite vårt er i forhold til alle andres
Gro:	Nei
Lisa:	Jo, det er dritlite
Jon:	Det er ikke det
Lisa:	Eeh jo
Jon:	Det er fordi de har mye større bygninger enn oss
Geir:	Vi må fortsette på den greia vi bygger ((Flyr tilbake til bygningen))

Toward the end of the reconstruction stage both Jon and Geir started to play with elytra and firework rockets. Geir asked Jon how he put on elytra with Jon answering that it should not be possible. Looking at his comments it seems the group were aware that limitation were set to prevent pupils from using certain items. Firework rockets were also being shot in the game as seen from the image below (figure 6.10) prompting Geir to place firework rockets in his hotbar. Lisa meanwhile was most likely looking at other groups' building as seen from her comments comparing their building to another group's building.

Figure 6.9: Screenshot of a group 2 member flying around wearing elytra

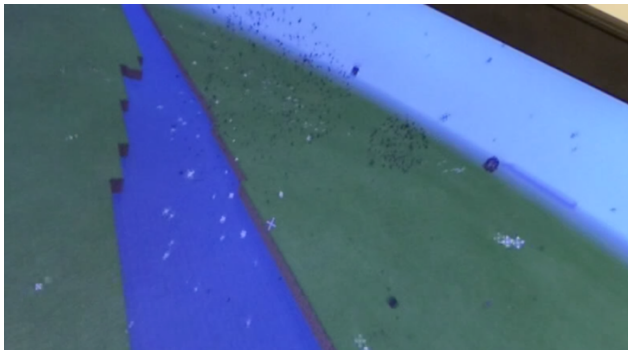


Figure 6.10: Screenshot of firework rocket having been shot leading to small pixels on the screen

00:25:26-8

Participant:	**Verbal:**
Nils:	Oi det var en fugl! (..) Sverger det var en fugl [...]
Iris:	Fugl?
Nils:	Ja. (..) Han har vinger
Iris:	Men hvor er han
Nils:	Her, jeg følger etter den (..) Han har en kappe det er [en klassekamerat]. (.1) Oi det er noen som går rundt og sprenger (..) Han der, ser du han der. (..) Å nei, de ødelegger, de sprenger med fyrverkeri

The excerpt above took place after the first break, during the middle of the reconstruction stage. In the excerpt Nils proclaimed that he saw a bird and followed it, later commenting that it had a cape and that it was a classmate. The cape was most likely an elytra as this is the only cape like item in the game. In the last part of the excerpt Nils implied that someone were destroying objects with firework rockets.

Excerpts 23-24: Destruction

During the interview with group 1, they were asked if anything was difficult or if they encountered any problems:

00:31:48-1	Nils:	*"Ja det er en fyr, eller to fyrer [..] som ødelegger alt vi har bygd, alt vi har bygd knuses hele tiden. Vi blir knust fra den gruppa. Også kommer alle gruppene og klager over at det er noen som ødelegger*

In his answer Nils told the interviewer that someone walked around and destroyed their building. Even though the students were convinced that another student was responsible the teacher student argued that technical issues could be another reason:

00:08:28-5

Participant:	**Verbal:**
Nils:	Det er noen som er usynlig og som går inn i huset vårt
Iris:	Jeg vet
Daniel:	((Skriver '/gamemode S' i chatten))
Nils:	Se hvor mye de ødelegger
Daniel:	Du kødder, noen har løpt over her og så har de ødelagt alt det her ((Flyr tilbake til bygget sitt og plasserer blokker i huset))
Daniel:	Ja hva […] har skjedd her nå da? (..) Alt er ødelagt, vi må bygge opp nå ((Har flyttet seg til den andre siden av bygget))
Lærerstudent:	Men vi vet ikke om noen har ødelagt det
Iris:	Jo, det er noen som gjør det
Lærerstudent:	Men da vi lagde det så skjedde det noen ganger at ting vi hadde gjort plutselig ble slettet
Daniel:	Ja, det lagger veldig nå
Lærerstudent:	For det har også noe å gjøre for da serveren fikk overload da vi holdt på med det så var det ofte at det vi lagde ble slettet

Whether it was a server issue or someone purposely destroyed their building was not made clear. However, the teacher student's explanation could be reasonable because server issues were also experienced by group 2 (excerpt 21). However, looking at the images below (figure 6.11 & 6.12) the distant buildings does not seem to be as damaged as group 1's building or damaged at all. In addition, random destruction occurred on the ground (figure 6.13), which could speak against the server issue.

Figure 6.11: Group 1's building is being destroyed

Figure 6.12: The roof has taken a hit.

Figure 6.13: Random destruction on the ground

Another action that happened in the excerpt was Daniel going into the chat function, though it is uncertain why. However, an unknown participant using the chat function to change the gameplay was also experienced by both group 2 and 3.

Excerpts 25-26: Chat

01:02:49-6

Participant:	**Verbal:**
Geir:	Allowmobs har blitt endret til true. (.3) Nei, nei, nei, hvem har gjort det? Jeg vedder på at det var [en klassekamerat]. (..) Han har hacket Minecraft.
Geir:	Nei, nei, nei, nå kommer det dyr og alt
Lisa:	Tuller du (.4) Hvor er alle dyra? (..) Du sa det var dyr
Lærerstudent:	Går det greit eller?
Lisa:	Det er masse dyr her
Lærerstudent:	Masse dyr?
Geir:	Ja, det er noen som gjorde at det ble dyr her
Lærerstudent:	Men begynner dere å bli ferdig med huset eller? Dere skal begynne å lage filmen etter storefri og spising. Så dere må bli ferdig med huset i løpet av fem minutter

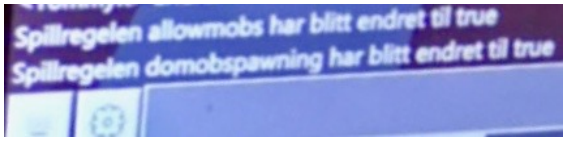


Figure 6.14: Two rules having been changed in Minecraft

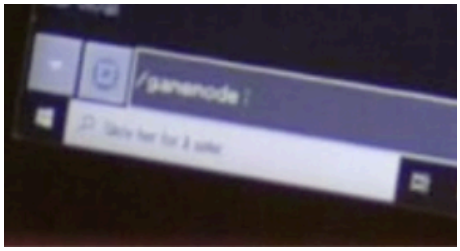


Figure 6.15: Daniel writing /gamemode in the chatroom to change the gamemode into one with more functionality

In the excerpt Geir read out loud that "allowmobs" had been changed to true and assumed that someone in class had hacked Minecraft. Like in excerpt 21 group 2's comment could again imply that limitations were set in the game. Later on he spotted animals (mobs) in the game, distracting Lisa to start looking for animals.

