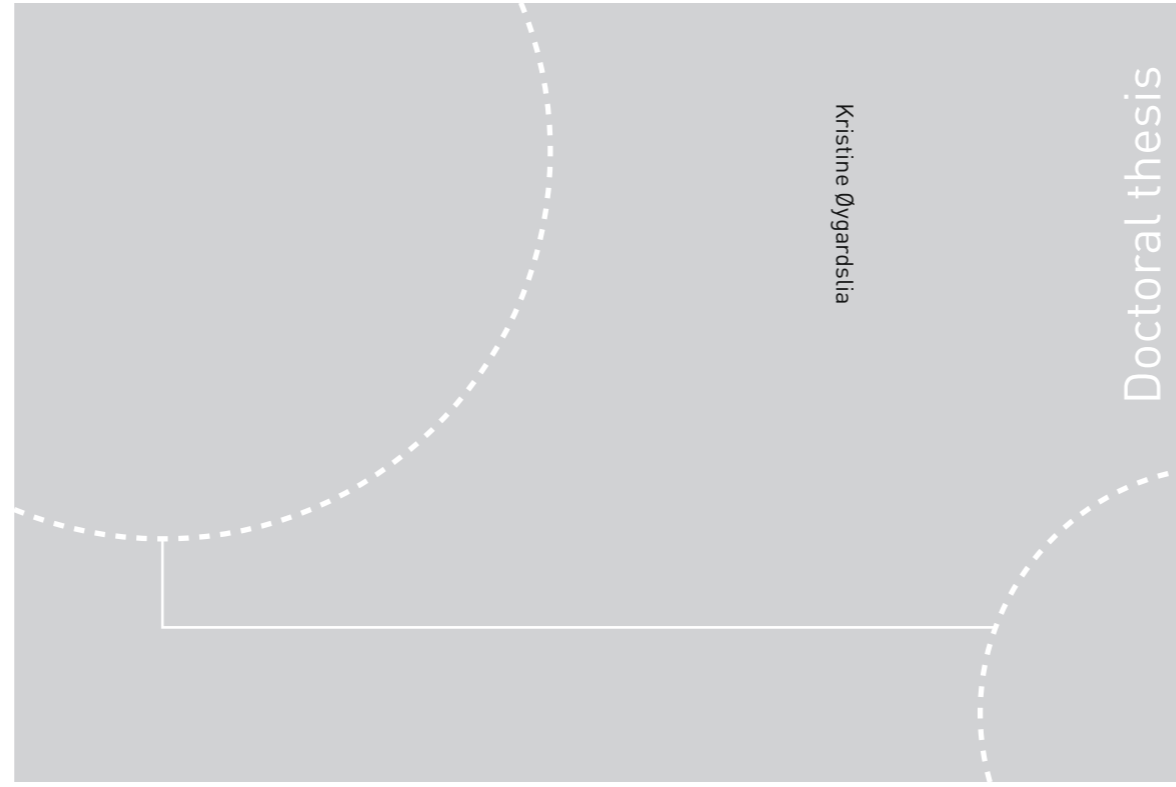


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Kristine Øygardslia

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Exploring collaborative game-based learning activities in the classroom

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Trondheim, June 2018

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Preface and acknowledgements

Spending the past four years studying computer games and learning has been a privilege and an adventure. Looking back on these years, I happily observe that the PhD adventure even follows a structure common in game stories: a calling to an adventure, leaving familiar surroundings, and starting a journey quite different than first imagined. For sure, challenges arise along the way, but fortunately, helpers also appear, making the PhD journey an amazing experience. I would like to thank my helpers.

First, my deepest gratitude goes to my supervisor, Pål Aarsand, for his support throughout all the stages of writing this thesis -- reading drafts countless times, sharing insightful comments, and always being there to give guidance and encouragement. He was the best supervisor one could hope for and will always inspire me. Moreover, I owe great thanks to Alf Inge Wang, my co-supervisor, for all his helpful suggestions and valuable comments on my texts in all stages of thesis writing. I am also grateful to the teachers and students who welcomed me into their classrooms. Their creativity and hard work provided a great source of inspiration.

I was fortunate to receive comments and input throughout the stages of this thesis. Daniel Schofield shared valuable feedback and inspiration at my halfway seminar, and Øystein Gilje helped shape my thesis at my final seminar. The Child and Youth seminar participants included me in invaluable discussions and gave helpful comments. I would like to thank Liselott Aarsand and the participants at the Discourse Seminar for useful data sessions, and participants in the SiPP research group for inspiring discussions. NATED, the National Graduate School for Educational Research offered a wonderful forum to meet educational researchers from different universities and gave me the opportunity to do my research stay abroad. The Track 2 leaders and participants, especially Caroline Cruaud, gave insightful feedback on many of my articles.

The Department of Education and Lifelong Learning offered a great environment to do a PhD. I would like to thank Hans Petter Ulleberg, Head of Department, and all the people who made the department and NTNU a great place to work. Astrid Hoås Morin, Tuva Schanke, Elin Weydahl, and Fride Røe Flobakk gave me support and friendship—and are simply amazing! I appreciate the useful discussions and fun breaks with my fellow PhD students, Anne-Lise Sæteren, Ida Malén Gabrielsen, Irene Haslund, Ingvil Bjordal, Sultana Ali Norozi, Nassira Essahli Vik, and Mariann Doseth. Ingvild Kvale Sørenssen and Kristine Ask shared

knowledge, support and coffee breaks at Sito. Spillpikene always made me remember how much fun studying games is.

Traveling to faraway places and seeing new perspectives are important to adventure. Inaba-sensei and researchers at Ritsumeikan Center for Game Studies, Ritsumeikan University, welcomed me and shared their insights into computer games and learning. I am happy to have studied there with Juhyung Shin and Tina Howard – thank you for the amazing experiences we shared in Kyoto! I also thank my friends and fellow game researchers in Denmark, Charlotte Lærke Weitze and Camilla Gyldendahl Jensen, for many inspiring talks and discussions on game-based learning.

While adventures often take us far away, returning home completes them. While completing writing this thesis, I worked mostly from my family’s summerhouse, my favorite place in the world. My mom and dad supported me in all stages of writing this thesis, but never more so than during the final stages of thesis writing. Their help was invaluable. I also thank my sister Helene for all her support, encouragement, proofreading, discussions—and the fun we had in our thesis writing!

Finally, I express my gratitude to all the people who helped me feel at home in Trondheim these four years—Marianne, Ragnar, Erlend, and Aud. I owe great thanks to Alexander for always being there with hugs, homemade risotto, and PlayStation controllers. These, too, are important to writing a thesis.

Kristine Øygardslia
Dragvoll, November 2017

Summary

Computer games are an important leisure-time activity for young people. What, though, happens if game design is introduced as a learning activity in the classroom? The present thesis explores this question.

The study is based on analyses of video data from a sixth-grade class and a seventh-grade class that designed their own computer games in the classroom, based on history-related topics from their social studies curricula. The main research question explored in this thesis is: *How do students' learning activities unfold when game design is introduced into formal education?* This leads to the following sub-questions: 1) How do tensions between school and leisure time unfold in game design activities in the classroom? 2) How do students build knowledge through collaboration in the game design process? 3) How do students use artifacts in the game design process?

The study adopts a *sociocultural perspective*, seeing learning as situated within social and cultural contexts and emphasizing collaboration and the use of *artifacts* as central to students' learning activities. In this study, *guided participation* draws attention to how young people learn from participating in activities with more skilled companions, while *subteaching* refers to how students may take on teachers' common behavior, such as instructing, evaluating, and disciplining other students. The study utilizes *activity frames* to explore how students make sense of what is going on in the current situation and *stancetaking* to examine how students position themselves or others, make claims, and respond to other participants' actions.

Using video data gathered during short-term, data-intensive field visits as the primary data source, the study is a *focused ethnography* but also inspired by *design-based research* to develop and implement learning resources into the classroom for the study. A webpage with challenges and instructional videos on how to create computer games was developed by the author, used by the students to learn how to use the game design software *RPG Maker VX Ace*. After an initial one-day observation phase, the students were observed in two phases of data collection. First, over two consecutive days for each class, the students, in pairs or groups of three, made computer games on the topics of the *Middle Ages* (sixth-grade class) and *European explorers* (seventh-grade class). In the second phase, two months later, the classes took one day to make new games on the topics of the *Viking Age* (sixth-grade class) and the *Renaissance* (seventh-grade class). Data were collected using three video cameras. Two cameras recorded the interactions of a three-member target group in each class, with one

camera focused on the group's computer screen and one capturing social interactions. A third, handheld camera was used to record classroom interactions. The students' finished computer games were collected and used to support the analysis. The data were organized in a content log, utilizing *sensitizing concepts* to draw attention to central elements of the students' social interactions. Based on recurring patterns, episodes were selected for in-depth analysis. They were transcribed using Jeffersonian Transcription Notations and analyzed applying concepts from conversation analysis.

This thesis contains three articles. The first article, *'But this isn't school': Exploring tensions in the intersection between school and leisure activities in classroom game design*, investigates tensions arising among the students as they position themselves within different -- and quickly changing -- activity frames. The second article, *Pointing, praising, and pondering: Unpacking game design as a learning activity in social studies classes*, focuses on how the students in collaboration construct knowledge in the game design process, and explores students' guided participation and subteaching. The third article, *'Move over, I will find Jerusalem': Artifacts in game design in classrooms*, unpacks the role of artifacts in the game design process and their contributions to the social organization of learning activities.

Across the articles, three main findings can be highlighted. First, *tensions may arise as the students fail to agree on what the activity is really about* and emphasize different aspects of the activity. While some students see it primarily as a school activity, emphasizing the need to make the games historically accurate, other students focus on the design and storytelling, drawing upon their leisure-time activities. The students may also *reduce* tensions themselves through means such as clearly expressing their intentions and ensuring that all the participants have access to relevant resources.

Second, while designing computer games, *the students collaboratively build knowledge about social studies topics and the tools they use*. The students guide and instruct one another but also expect each other to offer evidence to back up the claims they make. As the students may pursue what they find interesting in the activity, who is seen as the more skilled may change quickly, and the students may position themselves as *subteachers*, instructing and evaluating other students' work. While the students most often emphasize making the games as historically accurate as possible, they also mix facts and fiction in the game design process.

Third, when computer game design is introduced into the classroom, *the game design activity not only takes places on computers using game design software, but the students also use a*

wide range of artifacts, such as textbooks, Google, Wikipedia, and maps hanging on the wall. The new software introduced thus becomes part of the established classroom ecology. The textbook still has the epistemic authority, as the students often use it as a point of departure for game stories and characters and to verify claims made by other students and information they find using other sources.

While game-based learning often is intended to bridge young people's interests and academic learning, this thesis argues that when incorporated into formal education, the nature of game design changes as it must be balanced with achievement of competency aims. While the students may draw upon their interests, the activity is also shaped by the classroom environment (e.g., social norms and values) and established artifacts (e.g., textbooks). In this study, the students create *bridges* but also *borders* between school and leisure, guarding what classroom learning should be. The students' learning activities unfold at this intersection, where the tensions between their agency to pursue their interests and their expectations of what classroom learning should be often spark collaborative knowledge building.

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Articles:

Article 1: Øygardslia, K. (in press). ‘But this isn’t school’: Exploring tensions in the intersection between school and leisure activities in classroom game design. *Learning, Media and Technology*.

Article 2: Øygardslia, K. (2017). Pointing, praising, and pondering: Unpacking game design as a learning activity in social studies classes. *Manuscript submitted for publication*.

Article 3: Øygardslia, K., & Aarsand, P. (2017). ‘Move over, I will find Jerusalem’: Artifacts in game design in classrooms. *Manuscript submitted for publication*.

1 Introduction

What would happen if game design became a learning activity in a formal education environment?

If you entered a classroom where sixth- and seventh-grade students were designing computer games about topics from social studies, you may, for example, see three seventh-graders discussing what the Santa Maria Church in Florence looked like during the Renaissance. You also may hear an 11-year-old boy, while building a pub using game design software, stating that you *had* to brew beer during the Middle Ages if you wanted to avoid being put in jail. You may even see two sixth-grade boys standing on their chairs to touch an old-fashioned world map, tracing the journey of a Crusader from Rome to Jerusalem, creating the story of the foes he had to fight and the rivers he had to cross – how he even had to slay crocodiles! Then, when the school bell rang for recess, and the teacher asked the students if they needed a break, the students would shout “NO!” But you also could hear an 11-year-old boy say, “But this isn’t school,” and hear students negotiate what the activity is really about.

You may wonder: What really happens in the classroom when students work together to design these games? How do they collaborate to build knowledge about Magellan’s travels before integrating it into their game? What is the role of the artifacts they are using, such as the maps used to make a story about the Crusader game’s protagonist, or the pictures of Magellan in their textbook used to make the character in another game as accurate as possible? These are some of the questions that will be explored in this thesis.

1.1 Defining the terms

Computer games and *games* are terms used throughout this thesis and will be defined here. The thesis does not intend to be an examination of terms and definitions, but defining the terms early is done for practical purposes, as these terms might be interpreted differently, depending on readers’ various traditions and perspectives.

The answer to the question “What is a game?” might seem intuitive to most people, but this question has been debated often among researchers (e.g., Salen & Zimmerman, 2004). A common definition proposed by game designers and researchers Salen & Zimmerman (2004) is that «A game is a system in which players engage in an artificial conflict, defined by rules, that result in a quantifiable outcome» (p. 80). A game can be broken down into different elements, such as mechanics (the objective of the game and how this objective is reached, as

well as the actions that the player might take in the game), story (the series of events that unfold in the game), aesthetics (what the game looks like, sounds like, and feels like), and technology (the items used to make the game, which can be as simple as paper and pencil) (Schell, 2008).

In game literature, the term *digital games* often is used as an umbrella term for games that are played on a computer, TV screen, hand-held console, or mobile device, distinguishing them from analog games such as board games and card games. At other times, the term *video games* refers to games played through a gaming console on a TV screen, while *computer games* are played on a personal computer. However, the terms often are used interchangeably, i.e., *computer games* and *video games* might refer to the same technology. According to Wolf (2008), the term *computer game* is more accurate, as most games use a microprocessor. However, by the mid-1980s, the *video game* was the most common term, with *computer games* used to describe games played on actual desktop or laptop computers (Wolf, 2008).

In this thesis, *computer games* will be used to emphasize that the games made by the students in this study were created on a computer. Unless explicitly stated otherwise, *computer games* also include other digital games, such as those played on consoles and mobile devices.

1.2 Why study game design for learning in classrooms?

Understanding the presence of games in our everyday lives might contribute to contextualizing game-oriented learning and learning from game design. Games always have played an important part in our society. In *Homo Ludens: A Study of the Play-Element in Culture*, an early study that has become highly influential in the study of play and games, Huizinga (1955) argues that play shapes our way of life in several aspects, e.g., as a cultural phenomenon expressed in language, law, war, poetry, philosophy, and art. This has become even more true over the years, as contemporary society arguably has become even more play-oriented than before (Frissen, Lammes, de Lange, de Mul, & Raessens, 2015). Not only are we playing games on a wide range of platforms, often several hours a day, but revenue from the gaming industry has surpassed that of the music and film industries combined (Dring, 2015).