While Geir saw the appearance of animals as something that should not have happened, and became distracted along with Lisa, group 3, had another view on the appearance of animals. When asked if they found anything to be difficult or if the group experienced any challenges when they were building, the group answered:

00:03:26-3	Thea:	*"Det var litt sånn griser"*
	Kris:	*"Det var noen griser som ble sluppet ut så vi tok og fjernet dem for noen andre fordi de drev og gjorde masse andre ting"*

Interviewer: *"I deres bygd?"*

Kris: *"Ja (..) Men de hadde en gård og så ble grisene sluppet fri."*

As opposed to group 1, both group 2 and 3 were on the same server. Even though I do not have video material of the group's building process some of the comments they made in the interview still show a different perspective on an event that happened on the server. In their answer they mentioned that they helped another group and removed pigs for them that were let loose out of a farm. This could suggest that either someone on purpose entered a command to let animals in the game appear or they used the opportunity to gather animals as part of their building or role play.

Figure 6.16: One of the animals (a passive mob; grassing horse) that appeared in the game

Looking at the data material from the reconstruction stage domain knowledge played a central role in the decision-making process. Both groups tried to create buildings that were accurate to the images they had. Both groups also experienced issues trying to recreate certain parts of the buildings leading to creative decision making such as group 1 creating a seating area outside their building, or group 2 doubling the number of windows.

Other aspects that affected the reconstruction stage was expertise. In group 2 the teacher students made an explicit comment on Jon and Geir's abilities, and Lisa indirectly commented on her own expertise and used it as an excuse to not do certain tasks.

Towards the end of the reconstruction stage when the groups were finished or almost finished with their buildings, several disturbances appeared. Class members started using items for fun distracting both themselves and others from working on the task. Random destruction also appeared on group 1's building, with the group and teacher student discussing what caused this. Lastly at two occasions commands were being used. Daniel tried to change the game

mode to survival, while someone on group 2 and 3's server entered a command to allow mobs to appear in game.

6.3. Transformation

The last stage in the task is the performance of the role play. In this stage the students were using their creations in Minecraft to perform a historical reenactment set in the industrial age.

6.3.1. Domain knowledge and entertainment

Excerpts 27-29: Entertainment in foreground, domain knowledge in background

The first group had already finished creating the script for the role play before they began building. As noted in the introduction stage (excerpt 6) Daniel told the interviewer that he made the script for the role play prior to the second stage. When asked to further elaborate he answered:

00:29:49-2	Daniel:	*"Det handlet om at det begynte å brenne. Først skulle vi på jobb, så møter jeg to stykker, så liksom bygger vi dør, så løper han rundt og sier han må på do fordi vi skulle ha litt humor ikke sant. (..) Og så sier hun at det begynner å brenne, og så løper vi ut, og så løper han rundt og sier han må på do. Og så løper vi og så kommer brannvesenet, men det er ikke med. Også kommer vi tilbake noen dager senere og begynner å bygge det opp igjen*

Describing the beginning of the role play, Daniel told the interviewer that the main premise of the role play is that the building is caught on fire. Before that happens however, Daniel's character in the role play, meets two other characters and they begin to start building a door. A fourth character in the role play is running around in the saying he has to use the bathroom, something he included because they needed to have some humor. After the factory starts burning they run out of the building with one character running around repeating that he has to use the bathroom. A couple of days later they come back to the factory and rebuild it.

In the first part of the answer Daniel said that they wanted some humor included. When asked why they wanted humor in the role play Daniel answered:

00:31:21-1	Daniel	*"Så det ikke skulle bli kjedelig."*
	Interviewer	*"Kjedelig for hvem da?"*
	Daniel	*"For de som ser på. (..) At det blir litt morsomt å se på."*

In his answer Daniel said that they included humor so that it would not be boring. Looking at his comments it looks as if the role play had two channels for the pupils: one was the factual channel, the workers coming to work, the building catches fire and afterwards the factory is rebuilt. The second channel was entertainment, which is the one character running and repeatedly saying he has to use the bathroom. The excerpt below is taken from the role play and shows how the play swaps between the two layers during the fire:

00:25:50-6

Participant:	**Verbal:**
Iris:	Hva skal vi lage i dag da?
Anna:	Sikkert lage en dør da
Daniel:	Da begynner vi da
Nils:	Jeg må på do (..) Jeg må på do (..) Jeg må på do [..]
Anna:	Se, det begynner å brenne
Daniel:	Vi løper ut ((alle går ut av bygningen))
Anna:	Vi må bort herfra
Nils:	Jeg må på do! (..) Jeg må på do! [..]

Excerpts 30-31: Domain knowledge in the foreground, entertainment in background

Group 2, similar to group 1, told in their interview that their role play is partly made up, and partly consisting of factual (domain specific knowledge) information (excerpt 7). Unlike the first group, group 2 had not developed their script prior to the second stage. As such they worked on the script during the reconstruction stage after finishing up their building:

00:36:32-3 (Lisa's screen)

Participant:	**Verbal:**
Lærerstudent:	Har dere begynt å planlegge rollespillet også? Hva dere skal si og sånt?
Gro:	Ja, men vi er ikke helt ferdig med det
Lisa:	(ler) Det ender med at Kåre dør (.1) ((Går inn på OneNote og leser opp dialogen)) Da det begynner med at han kommer på jobb for første gang. Dagen etter kommen han på jobb og aner fred og ingen fare. Han går til sagen for å begynne å jobbe. (..) Au! (..) Hva skjedde? (..) Jeg mistet hånda mi
Geir:	Er ikke så lang ((Lisa går inn i Minecraft))
Lisa:	Nei, vi har ikke nok

Geir:	Burde vi ikke ha med sånn at de spiser lunsj? (..) At han får seg noen nye venner
Lærerstudent:	Har dere fått noen beskjeder om hvor lenge det skal vare?
Lisa:	Maks to minutter, men det kan jo vare i et og et halvt. (..) Men jeg tror ikke de vil at det skal vare i to sekunder
Lærerstudent:	To minutter er ganske lett. (..) Det tror jeg at dere får til

The excerpt below is a dialog taken from the role play. Along with having a modern language similar to group 1 group 2 also included a female manager, referred to as manageress (bestyrerinne) in the role play which was unusual during the industrial time. Yet by naming her manageress they allude to the fact that it was common practice before to give work positions both a male title and a female.