Games also may influence our lives in other ways beyond playing on screens. Games are increasingly more platform-independent, or multi-platform, which can be seen in pervasive games in which computer games and the real world merge (e.g., Montola, Stenros, & Waern, 2009). Game stories can be told not only on a computer screen, but also through newspaper

ads, phone calls, and real-life encounters. Through *gamification*, commonly defined as “the use of game design elements in non-game contexts” (Deterding, Dixon, Khaled, & Nacke, 2011, p. 9), everyday life and culture are influenced by games and play. Many fields -- including our educational system, health, networking, businesses, and marketing -- now benefit from using game elements to achieve desired outcomes (e.g., Raessens, 2014). Game visionaries foresee games that “make us wake up in the morning and feel thrilled to start our day,” increase our satisfaction at work, make us healthier, and can be used to deal with global problems, such as poverty and climate change (McGonigal, 2011, p. 14). However, games and gamification are also used for purposes that may be more troublesome, such as military recruitment and marketing directed toward children (e.g., Michael & Chen, 2005).

Juul (2005) has noted that games are *half real*, i.e., while the play occurs in a fictional world, we are playing by *real rules* while imagining a fictional world. Games can function as “cultural snapshots” of a time and culture (Flanagan & Nissenbaum, 2014) and might tell us something about what the creators value and emphasize (Selander & Kress, 2010). According to Machin and van Leeuwen (2005), some of the most important political discourses of our time happen through computer games. Recent, well-known computer games have dealt with issues such as civilians in wartime, such as *This War of Mine* (11 bit studios, 2014); friendship and being different, in *Life is Strange* (DONTNOD Entertainment, 2015); sickness, such as in *That Dragon, Cancer* (Numinous Games, 2016); and mental illness, in *Hellblade* (Ninja Theory, 2017). Tolkien argued that the creation of fictional worlds might make us understand our own world more clearly (Pu, 2012), and when it comes to exploring important topics, computer games are in a unique position, with the player not only reading about or viewing a story, but also having to make choices that may affect the story’s outcome (e.g., Gee, 2007b).

Research and development related to games for education¹, health, and social change often are categorized within the *serious games* movement. The term *serious games* often is used to describe games with a primary purpose other than entertainment (e.g., Flanagan, 2009; Michael & Chen, 2005), emphasizing the integration of theory, content, and game design (Winn, 2009). While the term *serious games* has been described as both an oxymoron and a tautology, depending on the theoretical stance (e.g., Breuer & Bente, 2010), and other terms,

¹The term *edutainment*, which is sometimes used to describe games for learning, is discussed in the literature review.

such as *applied games*, have been used to describe the same kind of games, the term *serious games* increasingly has been used in recent years (e.g., Boyle et al., 2016). Serious games researchers usually are concerned with the positive aspects and possibilities of computer games, such as how gameplaying can be tied to greater creativity (Jackson et al., 2012), increased empathy (Belman & Flanagan, 2010), building peace (Brynen & Milante, 2012), or as a means for critical thinking and debate (Flanagan, 2009). However, challenges come with using serious games, e.g., educational games are not always received as favorably by players as their developers might hope. Serious games always need to balance gameplay and fun with educational-outcome goals, and Kafai and Burke (2015) have noted that young people usually can quickly distinguish between games for entertainment and games for education. They often prefer the former.

1.2.1 Digital media, games, and the classroom

Opportunities for using games for educational purposes also have been linked to *designing* games. As early as the 1980s, Seymour Papert's *Mindstorms* (Papert, 1980) influenced educators and researchers with ideas about learning through creating, and the importance of learning how to talk to computers using computer language. The *maker movement*, which refers to "the growing number of people who are engaged in the creative production of artifacts in their daily lives and who find physical and digital forums to share their processes and products with others" (Halverson & Sheridan, 2014, p. 496), has seen a renaissance both in people's leisure activities and in education (Halverson & Sheridan, 2014; Hatch, 2014). Coding clubs (e.g., Lær Kidsa Koding, 2017) can be found in many places in Norway, and hackerspaces – makerspaces with a focus on digital technology and coding – are popular with both kids and adults (e.g., Hackheim, 2017). In Sweden, programming and makerspaces are receiving attention (Kjällander, Åkerfeldt, & Petersen, 2016), and interest in learning from creative media production also has been seen in the U.K. (Royal Society, 2012).

In Norway, curricular aims are, in many ways, well-suited for learning through design. For example, the *Framework for Basic Skills*, developed by the Norwegian Directorate for Education and Training (2012) (Appendix 5), states that digital tools should be used in all subject areas. Digital skills include being "able to use digital tools, media and resources efficiently and responsibly, to solve practical tasks, find and process information, design digital products and communicate content," as well as "developing digital judgement by acquiring knowledge and good strategies for the use of the Internet" (Norwegian Directorate

for Education and Training, 2012, p. 12).² Both students and teachers have reported mainly positive experiences using information and communications technology (ICT) in the classroom (Egeberg, Hultin, & Berge, 2017, p. 9). However, while Norway is ranked highly when it comes to access to ICT in the classroom (European Commission, 2013), digital media's potential is not utilized well enough, e.g., tablets and whiteboards are often used in the same way as traditional learning resources would be used without utilizing their interactive potential (Guðmundsdóttir, Dalaaker, Egeberg, Hatlevik, & Tømte, 2014).

The success stories often overshadow the challenges of incorporating technology into the classroom (Selwyn, 2016). Differences in nature between ICT and traditional learning resources might explain some of these challenges. Digital tools often have been implemented into classrooms without considering existing learning resources -- such as blackboards, pencils, and textbooks (Sørensen, 2009) -- which schools have used for centuries. Introducing a medium often associated with young people's leisure practices -- i.e., video games -- can be seen as challenging the traditions that classroom learning is based on (Säljö, 2010). It has been argued that the authority of the textbook, a learning resource that traditionally has represented what students should know (Selander, 2008a), has been challenged by digital learning resources (Åkerfeldt, 2014, p. 172). Blikstad-Balas and Hvistendahl (2013, p. 40) found that high-school students preferred to use Wikipedia over textbooks to find information about curricular topics, even though the textbook was specifically developed to provide the students with information needed for that course.

While challenges to implementing technology in the classroom exist, it has been noted how researchers often talk about educational technology in uncritical ways, and a more nuanced debate has been called for (Selwyn, 2011, 2012, 2016). This thesis aims to unpack how *students themselves* orient toward classroom game design.

1.2.2 Game design

Game design is a central term in this thesis, as it describes students' principal activities in the study. Often, the term might be used interchangeably with concepts such as *game development*. In this thesis, *game design* is used because it points to aspects such as designing game worlds, characters, and stories.

² The *digital skills* section of the framework for basic skills, including subcategories and the competency aims for digital skills in social science, is presented in Appendix 5.

In larger teams, team members' contributions in creating a game might be highly specialized. Programmers, concept artists, animators, modelers, writers, and sound artists might have clearly defined responsibilities in game creation. In these cases, the game designer is often responsible for ensuring that the game adheres to overall parameters during the design process and should be able to effectively communicate these parameters to the design team.

The main job of the game designer, however, is to design the interactions with players – to create the rules and ideas that constitute the game (Rogers, 2010). Game designer Jesse Schell (2008) has noted that the most important skill of the game designer is to be able to *listen* -- to the team, the game's audience, the game, clients, and oneself. While game design, at its core, is about creating a series of interesting choices for the player, it often, in practice, implies several aspects of the game-creation process: making game-design documents, deciding on the game's genre, ensuring that ideas fit together, creating the core mechanics of the game, creating the game's narrative and dialogue, designing game characters, and setting the game's "mood." Playtesting, balancing, and refining the game are often the game designer's responsibilities. Emphasizing these aspects of game design, as done in this study, makes the focus different from learning programming and computational concepts.

When designing *serious games*, or games with a purpose other than entertainment, the main difference is that the design also needs to consider the *serious goals*, i.e., what should be the learning outcomes or aims for behavioral change; how should this be achieved; and how should this all be assessed? The students' game designing, thus, shares characteristics with serious-game design, as their design activity – as will be discussed later – is informed by and constrained by a formal learning environment.

In sum, studying game design for learning in classrooms can contribute to increased understanding of an activity that has the potential to bridge young people's interests with academic learning, utilizing the educational benefits of creating and designing, though certain challenges in the process must be understood for this to be done in a suitable way.

1.3 Purpose of study

The main objective of this research project is to explore the use of game design in classroom contexts related to topics in the social studies curriculum. Through detailed analysis of interactions occurring in the classroom, this thesis unpacks how students respond to the introduction of game design in a formal learning context. This will not only contribute to the growing body of research within the field of game-oriented learning, but it also can be a

balanced contribution in the ongoing discussions on using computer games and other digital technology in classroom contexts (e.g., Selwyn, 2016).

1.3.1 Research questions

This Ph.D. project studies how students' learning activities unfold when game design is introduced into formal learning. The overarching research question for the study has been the following: *How do students' learning activities unfold when game design is introduced into formal education?*

This main research question is explored through the following sub-questions:

- 1) How do tensions between school and leisure time unfold in game design activities in the classroom?
- 2) How do students build knowledge³ through collaboration in the game design process?
- 3) How do students use artifacts in the game design process?

³ In this thesis, the term *knowledge building*, and related concepts such as *building knowledge*, is utilized. *Knowledge building* is not intended to be used as a definitive theoretical term or refer to a specific framework, but is considered a suitable term as it draws attention to "the creation of knowledge as a social product" (Zhang, Scardamalia, Reeve, & Messina, 2009, p. 8), emphasizing collaboration in a community of learners (Bielaczyc & Collins, 1999; Scardamalia & Bereiter, 2006).

2 Playing and designing games as learning activities

Learning from game design is highly interdisciplinary, often merging theories and research methods from several different fields. While game studies recently have begun to gain acceptance as a field of their own, researchers come from a variety of backgrounds and research traditions (Mäyrä, 2009; Mäyrä, Holopainen, & Jakobsson, 2012). The interdisciplinarity of game design and learning makes it an intriguing field in which to do research, but it also poses challenges for a literature review. As noted by Salen (2008) when editing *The Ecology of Games: Connecting Youth, Games, and Learning*: “Wealth comes in the form of new frameworks, methodologies, and alternate histories that enrich the dialogue with multiple points of view; poverty comes in the choice of breadth over depth and in the challenge of locating a common vocabulary” (p. 3). While the study draws on a wide range of sources, literature from journals dealing with educational technology, where research on game-based learning is featured, has been emphasized to get a view of the current state of research developments. This includes journals such as *Learning, Media and Technology*; *Computers and Education*; and the *Nordic Journal of Digital Literacy*.

Some concepts that might be relevant to the current research’s aim and research questions are not elaborated in this review, while other concepts are only touched upon in specific relation to learning from game design, e.g., research on games in relation to media education and literacy (e.g., Buckingham & Burn, 2007; Partington, 2010), or *multimodality*, which is a central characteristic of computer games (Lemke, 2009). Research on creativity and motivation could provide a large amount of relevant literature. However, the literature that has been reviewed in this section is considered to belong to the most central areas for the research project, a project concerned with learning activities when designing history-themed computer games in formal education, with a tool that focuses on narrative and world-building. Key texts, concepts, ideas, and reports that can contribute to understanding classroom game design have been emphasized.

While the main emphasis is on learning from designing games in a classroom context, the literature review also will outline game-related activities in young people’s leisure time. Research regarding these factors is considered necessary, as classroom game design draws on both young people’s experiences with games and creating from their leisure time, as well as social norms and values in the classroom. As argued by Grant (2011, p. 292), “for connections to be made between learning at home and in school, elements of both need to be drawn together in a space in which both are valued.” This view is supported by the present research

project. This section will conclude by positioning the present research project in relation to outlined research.

2.1 Games and learning as a research field

In 1985, players were glued to their screens tracking down a master villain and her pack of thieves, receiving geographical clues that led the player to different countries and places of interest around the world. *Where in the World is Carmen Sandiego* (Broderbund, 1985) is an early example of computer games used for learning purposes, still fondly remembered by many as a game with an intriguing premise that triggered players' curiosity and compelled them to embark on geography-related quests. Since then, research on the learning properties of games has increased rapidly.

Dondlinger (2007) conducted a review of educational computer games and concluded that it is "fairly clear from the breadth of research on the subject that video games affect learning" (p. 28). Based on her review, learning outcomes from educational computer games can be categorized into the following categories: 1) 21st century skills; 2) Deduction and hypothesis testing; 3) Complex concepts and abstract thinking; and 4) Visual and special processing. Several elements are important to achieve desired learning outcomes, such as narrative, goals, rules and rewards, multisensory clues, and interactivity (p. 28).

Studies on games and learning have been conducted in a variety of informal and formal learning settings, and within many different subject areas, as seen in a metastudy by Ke (2009). The review shows that games seem to foster cognitive learning outcomes and higher-order thinking skills to a larger degree than factual-knowledge acquisition, and that "instructional computer games seem to facilitate motivation across different learner groups and learning situations" (p. 22). Methodologically, most of the studies are conducted from a quantitative perspective. For example, in the studies concerning the effects of instructional gaming, 69% of the studies used quantitative methodology, 15% used a mixed-methods design, and 15% were qualitative, using ethnography or case-study methodologies (Ke, 2009, p. 20).

The studies also show that game-based learning is a rapidly increasing research field. In 2011, a systematic review identified 129 papers reporting empirical evidence on game-based learning and serious games (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012). The review concluded that "playing computer games is linked to a range of perceptual, cognitive, behavioural, affective and motivational impacts and outcomes" (p. 661), with the most

frequent outcomes being content acquisition and affective and motivational outcomes. However, the number of published papers on the topic is rapidly increasing. In an update to the review conducted five years later (Boyle et al., 2016), the researchers reported finding 512 papers reporting empirical evidence of positive outcomes from playing computer games (p. 186). The review reported that most of the games for learning focused on knowledge acquisition, with the highest number of games for learning focusing on STEM subjects, i.e., science, technology, engineering and mathematics, as well as health. It also addressed possible benefits from games that are primarily for *entertainment*, stating that entertainment games “addressed a broader range of affective, behaviour change, perceptual and cognitive and physiological outcomes” (p. 178). Only five qualitative studies were included in this review, which the authors attribute to the focus of the study. The authors suggest that qualitative research on games could “provide useful and detailed information about what works in games and what does not” (p. 188).

While the reviews presented have shown promising results, other reviews have reported mixed results. For example, a review of more than 300 studies on serious games in education (Young et al., 2012) concluded that while many interesting educational games are available, “evidence for their impact on student achievement is slim” (p. 61). The authors said that while computer games have strengths that could promote reflection and active engagement, a challenge was that this could come at the cost of curriculum coverage and efficiency (p. 81). The authors also suggested, among other things, that focus should be turned to the situated nature of gameplay, and the social interactions among players, the players’ interactions with the game, and the context in which game play occurs.