00:34:10-7

Participant:	**Verbal:**
Thea:	Hei, jeg heter Sigrid og er bestyrerinnen her på Skjærvasaga

The group's role play spans two days and begins with an employer coming to work for the first time. Walking up the doorsteps he is greeted by a female manager and a coworker. The coworker gives the new employer a tour around the building, first taking him to the saw and then to a room where they keep the cut-up wood (planks). Next, the coworker takes him to a lower floor and suggests they eat lunch. During this, the manager together with the coworker mention to the new employer that the trees comes from the forest nearby and that they use the river to carry the trees to the factory. After lunch the characters are going back to work before the day is over. On the second day the character comes back and starts again to work on the saw. During lunch he tells them that he will work a little bit more before joining them. He ends up cutting his hand off and one of his coworkers rushes off to find the doctor, but cannot find him. Trying to take the employer to the hospital they end up being unsuccessful and the character dies.

Excerpts 32-34: Domain knowledge as a framework for the role play

The last group, group 3 started recording their role play after group 2 had finished. As mentioned in the introduction stage, the group was very positive to the senior citizens coming to visit. There were entitled as professionals (excerpt 1). In the interview, the group was asked if they had enough domain knowledge for the building and the role play, with the group commenting that they learned more from the 'pros' (proffen) than they learned from the teacher:

00:03:04-9 Mikkel: *"[…] Han derre proffen hadde lært oss mye mer enn det læreren hadde gjort"*

The group's role play revolves around the employees not receiving payment for their work, which is brought up with the manager of the factory. After an unsuccessful meeting with the manager, the worker brings with him the manager's supervisor. Unlike the two other groups, group 3 had no accident in their role play. Instead, the central element of the role play was an argument between the employer and the manager about insufficient payment. This issue was a societal problem characteristic of its time and highly relevant knowledge about working conditions during the industrial revolution in Norway.

00.15.21-6

Partcipant:	**Verbal:**
Kris:	Albert, nå har vi ikke fått lønn på over tre måneder ((går tvers over skjermen på vei opp til et bord))
Mikkel:	Så synd for deg da
Kris:	Hvorfor er du så sur hele tiden?
Mikkel:	Hvorfor spør du så mange spørsmål?
Kris:	Fordi jeg er så nysgjerrig
Mikkel:	Gå ut nå

In the excerpt above, taken from the roleplay, an employer and his manager interact with each other about delayed salary. The employer (Kris, called Arne in the role play) asks the manager (Mikkel, called Albert) why he is angry all the time, a very direct question that would be considered inappropriate for a worker to ask his manager. Mikkel answers by asking a question, which in turn could be understood as rhetorical. Later in the roleplay the manager's supervisor comes to the office after being contacted by Kris, and this time we see the supervisor use a form of slang (folka) when discussing Kris' lack of salary:

00:16:21-1

Participant:	**Verbal:**
Thea:	Arne kontaktet meg og sa at du ikke gir folka lønn, og det må du gjøre ellers kommer du i arrest

Looking at all three role plays it seems the groups had different approaches as to how they implemented domain knowledge. The first group had a fire as the second act of their role play, with the first being the group working, and the third act being the post narrative. They

also had a second channel that dominated the story, focused on humor. The second group also had an incident taking place in the second act with one of the characters losing a hand. The third group brought up a societal issue illustrated by a dialog between a worker and his manager that framed the rest of the story.

6.4. Summary

Looking at the first stage (domain knowledge introduction), all three groups had various methods for acquiring domain knowledge. Group 1 acquired information from the teacher students and by searching on the web, and continued to use various web sites during the reconstruction stage when they were building the factory. Group 2 acquired physical knowledge (measurements and visuals) by detailing their building, but they did not incorporate any historical information and were under the assumption that they did not need to do so for carrying out the role play. The teacher student who was assigned to the group during this stage helped the pupils gather historical information for their role play. Group 3 cited the senior citizens as the most important source of knowledge for their activity and said they learned more from them (they called them professionals) than from their teacher (excerpt 30).

In the reconstruction stage, both domain knowledge and domain general skills were central. For the pupils creating a building that was as accurate model of the real one was of utmost importance. However, the information they had gathered during the introduction stage, was primarily of the building , its construction, and the products produced inside the building . In the situations where the domain knowledge were insufficient, the students used their creativity and deliberation skills to came up with reasonable solutions that still made the buildings resemble the real ones.

Another central aspect during the reconstruction stage was how the groups would split up their tasks into subtasks. In group 1 these tasked were placed upon the other members by Daniel (excerpt 14), whereas in group 2 the teacher student proposed that Jon and Geir work on the more demanding tasks because they have more experience (excerpt 19).

Near the end of the reconstruction stage several disturbances happened. Group 11's building was destroyed (excerpt 24), Jon and Geir in group 2 began to play in Minecraft by setting off

firework rockets and flying with elytra (excerpt 25). Group 3 hunted down animals for another group to herd (excerpt 26).

In the role play all three groups applied domain knowledge and domain general skills in various combinations. For group 1 it was important to include humor in the role play so it would be more entertaining for the audience to watch and domain knowledge came in the background. Group 2 and 3 on the other hand were more focused on domain knowledge and achieved this by acting out role plays that put characteristics of work related issues of the industrial revolution in the foreground.

7. Discussion

In this chapter I will review the empirical results in order to answer my research questions:

- *How are domain-general skills expressed through the use of Minecraft in social studies?*
- *How does domain knowledge manifest itself through the use of Minecraft in social studies?*
- *How are domain general skills and domain knowledge integrated in Minecraft?*

In order to answer the questions I have organized the chapter around the research questions. The first part of the chapter looks into domain general skills with each section under this part focusing on one group of skills. The second part discusses how domain knowledge have been manifested, and the third part discusses how domain general skills and domain knowledge are integrated in Minecraft. In all sections I will discuss the empirical findings in light of the theoretical approaches (chapter 3) and previous studies (chapter 4).