While the body of research on games for learning is quickly increasing, there is less research on learning from *designing* games. Kafai and Burke (2015) have argued that constructionist gaming approaches, in which students *make* games instead of *play* games, have been “Glaringly absent in the discussions about the effectiveness of serious gaming” (p. 314). The authors suggest that this might be due to, among other things, that *instructionist* approaches to game-based learning, i.e., learning through *playing* games, is more accessible to teachers. Teachers can then download and use a finished product that teaches children, instead of an instructor having the responsibility of teaching students. In their review and synthesis of 55 studies on learning from game creation, they indicate that “the largest number has and continues to focus on learning programming, followed by other academic subjects” (Kafai & Burke, 2015, p. 317). Fewer studies focus on the social and cultural dimensions of learning

from game design. Their review also showed that half the studies on educational outcomes from game design take place at out-of-school sites, such as after-school clubs and summer camps, while the other half take place in school settings (Kafai & Burke, 2015).

2.2 Playing and making games in young people's leisure time

The increasing interest in computer games and learning is, among other factors, influenced by changes in young people's everyday lives, in which games and digital media play an important part. Tapscott's (1998) ideas on the *net generation*, Prensky's (2001) work on *digital natives*, and Gee's writings on learning in interest-driven, online communities called *affinity spaces* (Gee, 2005) are among the ideas that sparked discussions on how digital media culture could make us rethink education. Young people's participation in communities centered on digital media opens up many possibilities for informal learning (Hillman & Säljö, 2016). This includes *playing* and *making* computer games.

Almost all young people play computer games. According to statistics from the Entertainment Software Association (Entertainment Software Association, 2016) about the computer and video game industry, 63% of U.S. households contain at least one resident who plays games at least three hours a week (p. 2), with 41% of those playing games being female and the average player being 35 years old (p. 3). While the age of the average game player has increased, 27% of the game players in the U.S. are under 18. In a Norwegian context, the statistics show that 96% of boys and 76% of girls ages 9 to 16 play computer games (Barne- og familiedirektoratet, 2016), with *Minecraft*, *FIFA*, *Grand Theft Auto (GTA)*, *Call of Duty*, and *Counter-Strike* being the most popular games (Medietilsynet, 2016, p. 7). There are some differences in the gaming habits of male and female players: Young boys tend to spend more time playing than girls (Bakken, 2017)⁴. Female players tend to favor PC games over console games, while boys play mostly console games, and more girls than boys favor mobile phones as their preferred gaming platform (A. I. Wang, 2011).

To many young people, in Norway and globally, games are also a part of their leisure in other ways than through play. In an influential report on young people's media usage, Jenkins et al. have argued that at home, many young people are part of a *participatory culture* (Jenkins, Purushotma, Weigel, Clinton, & Robison, 2009). This phenomenon is characterized by children not only being consumers of digital media, but also producers of digital-media

⁴ The numbers are based on eighth-grade students, so they are one or two years older than the students in this study.

content as well, with “relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one’s creations, and some type of informal mentorship whereby what is known by the most experienced is passed along to novices” (Jenkins et al., 2009, p. xi). Thus, there has been a shift toward *making* games instead of merely playing games. This shift can, among other factors, be attributed to the game industry itself (Kafai & Burke, 2016), as making is a central part of many of today’s most popular games, such as *Minecraft* (Mojang, 2009) and *Super Mario Maker* (Nintendo, 2015). Tools such as *Scratch* (MIT Media Lab, 2017), *Kodu* (Microsoft Research, 2017), and *RPG Maker* (Enterbrain, 2011) also have made game-making more accessible than before.

While it is certainly not the case that *all* young people are active producers of media content, it is an important part of what characterizes young people’s media usage (Ito et al., 2013; Jenkins, 2006; Jenkins, Ito, & Boyd, 2016). In relation to game-related activities, these forms of participatory culture can be related to membership in online game-oriented communities (*affiliations*), producing new media content, such as *modding* computer games or creating gameplay videos (*expressions*), solving problems in alternate reality games, collaborating in guilds on challenges in online games (*collaborative problem solving*), or writing blog posts or creating podcasts on personal gaming experiences (*circulations*) (Jenkins et al., 2009). This has educational potential, such as peer-to-peer learning, in developing skills needed in the current workplace and giving young people a more empowered conception of citizenship (Jenkins et al., 2009, p. xii). However, challenges to the participatory culture exist as well, such as ensuring that children can access all the necessary skills needed to participate fully in a future society, including the ability to understand how media shape their perceptions of the world and the ability to apply ethical standards when creating media content and participating in online communities (Jenkins et al., 2009).

The growing interest in active production also can be seen in the increasing *maker movement*, which promotes playful creation, sharing, and learning together (Hatch, 2014). Central to the maker movement is *makerspaces*, which are “comprised of participants of different ages and levels of experience who work with varied media, but a commonality is that these spaces all involve making – developing an idea and constructing it into some physical or digital form” (Sheridan et al., 2014, p. 507). Makerspaces bring people with different interests together, and it is not uncommon to see some people sewing and some people welding together under one roof. While it is more common to hear about makerspaces in relation to making physical artifacts, some also are into computer programming and producing digital content, e.g.,

making games, animation, and/or interactive and digital stories (Kafai & Peppler, 2011). When making digital content is central, the term *hackerspaces* is often used. However, this distinction is not absolute, especially when the focus moves from the *tools* being used to the makers' *mindset* (L. Martin, 2015, p. 32). Makerspaces are often seen in informal learning contexts and have been increasingly popular in public spaces, such as libraries (Willett, 2017). However, as noted by Martin (2015), the maker movement has close connections to established learning theories, bringing more- and less-experienced participants together on a common task (Lave & Wenger, 1991). There is, therefore, also an interest in bringing makerspaces into classrooms, as this provides an opportunity for bridging informal, interest-driven learning and formal education (J. Cohen, Jones, Smith, & Calandra, 2017; Sheridan et al., 2014).

The maker movement draws, to a large extent, on Papert's ideas on *constructionism* (e.g., Papert, 1980), an often encountered term in research on learning from design. The constructionist perspective on learning from game design can be seen as both a theory of learning and a strategy for education. The main idea behind constructionism is that young people will learn better by *creating an external artifact* through a project that *they themselves find meaningful* (Papert & Harel, 1991). Knowledge is seen as actively constructed by the student, instead of just transmitted from teacher to student (Kafai & Resnick, 2012). Thus, constructionist theory suggests a connection between learning and design, stating that design-related activities such as creating, building, and programming might be well-suited contexts for learning (Kafai & Resnick, 2012, p. 4). The next section will present studies on learning from game design in out-of-school contexts, such as youth clubs, summer camps, and after-school contexts.

2.2.1 Learning from designing games at out-of-school sites

An example of research on educational outcomes from game design in out-of-school settings can be found in Peppler and Kafai's (Peppler & Kafai, 2007a) studies on the informal, creative media practices of youth in urban environments. Based on ethnographic fieldwork from the Computer Clubhouse in Los Angeles, using the programming tool *Scratch*, the authors argue that creative media production in out-of-school settings "empower youth as critical designers in a venue where their contributions are valued" (p. 161). The authors reflect that a benefit of out-of-school learning is that young people can follow their interests without interruptions over longer periods of time. However, if *Scratch* were used in classrooms, it would allow for more systematic and guided reflection on these media-creation practices (s.

163). The authors also found that computer-game design can provide a rich context for learning how to collaborate with others and give young people a good way of being part of a community based on similar interests (Peppler & Kafai, 2007b).

Studies on learning from computer games often have focused on learning programming and computation concepts (Hayes & Games, 2008; Kafai & Burke, 2015). In another publication on young people's Scratch development in the Los Angeles Computer Clubhouse (Maloney, Peppler, Kafai, Resnick, & Rusk, 2008), the authors analyzed 536 Scratch projects and found that making Scratch projects in out-of-school settings could contribute to learning key programming concepts "even in the absence of instructional interventions or experienced mentors" (p. 367).

In another study, Sheridan, Clark & Peters (2009) draw on their research on students designing computer games in summer camps and at Saturday game design programs, mainly with African-American participants. The authors argue that while game design, in itself, might be what motivates the students, they may derive technical skills and learn to engage in scientific processes that may provide educational benefits that may "lead them down many productive intellectual, educational and career paths" (p. 1561).

Game design to teach programming and computer science in informal learning environments also includes a gender perspective. Denner, Werner & Ortiz (2012) analyzed 108 games created by female middle-school students in an after-school setting, in which the participants had no previous programming experience. The authors argue that the results "provide evidence that game construction involving both design and programming activities can support the learning of computer science concepts" (p. 240). However, the authors suggested that a more extensive amount of instructional support could contribute to a larger number of students reaching a better understanding of more complex programming concepts.

Along the same lines, computer games in out-of-school settings have contributed to increasing girls' *interest* in computer science. This has been shown in a case study by Çakır et al. (2017), in which girls in grades five through eight designed computer games in an out-of-school workshop. The study showed that participants' perceptions of computer science improved. The authors emphasize the importance of settings in which new identities – such as an identity as a programmer – can be explored safely.

Studies also have been conducted on designing computer games with a narrative focus. Robertson and Good (2005) studied young people ages 12 to 15 who designed narratively driven games in a week-long summer workshop using the *Neverwinter Nights* engine. This study showed that creating narratively driven games offers educational benefits such as motivation, increased self-esteem, and increased narrative skills. This study seeks more research on how game-making could be integrated with the curriculum in classrooms (Robertson & Good, 2005).

2.3 Playing and making games in formal learning environments

Researchers have argued for connecting young people's own interests with academic learning (Ito et al., 2013), as explored earlier in this thesis. However, if games are to be introduced successfully into the classroom, many factors come into play and will be explored in this section.

2.3.1 Introducing games into the classroom

Several possible approaches to implementing game-based learning in the classroom can be used: Games can become starting points for instruction and reflection, with game narratives used as a context for learning, to support skill development, to provide just-in-time learning, and to create a "flipped classroom," in which students play games at home that later will be discussed in class (Grof, McCall, Darvasi, & Gilbert, 2016, p. 27). Well-known examples of how games have been successfully integrated into the classroom include the game-based class-response system *Kahoot!* (e.g., A. I. Wang, 2015), as well as the algebra game *DragonBox* (e.g., Siew, Geoffrey, & Lee, 2016).

Commercial, off-the-shelf games also have been used in classrooms. Examples include the zombie-adventure game *The Walking Dead* for ethics education (Staaby, 2015) and *Civilization III* for teaching history (Squire & Barab, 2004). This link between leisure and school is emphasized in findings from studies on entertainment games that indicate common game design principles are also good *learning principles*. Several of these are outlined by Gee (2007a, 2007b). For example, games can function as simplified descriptions of complex situations that players can safely explore and alter to see connections, as well as the consequences of their actions. He also states that video games are *pleasantly frustrating*, in which the learning is at the borders of what the player can do, but still within his or her area of competency (Gee, 2007a). This is closely related to Csikszentmihalyi's theory of *flow* (Csikszentmihalyi, 2014), which states that the best conditions for learning are when challenge and mastery are in balance. Also, video games give the player information *just in*

time and on demand, meaning a player can learn more about a topic exactly when this is needed, providing a context and making the information relevant to the players (Gee, 2007a). Skills also are often learned gradually in games, starting with simple tasks in safe environments that the player gradually must develop to proceed in increasingly more challenging game settings (Gee, 2007a). Thus, connections are seen between game design principles and theories of learning that emphasize learning as situated, with gradually increasing participation.

Recent institutional developments have promising implications for game-based learning. Schools have better IT infrastructure, there is an increase in the use of digital learning materials instead of printed materials in classrooms, and there is a larger body of research on game-based learning (Richards, Stebbins, & Moellering, 2013, p. 5).⁵ Also, students themselves are largely receptive to learning from games. A study conducted by de Freitas (2006), which combined surveys, semi-structured interviews, and workshops, found that using games and simulations for learning increased students' motivation, and that "93% of the respondents thought learning with educational simulations⁶ and games was more fun than learning in more traditional and often more text-based ways" (p. 351). The respondents also reported that they believed games could increase participation among student groups that previously had been excluded due to challenges related to language and/or writing abilities. Also, respondents perceived games and simulations as a way to learn through experience, which they found to be an easier way to learn difficult concepts (p. 353-354).

A practical example of how games and game making have been closely integrated into a formal learning environment can be found at Quest to Learn (Quest to Learn, 2017b), a public school for grades 6 to 12, with a learning philosophy shaped by game-based learning. The school has shown promising results in terms of students' learning gains, as well as critical thinking and communication skills (Quest to Learn, 2017c). At the Quest to Learn School, learning is shaped by seven principles of game-based learning (Quest to Learn, 2017a): *1) Everyone is a participant*, in which students can contribute with different forms and levels of

⁵ The report is based on U.S. data. The situation in Norway was described in the *Introduction* section of this thesis.

⁶ In this study, the use of *simulations* was reported together with games, defined as "representations of real-world systems, they contain rules and strategies that allow activity to take place flexibly and with variable conditions" (de Freitas, 2006, p. 344), based on Garris, Ahlers, and Driskell (2002). Educational games often use simulation in some ways – in fact, Squire has noted that "if it is not a simulation on some level, it is probably not a good educational game" (quoted in Richards et al., 2013, p. 22).

expertise; 2) *Create a challenging environment* in which creating a “need to know” is emphasized; 3) *Learn by doing*; 4) *Immediate and ongoing feedback*; 5) *Reframe failure as iterations*; 6) *Stress interconnectedness*, in which work, skills, and knowledge in and across communities are emphasized; and 7) *Allow for play*, as learning experiences are student-centered, creative, and engaging.

While these results are promising, however, activities that are parts of young people’s leisure time will not necessarily become successful classroom activities (Jenkins, 2006). A study on introducing social media into the classroom as a learning activity showed that students found it challenging to understand how the activity should be framed, as they used a medium they knew from their spare time in a formal learning context (Lantz-Andersson, Vigmo, & Bowen, 2016). On a similar note, Squire (2005) said introducing computer games with commercial qualities into the classroom can be a challenge, as students fail to see the purpose of the activity. This can be due to some students’ expectations of what classroom learning should be like. Chee, Mehrotra, and Ong (2015) found that teachers reported that some students resisted game-oriented learning approaches instead of reading and memorizing text from their textbooks, as they were used to doing. Teachers also may find game-based learning challenging. For many teachers, a limited understanding of games from an educator’s perspective and insufficient feedback from the games for assessment purposes provide challenges that need to be addressed (Grof et al., 2016, p. 20).

2.3.2 Learning history from games

As the games designed by students in this project were based on competency goals from the history part of their social studies curricula, games to learn about history will be explored further. Computer games have the opportunity to provide for *interactive* history learning, moving beyond just replicating what can be done with textbooks through new technologies (Kee, 2011). According to Schrier (2014, pp. 74–75), games about history usually fall into one of three categories: *Representations of the past*, in which players can engage with historic figures in past events, often presented with a focus on historical accuracy; *interaction with historical themes, concepts, choices, or resources*, which often are games in which the player must make strategic decisions in a historical setting; or *play within a history-related setting*, which might focus less on historical accuracy, though they are set in historical settings. Such games include commercial, off-the-shelf titles such as *Assassin’s Creed* or *L.A. Noire* (Schrier, 2014).