7.1 How are domain-general skills expressed through the use of Minecraft in social studies?

7.1.1. Collaboration and communication

Collaboration as understood from the sociocultural perspective is essential to learning as it is presumed to happen in interaction with others at first before becoming internalized (Vygotsky, 1978). Communication and collaboration (social interaction) are fundaments of CSCL systems as they encourage acts of intersubjective meaning making (Suthers, 2006). Looking at the participatory learning metaphor (Sfard, 1998) these skills are central because learning becomes student centered. From group 2 we learned that the group would work together on certain tasks, while at times they would split up in pairs and work in a more cooperative manner. As noted by Suthers (2006), collaborative work can increase the learning effectiveness through activities that are more difficult to do alone. Additionally Feltovich (in Koschmann, 1996) state that collaborative work makes it possible to learn more complex concepts. Because this assignment was a group work, collaboration can be traced in most of the excerpts. In the two next sections I will present collaborative work that involved intersubjectivity and scaffolding.

7.1.2. Intersubjective meaning making through collaboration

Rommetveit (1973) defined intersubjectivity as a temporarily shared space between individuals interacting with each other. It is a space of joint understanding, where the individuals share the same background. In group 2, Jon and Geir were discussing the type of block they should have atop the white part of the building (excerpt 12). Before they could make a decision, the teacher students reminded them to remember what material the building was made off, and to include the entire group in the decision making process. By trying to involve all group members he opened up a space in which the members could discuss the issue. Feltovich et al (in Koschmann, 1996) stated that group members might interpret a problem different from others. By discussing the issue with each other and present their point of view they could achieve an intersubjective meaning making between all members. In excerpt 12 it is not certain whether Lisa and Gro agreed or disagreed with the choice, but by opening a space for discussion the group members still had a chance to discuss the issue with each other.

At times when the group were working in a more cooperative manner the members would also discuss the problem, but only if paired together and not with the other members. According to Stahl et al (2006) cooperation does not involve group meaning making between all members of a group. Learning in cooperative groups is viewed as something that takes place individually with the group members working on their own and later combining their results into a group product. Collaborative learning, however, is more focused on the group members working together and sharing meanings and understandings over the problem between each other. While the group members would work in pairs and produce their own products and combining them later, they were also negotiating and sharing meanings with each other. For example In excerpt 13 Jon and Geir were discussing with each other how many spaces they should have between the windows.

Both collaboration and cooperation were modes of working in group 1 as well. As stated by Daniel under the interview, the group would at first build together, before splitting the process into subtasks (excerpt 14). According to Suthers (2006) group members engage in an intersubjective meaning making situation on multiple levels: 1) solving problems 2) maintaining interpersonal relations, and 3) affirming their identity in the group. In excerpt 15

we see what could be considered to be the first level as they try to solve an issue regarding the roof.

7.1.3. Scaffolding

From excerpt 19 we see that one of the members in group 2 was commenting on her own skill as being inferior to the other members. In the excerpt the teacher student had divided the tasks in accordance with the group members' experience, with Jon and Geir handling the more demanding tasks. This form of scaffolding can help maintain interest in the task and not divert them towards irrelevant game mechanics because they are working on more challenging tasks (Young et al, 2012; Wood, Bruner & Ross, 1976). This also makes it possible for the teacher student to scaffold the students in a manner more suited for their level. Whether or not the tasks were suited for their level is unclear, as no group members, other than Lisa, gave any explicit comments on their skills.

In excerpt 20 we see Anna from group 1 working on a challenging task herself. Unlike group 2 she involved the teacher student and discussed with him how they could interpret the image the group had in OneNote. From the excerpt we saw that interaction between the pupil and the teacher student was centered on creating a joint understanding on how to interpret the image. Even though she was not discussing with the other group members, discussing with the teacher student can also prove effective for meaning making. As noted by Young et al (2012) games alone cannot provide the sole solution, a teacher must be present to ensure an understanding of the learning material. Being able to study this issue in Minecraft also highlights a benefit with block based games. In a study by Caldera et al (1999) the participants used block play to teach pupils spatial skills. In their study, the pupils were at day one given a set of blocks and tasked with reproducing a spatial visual structure, while in the next day they were allowed to build whatever they liked. The authors noted that in the first day the students showed effects on spatial skills whereas in the next day the students showed effects on creative thinking. In the example above, by collaborating with the teacher student, who have performed the task beforehand, a form of scaffolding took place in which Anna were able to discuss and complete an issue she might not have been able to resolve on her own. According to Feltovich (in Koschmann, 1996) one of the benefits of collaborative work is that the group members have different interpretations of a task, which might better cover the complexity of the task. The members see different aspects of the problem as they connect the problem to previous knowledge they have accumulated. Even though the teacher student

was not a group member the excerpt showed that much of the benefits with collaborative work was also present with the teacher students.

7.1.4. Critical thinking and problem solving

Critical thinking and problem solving are often seen in relation to each other as they are focused on reasoning over information, making decisions and using relevant strategies (Trilling & Fadel, 2009). Due to the large amount of information available the pupils have to be aware and be critical over what they are reading. The issue of using multiple sources was brought up by group 1 who had several information sources gathered for their building (excerpt 2-6). The group acquired knowledge from both teacher students and various web sites thus employing at one hand strong critical thinking by backing their creation on various sites and sources. The group was also aware of the issue of using newer sources for their building (excerpt 7). In the interview they mentioned that, along with the images they had in OneNote, they were using Google Maps too refer to when building the windows. In excerpt 20 when Anna was working on the windows she had difficulties reading the image they had. Her struggle with spatial reasoning could be one reason for why the group used Google Maps, as the service, among others, makes it possible to zoom in on the actual building. An issue with using Google Maps is that the site could show a newer version of the building. However it is unclear how the group used Google Maps; whether it was for figuring out the distance between the windows or if it became the primary reference for the look of their building, modelling their work from Minecraft off the image in Google Maps. Using the program for their task also highlighted a form of scaffolding in which a digital tools plays a mediating role for problem solving (Stahl et al, 2006; Wertsch, 1991).

Issues with spatial reasoning was also present with group 2 when Jon and Geir were building the windows (excerpt 13). The group lacked the proper measurements and this lead to the pupils having to make decisions on their own on the distance between the measurements. Instead of looking up on other sources as group 1 did, they instead placed one block as seen in the image below (figure 7.1) Furthermore, we see traces of critical thinking and intersubjective meaning making, as the group members applied critical thinking skills such as analysis and interpretation and discussed the issue with each other to come up with a solution (Trilling and Fadel, 2009).

Figure 7.1: Group 2's image of their building (left) and their building in Minecraft

7.1.5. Creativity and innovation

In his discussion of creativity Nixon & Comber (in Sefton-Green et al, 2011) viewed creativity as part of place-based education in which teaching and learning are designed to focus on exploring space. Following this definition Minecraft could be considered a tool for practicing and developing creativity. Another central element of creativity in education is to use existing knowledge to generate new ideas (Nixon & Comber, in Sefton-Green et al, 2011). All three groups expressed in some way creative ideas as noted in the interview when the groups told during the interview that their work is partly based on factual knowledge and partly on their own ideas (excerpt 1, 5 & 8). Although creativity can be considered a domain general skill, Sawyer (2012) argued that creativity is driven by and grounded in domain knowledge. Ferrari et al (2009) also shared a similar point and argue that creativity begins with a student's existing understanding of a concept and before going beyond it. Similarly the knowledge creation metaphor puts an emphasis on generating new ideas off acquired knowledge through collaboration.

Understanding creativity from these definitions we see that creativity took place in excerpt 11 when group 1 was outside their building. In the excerpt Daniel combined two blocks in Minecraft to create a new object. It can be argued that Daniel used creative skills by employing either existing knowledge, either related to Minecraft or the industrial age. Even though the group lacked information on what the outside looked like, it did not stop the group from building. The other members reacted to this questionably with Iris asking if certain actions he performed were necessary while Nils asked if he was building a restaurant. It seems both members tried to achieve a sense of intersubjective meaning making with Daniel. Iris tried to achieve this by continuously asking him if his actions were necessary, while Nils on the other hand seemed to have a accomplished a sense of intersubjectivity with Daniel, as he quickly made suggestions to his chairs. This could come from the case that Nils quickly

understood that the outdoor area resembled a seating area, since he asked if he was building a restaurant, by looking at what had been built.

Figure 7.2: The outdoor seating area of group 1's building

7.2. How does domain knowledge manifest itself through the use of Minecraft?

Through the task and the collaborative knowledge adaption model (Mørch et al, 2019) the groups have undergone the various metaphors of learning. From first acquiring knowledge to then discussing, and creating buildings and scripting role plays (participatory learning), and finally making videos and showing off their work to the class (knowledge creation). For all three groups it seemed the domain knowledge had in one way or another framed the results and how they worked. However the amount of domain knowledge that has affected their work varies. For the groups it also seemed creative skills had an effect on their work. For example for group 1 and 2 it was important to create a building that was as accurate to the real one as possible, and when the group lacked information they would come up with their own ideas (excerpt 11).

According to Wertsch (1991) one of the key aspects of the sociocultural approach is the use of signs and tools as mediating artefacts. Signs such as symbols and language are shaped by society and can be considered important cultural artefacts as they can give insight into a society on a given time and how it has developed. For the role play language played a central part with all groups employing certain words and sentences that were rooted in both modern times and the industrial age (excerpt 29, 31 & 33). From the language, one can see how the groups role play have been shaped by the domain knowledge they have acquired. While Minecraft itself can be considered a tool for the assignments, many of its items could be

considered meditating tools as well, with blocks for example being important for group 2 in order to have an accurate building (excerpt 12).

Group 1 had a multi layered role play that at one end was historical focused, showcasing domain knowledge, something the group could document through several sources, and on the other end focused on entertainment (excerpt 29), the group's own ideas, representing domain general skills. From the excerpt we see that the role play swapped between the layers, with two characters at first creating a door before a fire erupts, and a third character breaking out of the story and shifting attention towards his needs. According to Daniel, it was important to bring humor into the play so it would be entertaining for the class to watch (excerpt 27). It seems the group had a focus on entertainment, and even though humor could work in favor of learning it was not integrated into the learning material. According to Young et al (2012) in order to successfully implement games in an educational setting, the game objectives has to correspond with the learning objectives, or else the students could become distracted by the game objectives. Though role play is not a game, the same could be applied here. Because group was dealing with two different layers, one representing domain knowledge and the other one representing domain general skill, that neither corresponded nor intertwined the pupils watching could have become distracted by the humor. Whether or not they were distracted is uncertain as I have no data on that.

Group 2's role play while providing a common issue among factories during the industrial age, also had little domain knowledge that could be directly tied to their building. According to the group themselves, they could not find any historical information (excerpt 9). Along with group 1 this group also generated their own ideas out of what they knew (excerpt 8), an activity central to the knowledge creation metaphor (Sfard, 1998).

From the excerpt taken during the reconstruction stage Lisa was reading the dialog they had written so far in the role play. Along with group 1 group 2 also had an accident included in the role play. The fact that she was laughing before saying that one of the character dies suggest that this group also tried to incorporate entertainment. However unlike group 1 this group grounded the entertainment in domain knowledge (the work accident). Prolepsis (Fugelli et al, 2013) was also seen in the excerpt when Lisa was reading the dialogue. In their script she said that "Kåre senses peace and no danger" (aner fred og ingen fare), which might be a subtle nod to something bad happening in the near future. Along with including a work

accident the group also included a female manager, which was unusual during the industrial age (excerpt 31).

Even though the manager position was unusual for a female to have during the industrial time, by calling her "manageress" (bestyrerinne) the group is alluding to the practice of giving work positions both female and male titles, which was common at that time. Also here prolepsis can be seen with the inclusion of a female manager signaling a future historical change in which female managers becomes more common .

Group 3 had the role play that was focused on domain knowledge. Through the role play the characters go back and forth asking each other questions showcasing a societal issue using a modern language (excerpt 33). The interaction between the employer and the manager is unusual for its time, with the employer talking back to the manager. Later in the role play when the manager's supervisor arrives the supervisor is referring to the employers as "folks" (folka) (excerpt 34). Unlike the other groups, the interaction and use of words in this role play is not alluding to the industrial age, but rather to modern times. While this does not reflect the historical times the use of a modern language could prevent the learning material as being distant. By using a language that the students are more associated with it can be easier to follow along.