One of the main benefits of computer games is that they allow players to seek answers to their questions about how historical events could have happened under particular circumstances (Simons, 2007), i.e., as stated by Uricchio, to “engage in a speculative or “what if” encounter with a particular past” (2005, p. 328). When using games to present a historical topic, however, what is shown can never be an objective truth, as it cannot fully represent the past – historical accuracy always must be balanced with good game play (Schrier, 2014).

Research on games used to teach history suggests that these kinds of games might make students engage in solving problems in a way that overlaps with academic content learning (Squire, 2008, p. 170). A study on the use of *Civilization III* in the classroom showed promising results in terms of social studies learning in several areas of the subject, providing improved understanding of how different topics, such as history, politics, geography, and economics, are connected (Squire & Barab, 2004, p. 505). It is, however, not a given that learning will happen when games are introduced into the classroom (e.g., Squire, 2008), as game-based learning in the classroom is a complex process in which many factors are involved that may influence students’ learning activities.

Narrative is often emphasized as an important factor in games used for learning (Dickey, 2006; Dondlinger, 2007; Malone, 1981). This is also central to games used for teaching history. Dickey (2006), referencing Conle (2003) and Eisner (1991), notes that introducing narrative into a learning environment creates “opportunities for reflection, evaluation, illustration, exemplification, and inquiry” (p. 248). However, not just any narrative will do; it must be interesting and relevant to students. If they are intrigued by the narrative, this might contribute to increased engagement in learning and problem solving. As noted by Rieber (1996), “When confronted with a problem without an immediate solution, a learner will seek resolution if a solution seems possible and within reach, assuming that the context (i.e., fantasy) is inherently interesting” (p. 50). Uncritically applying a narrative without it having any relation to game mechanics, however, is also an often-encountered criticism of game-based learning. This – often called *chocolate-covered broccoli* (e.g., Weitze, 2014) – is, according to Dondlinger (2007), one of the factors that distinguishes edutainment from educational games. Edutainment can be viewed as games that follow a format emphasizing skill-and-drill and repetition of skills or memorizing facts (p. 22), as opposed to educational computer games that “require strategizing, hypothesis testing, or problem solving, usually with higher order thinking rather than rote memorization or simple comprehension” (p. 22). In

the latter category, a narrative context with a clear relation to the rules and goals of the game, as well as to the learning content, is considered vital (p. 22).

2.3.3 Learning when designing games in the classroom

In 1997, inspired by Papert's constructionism, Kafai, Ching, and Marshall (1997) conducted a research project in which elementary school students designed multimedia resources aimed at teaching science concepts to younger children. The students were 10-12 years old and used the programming environment *Microworlds Logo*. Collecting data from a variety of sources, including field notes, video recordings, students' own writings about assignments, software log files, and pre- and post-tests, the researchers found that the students' programming skills, as well as their science understanding, significantly improved (p. 117). They also found that to make learning from design effective, there is a need to support collaborative work.

Studies on creating story-driven games in the classroom also have been conducted. A study by Carbonaro et al. (2008), conducted on high school students in an English class, showed that students could construct sophisticated stories with story-creation tools released by commercial game companies. Still, a study by Oldaker (2010) showed that creating story-driven computer games in a language arts class did not necessarily improve the students' writing skills, although the students' confidence with using technology, as well as their collaboration skills, improved.

In another study on classroom game design with narrative tools, Robertson & Howells (2008) provided evidence for learning outcomes when 9- and 10-year-old students created games with the Neverwinter Nights engine. The eight-week field study showed that making games presents opportunities for successful learning: "the children in this study were motivated and enthusiastic; they showed determination to achieve and were able to learn collaboratively and alone; and they also showed evidence of being able to link and apply their learning to new situations" (p. 576). Game design also can be a way of promoting cross-curricular learning, as it does not fit into only one curricular category or subject domain. The authors argue for the importance of clarifying intended aims and goals of the activity, both for assessment purposes and for facilitating productive reflection among students.

The students' emphasis on story and design also has been noted in studies with different intended learning outcomes. In a study by Ke (2014), middle school students created games with a math focus using the software *Scratch*. This mixed-methods case study indicated that while making games about math made the participants develop "significantly more positive

dispositions toward mathematics” (p. 26), it also showed that the students emphasized story creation and world-building aspects of the activity, rather than discussing math concepts or integrating mathematical content into their games. In addition, it showed that when students found game programming to be demanding, it interfered with how they interacted with math content. The author argued that future research on learning by design should “further investigate the relationship among design thinking, design-based computing, and content learning via design-experiment-based intervention studies” (p. 38).

Another aspect that studies often have emphasized is how classroom game design can promote *creativity*. This was demonstrated by pre- and post-tests by Eow, Ali, Mahmud, and Baki (2010), who concluded that “computer games development complemented with appreciative learning approach provide great opportunity in enhancing students’ creative perception” (p. 160). Navarrete (2013), in a case study that employed interviews, observations, and analysis of games made by middle-school students, suggested that “the creative thinking process in student-centered game creation learning approach may provide learners a rich and enjoyable learning experience with the authentic technology use as well as provide for deep, insightful learning” (p. 320).

Studies on game design in the classroom also have been conducted in Nordic countries. In Nordic discussions on games and making, the *Designs for Learning* perspective is often encountered, which explores learning as characterized by digital learning resources, a participatory culture, and globalization (Selander, 2008b). Learning can be seen as an increased ability to engage with a world in a way that is meaningful (Selander & Kress, 2010, p. 32) and is shown in students’ processes in designing something based on information they acquire. Documenting the indications of learning is done through observing changes in students’ sign-making activities, such as changes in behavior and skills, a deeper understanding of concepts, discussing new terminology, or suddenly being able to solve a problem (Selander, 2008a). While research on game-based learning from this perspective has been concerned with learning from *playing* computer games (e.g., Hanghøj, 2011; Wiklund & Ekenberg, 2009), the perspective also has been utilized for research with a focus on teaching game design itself (e.g., Larsen & Majgaard, 2016). In Larsen and Majgaard’s (2016) study, the authors observed undergraduate students designing computer games. The authors used this to develop a model of what they call the “expanded game design space,” which functions as a way to understand and structure the game design process, emphasizing students as both learners and game designers.

Other studies in Scandinavian classrooms include Weitze (2017), who, in a design-based research study conducted in three iterations over two years, found that students were able to implement specific learning goals in the games they were making. This could be supported by presenting and discussing relevant learning-game examples prior to designing games. Discussing the example, as well as relevant learning theories, could facilitate students' creation of more complex games.

Finally, it should be mentioned that game design often is seen as a way to learn new literacy skills (Beavis & O'Mara, 2010), as well as how to be critical and thoughtful producers and reflective *players*. Zimmerman (2009) has proposed that game design might be a way to teach game literacy, which is also supported by Buckingham & Burn (2007). Peppler and Kafai (2007a) argued that game design not only functions as a way to learn how to create multimodal texts, but also to understand the *complexity* of this design process. They also mention a political and cultural function of game making, as it can better make creators ask and understand questions such as "Who is doing the writing? Whose voice is being heard? Who is being positioned in certain ways within a particular text and for what purposes?" (p. 152). On a similar note, Denham and Guyotte (2017) emphasized that for game design to be used in an educational setting, there is a need to focus on *cultivating critical game makers*.

Salen (2007) argues not only that game design might be one of the keys to learning important 21st century skills, but also that new projects on using game design in the classroom are critical to understanding how games can make us rethink the future of education. The next section will synthesize findings to better understand where we are now and where to go next.