7.3. How are domain general skills and domain knowledge integrated through the use of Minecraft?

From how we understand learning today as a multifaceted process (Vygostky, 1978; Wertsch, 1991; Rommetveit & Blakar, 1978; Young et al, 2012,), involving interaction and internalization, Minecraft on its own does not facilitate learning. However, as a game focused on exploration and creation, it could be argued to be supportive of the knowledge creation metaphor (Sfard, 1998). Using the platform to work on recreating a historical building and performing a role play the game acted out as a space for both domain general skills and domain knowledge to take place. However at times issues took place regarding the game's objectives.

An issue with using games in general, occurs when the full game narrative is not implemented into the assignment. Near the end of the reconstruction stage the play part of the game became

prominent with students playing with items, destroying and altering the game play allowing mobs to appear (chapter 5, section 5.2.4). Especially destruction became a noteworthy issue for group 1 who experienced several times their building being destroyed by other groups (excerpt 23-24). While the teacher student suggested that the destruction was a result of server issues, some of the group members were under the impression that someone walked around invisible and destroyed their building. Destruction is one the elementary acts in Minecraft, along with building. When usually playing Minecraft the game would spawn areas that includes mountains, and rivers where destruction at times is necessary to create a leveled space for building. However in the area the groups played it was already flat (figure 6.3), removing the need for destruction unless the group wanted to redo their building. When game mechanics are not aligned with the assignment the students can become distracted and start playing with other mechanics (Young et al, 2012). In excerpt 25 we see this happen with group 2 who left their building to start looking for animals after someone in their class wrote in a command that let mobs appear in their server. With Minecraft Education Edition the teacher has the possibility to remove items and features that are not necessary for the task. In this project though, many features that could be considered irrelevant were still available in the game disturbing the pupils. By limiting these options the socio cognitive load can also be reduced thus making it easier to focus on the learning agenda. On the other hand, by constraining the game too much, creativity might be hindered and also render the game less enjoyable. An example of this is shown in excerpt 26 in which group 3 stated that someone in their class had a farm where they gathered pigs. We do not know if the farm was part of their building, but the excerpt show that someone saw the introduction of animals as an opportunity to create. Other disturbances that happened were students firing off firework rockets and flying while wearing elytra. The latter one is necessary to wear if the player wants to glide when playing in survival mode, but is not necessary when playing in creative mode.

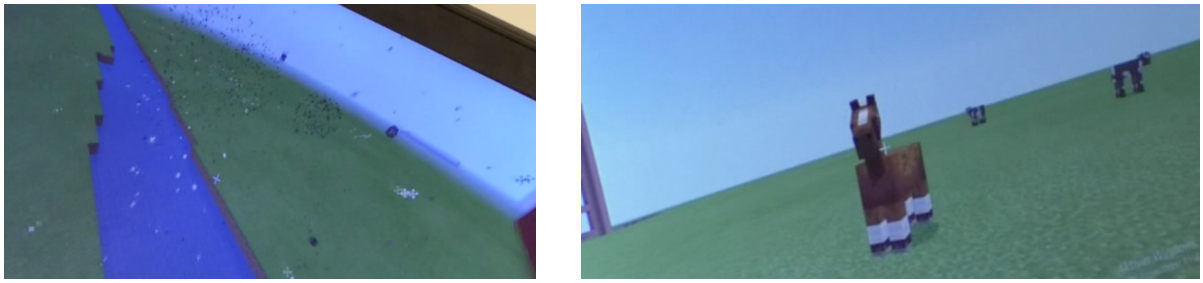


Figure 7.3: Two screenshots showing the flat area. Besides the water running through, no other details were present prior to the pupils building

When playing in creative mode many of the challenges such as hunting for material and creating tools were removed. Whereas for newcomers this might make it more comfortable to play, for the more experienced players they might not feel challenged enough, and not experience the sense of flow (Csikszentmihalyi, 1996). It is uncertain whether or not any pupils felt that as I have no data, but as Young et al (2012) note, playing a game in a way that it is not meant to be played can create contradiction as the pupils' goals are at odds with the task. An example they make is a teacher who requires the class to play World of Warcraft as homework. If they do not play they will fail the class. Students who usually play World of Warcraft on the spare time might now find the game less fun because the reason is now extrinsic rather intrinsic. Along the same line, creative mode makes it easier to perform assignments, but contradictions can appear for the more experienced players as it does not offer the same level of challenge as survival mode does. Instead of working on their assignments the pupils shifted their attention towards the games objectives that were not part of the task.

In their study on using role play to teach interpersonal skills Mørch et al (2015) argued that through role playing pupils immense themselves into the learning material by adopting a role. Caruso et al (2014) also highlighted a benefit of using 3D simulation for role playing, saying that the threshold for engagement is lower than in real life role playing. In their study they noted that their students enacted their roles less consciously than in the real world, and attributed this to the fact that they were not influenced by distractions such as the feeling of embarrassment of being someone else. Though there were not any responses from the pupils and whether they felt it was easier to perform the role play in Minecraft, performing the role plays in a virtual world does offer several benefits compared to performing face to face. Among others, in virtual world it is possible to create an environment that resembles the story in the role play. All three groups used the buildings they had created during the reconstruction stage for their role play. By using their buildings in Minecraft the pupils reenacted their role plays in a more natural environment contrary to a classroom that might feel artificial. For example group 2 created a saw mill in the middle of the factory and placed wood blocks around it to resemble wood being cut, while group 3 created a large office for their manager. Mann (2006) noted that a bigger focus on spatial learning in schools could foster skills such as creativity, problem solving and abstract thinking. While the reason for using Minecraft was not to teach spatial reasoning, using the game to visualize concepts might make it easier to grasp and understand the material, in effect making the abstract more concrete.

8. Final reflections

In this project I have sought to understand how Minecraft can be used as tool for development of domain general skills and acquisition of domain knowledge in social studies. In order to explore this issue I presented three research question focusing on how domain general skills were expressed through the use of Minecraft, how domain knowledge manifested itself, and how both of these were integrated in the game. In order to study these questions I have, as part of a research team, conducted a study in three 7th grade classes. Together we gathered data from interviews of three groups and observational data from two of those groups. Further, I framed the themes in light of the collaborative knowledge adaption model, as this was the model used for organizing the pupils' assignment.

8.1. Key findings

8.1.1. How is domain general skills expressed through the use of Minecraft in social studies?

The data from this study showed that domain general skills were expressed throughout the reconstruction stage and the transformation stage. Especially collaboration were strong among the two groups observed, with the group members working either all together or in pairs. With the groups collaborating, characteristics such as discussion, scaffolding and intersubjectivity were present, and had an effect on other domain general skills. Collaborating with each other and the teacher students also proved valuable in regards to mastering complex concepts such as spatial reasoning. Being able to accurately depict the buildings as they appear, the images was important for the pupils, and during the activity much of the critical thinking and problem solving skills where revealed in these discussions. Among others, the group members would discuss with each other what blocks represented the buildings best. For one of the groups this involved ignoring the blocks' functionality in Minecraft and instead focus on its appearance. At times when the groups did not have enough information about the physical buildings the members would come up with solutions that resembled the actual buildings thus showcasing creative skills, such as when one of the groups combined blocks into a new item to create an outdoor area.

8.1.2. How does domain knowledge manifest itself through the use of Minecraft in social studies?

The findings from the data showed that the pupils had grounded the domain general skills in domain knowledge. As stated in the section above, accuracy was important for all groups when building. However while domain knowledge was present during the reconstruction of the buildings, the amount present during the role plays varied. Moreover, domain knowledge framed the role plays, but domain general skills such as creativity and communication were also present. In their role plays the groups combined factual information with their own ideas and expressed it through a modern language. Examples of using language was to showcase future historical changes, present typical discussion in a modern way or for the sole purpose of entertainment. From the perspective of the knowledge creation metaphor, the groups could be argued to show an understanding of the learning material as the groups' ideas were based of the knowledge. At the same time the role plays tended to ignore how communication and interaction during the industrial age was played out; as the pupils were more modern day focused. However as was seen in the section above the groups were short on information about the buildings and the historical times during the reconstruction stage, which could also be a reason here as well for why they used a more modern day language.

8.1.3. How are domain general skills and domain knowledge integrated through the use of Minecraft in social studies?

With a focus on creation and exploration Minecraft offers the players a space to create a wide variety of visual structures. The game's many features were actively used by the pupils for their assignment, but could also at times be a distraction. Issues with combining education with playing a game happen when the objectives are at odds with each other. At times this happened during the project when the pupils became more interested with the play part. Destruction rather than construction took place, and tools irrelevant to the task were used. At one point someone altered the game world to allow mobs to appear. And while it is possible to limit functions and objectives for the players it could limit creativity as well.

From how learning has been viewed in light of the various learning metaphors, acquisition and participation were quite visible when the students were building their factories, while participation and knowledge creation appeared later during the role play scripting. It could be argued that using Minecraft as a mediating tool offered the pupils the possibility to practice

and express domain general skills within the frames of the domain knowledge. The data indicates a dynamic relationship between the two types of skills practice. This finding is outside the scope of my thesis, but is an area ought to be explored in further work.

8.2. Limitations and further research

This study was performed using video cameras to capture the observation of the group activity and conducting interviews. Originally three cameras were present, and the plan was to observe three groups, but due to limits of space which was out of our control, and technical issues with one camera, only two groups were observed. And even though three groups were interviewed, and three role plays were analyzed, it can be difficult to generalize our patterns, especially during the construction of the buildings. Even though one could find patterns within the groups, this too also proved challenging because not all pupils were filmed throughout the entire period. One of the cameras had a handle and was moved every half hour, while the other one lacked a handle and stood still behind one pupil. Even though I could analyze the verbal interaction, I would still be missing some of what they were doing on the computer. However, even though only two groups were observed, I was still left with a large amount of relevant data, much more than I could present in this thesis.

As mentioned in the prior section, distraction became prominent as the pupils became more focused on game objectives that were not part of the task. By turning off many of the game function one could help the pupils focus more on the task, and align the game more with the assignment without it affecting it negatively.

For further research, looking at the how knowledge sharing between the local historians and the pupils, and/or knowledge sharing between the teacher and the pupil could be interesting to study. From what we saw during this thesis is how the domain knowledge laid the framework for the domain general skills. And while it proved to be quite strong during the reconstruction of the buildings, it took a step back during the scripting of the role plays. As such having data on how much and what information the pupils were given could be valuable to better understand how much of the domain knowledge actually acquired and how domain knowledge affected domain general skills.

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Appendix
Appendix 1: NSD Assessment

NSD NORSK SENTER FOR FORSKNINGSDATA

NSD sin vurdering

Prosjekttittel

Minecraft i lærerutdanning - utvikling av generiske ferdigheter i samfunnsfag

Referansenummer

432768

Registrert

26.12.2019 av Carl Sebastian Eielsen - carlse@uio.no

Behandlingsansvarlig institusjon

Universitetet i Oslo / Det utdanningsvitenskapelige fakultet / Institutt for pedagogikk

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)

Anders Mørch, anders.morch@iped.uio.no, tlf: 22840713

Type prosjekt

Studentprosjekt, masterstudium

Kontaktinformasjon, student

Carl Sebastian Eielsen, carlse@uv.uio.no, tlf: 95103505

Prosjektperiode

01.08.2017 - 01.09.2024

Status

11.02.2020 - Vurdert

Vurdering (1)

11.02.2020 - Vurdert

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet 10.02.2020 med vedlegg, samt i meldingsdialogen mellom innmelder og NSD. Behandlingen kan starte.

Dette masterprosjektet mottar data fra innmeldte prosjekt 720739. Formålet i de to prosjektene samsvarer, og de registrerte er informert om at dataene som er samlet inn i hovedprojsektet også vil deles med masterstudenter.

MELD VESENTLIGE ENDRINGER
Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde:
https://nsd.no/personvernombud/meld_prosjekt/meld_endringer.html

Du må vente på svar fra NSD før endringen gjennomføres.

TYPE OPPLYSNINGER OG VARIGHET
Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 01.09.2024.

LOVLIG GRUNNLAG
Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake. Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

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

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

DE REGISTRERTES RETTIGHETER
Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: åpenhet (art. 12), informasjon (art. 13), innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18), underretning (art. 19), dataportabilitet (art. 20).

NSD vurderer at informasjonen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.

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

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

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

OPPFØLGING AV PROSJEKTET
NSD vil følge opp underveis (hvert annet år) og ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet/pågår i tråd med den behandlingen som er dokumentert.

Lykke til med prosjektet!

Kontaktperson hos NSD: Kajsa Amundsen
Tlf. Personverntjenester: 55 58 21 17 (tast 1)

Appendix 2: Information and consent letter

Vil du delta i forskningsprosjeketet *"Minecraft-Samfunnsfag"?*

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å få innsikt i hvordan elever opplever å bruke Minecraft til forståelse for et samfunnsfaglig tema. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
Formålet med prosjektet er å få forståelse for hvordan elever bruker generiske ferdigheter, som for eksempel kreativitet, nyskapning og samarbeid, og hvordan de integrerer disse med fagspesifikk kunnskap som sammfunnsfag.

Hvem er ansvarlig for forskningsprosjektet?
OsloMet og Universitetet i Oslo er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Alle elevene i deltakende klasser på en barneskole i Akershus får forespørsel om å delta.

Hva innebærer det å delta?

- *Hvis du velger å delta i prosjektet, innebærer det at noen elever blir forespurt i å delta i intervju mens de jobber. Det er frivillig å delta.*
- *Skjermopptak av et rollespill foretatt i Minecraft og skjermdumper av byggeprosessen. Skjermdumpene er av avatarene og i byggeprosessen blir elevene oppfordret til å bruke rollenavn som "nickname". Dersom elevene velger å bruke eget navn vil dette bli fjernet fra skjermdump.*
- *Videopptak av byggeprosessen i klasserommet. Dette innebærer at vi filmer klassen fra ulike vinkler samt aktivitet som foregår på skjermen. Dersom du velger å ikke delta vil din gruppe ikke bli filmet.*
- *Bruke video fra rollespill i Minecraft til å vise til lærerstudenter og forskere samt til analyseformål. Dersom eleven velger å bruke eget navn vil dette bli fjernet fra filmen.*

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysningene om deg vil bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

- *Det er kun forskere og ev. masterstudenter som ev. knytter seg til prosjektet vil ha tilgang til dataene. Eventuelle bilder som blir brukt for å vise aktivitet i faglig fora blir anonymisert.*
- *Dataene blir oppbevart i en ekstern harddisk i et låst skap på OsloMet.*

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Prosjektet skal etter planen avsluttes *01.09.2024. All personopplysning blir slettet etter denne datoen. Lyd og observasjonsdata blir slettet umiddelbart etter at de har blitt transkribert og anonymisert. Anonymiserte transkribert data blir oppbevart ved UiO og OsloMet.*

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:
- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra OsloMet og UiO har NSD – Norsk senter for forskningsdata AS vurdert at behandlingene av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:
- Louise Mifsud (louise.mifsud@oslomet.no, telefon 67 23 71 13) eller Siv Eie (siv.eie@oslomet.no, telefon 67 23 72 05) ved OsloMet eller Anders Mørch (anders.morch@iped.uio.no , telefon 22 84 07 13) ved UiO
- Vårt personvernombud: Ingrid Jacobsen (ingrid.jacobsen@oslomet.no, telefon 67 23 55 34) ved OsloMet.
- NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller telefon: 55 58 21 17.

All informasjon som hentes inn vil bli behandlet slik at de opplysningene du gir ikke kan tilbakeføres til deg personlig i tilknytning til skriftlig arbeider eller muntlig presentasjoner av studiet.

Med vennlig hilsen

Louise Mifsud *Anders Mørch* *Siv Eie*

Prosjektansvarlig

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet "Minecraft Samfunnsfag" og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ *å delta i spørreskjema*
- ☐ *å delta i intervju hvis det blir aktuelt*
- ☐ *å bli observert i klasseromsomgivelsene og at observasjon kan bli filmet*
- ☐ *at filmen jeg produserer i Minecraft blir brukt i dette forskningsprosjektet*
- ☐ *at informasjon jeg bidrar med blir brukt i dette forskningsprosjektet.*
- ☐ Informasjon om meg blir oppbevart i et låst skap som kun prosjektmedarbeider har tilgang til

Jeg er innforstått med at informasjonen jeg bidrar med ikke kan tilbakeføres til meg personlig. Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. *01.09.2024*

(Signert av prosjektdeltaker, dato)

Appendix 3: Interview

Intervju guide til elever (individuell og gruppe)

1) Introduksjon og formål med intervjuet
2) Alder og kjønn

3) Tidligere erfaring med MC

4) Hva bygde dere i Minecraft og hvorfor?

5) Hvordan fungerte det at OsloMet-studenter hadde opplæring i Minecraft?

6) Hva samarbeider dere om i prosjektet?
   a) Hva var vanskelig å samarbeide om?
   b) Kan dere gi et eksempel på hvordan dere samarbeidet med de andre i klassen når dere bygde i Minecraft?

7) Hvordan jobbet dere med skriptet?
   a) Research til skriptet: research/datainnsamling, hvilke kilder var sentrale?

8) Hvordan samarbeidet dere om å lage scriptet/manus?

9) Lagde dere noen egne modifikasjoner i Minecraft? Kan du gi et eksempel?

10) Hjalp du noen av medstudentene dine med å bygge i Minecraft? Kan du fortelle mer om det. Hva bygde dere?

11) Hvordan var rollespillet og rollefordelingen?

12) Hvordan samarbeidet dere om å bygge i Minecraft og fikk du hjelp av noen av de andre studentene i klassen?
   a) Hvis, ja, kan dere gi et eksempel på dette?

13) Hvordan gjorde dere videoinnspilling av Minecraft scriptet? Hva fungerte, og hva fungerte ikke?

14) Hvordan opplevde dere å bruke Minecraft i samfunnsfag? Utdyp.

a) Hvordan bygde dere, planla osv (kan du si noe om utviklingen fra møte med Minecraft første dagen til du var ferdig å bygge et bygg i Minecraft. Hvordan opplevde dere denne prosessen?)
b) Var det noen problemer? Kan du gi eksempler der dere støttet på vanskeligheter? Hva gjorde dere da?
c) Hva lærte du om faget – Sagelva?
d) Hva synes du om å bruke rollespill i samfunnsfag på denne måten?
e) Hvilke kilder brukte dere for å finne fagstoff til Minecraft bygging og rollespill?