2.4 Positioning the current research project

The literature shows that there are few existing studies on learning from *designing* games instead of *playing* games, and that the goals of introducing game design often have been to learn programming or computer science (Hayes & Games, 2008; Kafai & Burke, 2015). Half of the studies in the literature also are conducted in out-of-school settings (Kafai & Burke, 2015).

However, the relationships between *playing* and *making*, as well as *home* and *school* sites, must be noted. While designing games has different theoretical and didactic foundations than learning through playing computer games (Felicia & Egenfeldt-Nielsen, 2011), a strong motivational factor related to game creation is that the students can make a game with familiar game components that their friends can play (Good & Robertson, 2006). Also, the bridge

between school and leisure is emphasized, as commercial off-the-shelf games may be utilized in formal education, offer game design principles that are also learning principles (Gee, 2007a, 2007b), and are linked to educational outcomes (Boyle et al., 2016). Thus, understanding both games and making as components of students' *interests*, as well as the environment in which the learning occurs, is considered important to understanding students' game design activities.

Research on designing games as a way to learn curricular topics has been requested (Ke, 2014; Oldaker, 2010; Pepler & Kafai, 2007b), as well as studies on how to better integrate classroom game design with curricula (Robertson & Good, 2005). Most studies on using games in a classroom context have been conducted by taking a quantitative approach (Ke, 2009). This also has been noted by journals such as *Computers & Education*, which called for more qualitative research on computers for educational purposes (Twining, Heller, Nussbaum, & Tsai, 2017).

As seen by the literature, there are promising results from introducing games and game design into the classroom, but also challenges and mixed views on the effectiveness of game-based learning. Classrooms are complex, and – as emphasized by several of the studies – it would, therefore, be useful to turn the focus to *how* interactions between students and tools unfold, while considering the sociocultural context of the activity (Beavis, Muspratt, & Thompson, 2015; Kafai & Burke, 2015; Young et al., 2012). While the implications for formal learning have been noted in some of the studies on game design in out-of-school learning, classrooms' learning environments and the differences between different sites, such as after-school contexts, youth clubs, and classrooms, often are not emphasized.

The challenges of game-oriented learning are not sufficiently understood (Bate, MacNish, & Males, 2014), so more focus here is needed to improve game-oriented learning. Here, understanding how *students* perceive game-oriented learning should be the main focus (Beavis et al., 2015; Selwyn, 2016). Therefore, a qualitative study focusing on participants' social interactions in the learning process (e.g., Ludvigsen, Stahl, Law, & Cress, 2015) might provide valuable new insights on the use of game design for learning. The current study aims to address the gaps in the literature by showing how students' learning activities unfold when designing games in the classroom, emphasizing learning as *situated* and providing detailed analysis of social interactions. Thus, instead of focusing on whether classroom game design can promote specific learning outcomes, it aims to show *how students themselves* orient

toward the activities, situated in a community of practice with a network of established artifacts, as well as social norms and values.

3 Theoretical and analytical concepts

This section will present the central theoretical and analytical concepts utilized in this thesis.

3.1 A sociocultural view on learning

The core underlying assumptions in this research project are based on a *sociocultural view* on learning. As the theoretical and analytical concepts utilized in this thesis draw on this perspective, emphasizing the situated nature of learning, collaboration, and the use of artifacts, core concepts of sociocultural theory will be outlined before moving on to the core theoretical and analytical concepts utilized for this thesis.

Sociocultural theory stems from the theories of the Russian psychologist L. S. Vygotsky, who said, “every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, *between* people (*interpsychological*), and then inside the child (*intrapsychological*)” (Vygotsky, 1978, p. 57). Thus, central to a sociocultural perspective is not to see learning as something isolated in the mind of the learner, but to understand the social interactions between individuals or communities of practice, as well as the use of available resources (Säljö, 2006).

While sociocultural theory has been influenced by several researchers from different fields (e.g., Cole, 1996; Wertsch, 1998), the relevant aspects of sociocultural theory for this thesis are to explore how human beings develop and use physical and intellectual tools (here referred to as *artifacts*), as well as communication and development of collaborations among people (Säljö, 2001). When describing the perspective as *cultural*, it refers to culture as a collection of ideas, beliefs, and knowledge that people acquire from interactions with other people and the environment, including tools and artifacts (Säljö, 2001, p. 30). Important questions to answer when analyzing learning from a sociocultural perspective include the following: How do people acquire social experiences? How do they learn to use these experiences in different contexts? How will these insights and this knowledge live on? (Säljö, 2006, pp. 20–21).

Sociocultural theory is a perspective that has gained popularity in research on education. Often, this builds on Vygotsky's *zone of proximal development*, which is defined as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). This

emphasizes the role of learning as happening in a social and interactional context, supporting the concept of learning together in a group when designing computer games in the classroom.

Research on collaboration and learning from a sociocultural perspective also emphasizes learning opportunities that arise when different perspectives converge. According to Wegerif (2007), when tension is created by two or more perspectives, this will open a *dialogic space*. Here, technology has an important role as a tool “opening up and resourcing the kind of dialogic spaces that enable people to think, learn, and play together” (p. 7). When students engage in productive dialogue, it may benefit not only their learning processes, but also facilitate creativity when co-constructing knowledge (Wegerif, 2005, p. 236).

3.1.1 Learning as *situated and grounded in participation*

From a sociocultural perspective, learning is seen as *situated*, with a foundation within social practices (Säljö, 2006), and must be understood within the setting in which it is currently operating. Our actions as humans are based on our knowledge and environment, what we think is expected in a current situation, and what our environment allows us to do (Säljö, 2001, p. 131). Learning is now largely about mastering technology in different forms and *contexts*. For example, at school, learning is largely about being able to identify which discourses are relevant in this environment and mastering the artifacts that are used and valued in current practice (Säljö, 2001, p. 235).

In their seminal work *Situated Learning: Legitimate Peripheral Participation*, Lave and Wenger (1991) note how situated learning often has been used interchangeably with learning *in situ* or *learning by doing*. However, as they said, learning should be viewed as “an integral and inseparable aspect of social practice” (p. 31), and they characterized learning as *legitimate peripheral participation in communities of practice*. This perspective emphasizes that there are different, legitimate ways of participating, defined by the community, and that learning is viewed as increased participation in this community of practice. The learner, often seen as an *apprentice*, learns through participating in activities that are important to the community, first through easy tasks -- in the periphery, but still legitimate -- before moving on to more central aspects of participation. A newcomer to a community of practice might gradually increase his or her participation in the community until he or she becomes an old-timer. It should be noted that old-timers need not be experts, but can be *relative old-timers* (p. 56). Thus, learning can be viewed as *trajectories of participation*, situated in the social realm (p. 121).

While the examples used by Lave and Wenger refer to informal learning outside classrooms, such as learning tailoring or fishing, theories regarding learning as participation in a community of practice are also useful for studying learning in classrooms. An example of this is the concept of *communities of learners* (Rogoff, Turkonis, & Bartlett, 2001). In a community of learners, several traits are emphasized: Instruction and learning should be done in a collaborative way, and students' own *interests* should lay the foundation for participation. Students should participate in planning learning activities, and the mutual efforts of children and adults should be emphasized in the learning process. Furthermore, teachers and other involved adults also learn from their interactions with students (Rogoff et al., 2001, p. 3). As the students learn while contributing to an activity that they themselves find useful, the purpose of the activity becomes clearer. As stated by the authors, "Children are natural learners as long as they can be deeply involved in activities which they help to devise and for which they see a purpose – 'minds-on' activities" (Rogoff et al., 2001, p. 33).

A noteworthy aspect of communities of learners is how the structure of the community makes it able to function "even in the short-term absence of any individual (including a teacher); people learn to fill in for others' complementary responsibilities" (Rogoff et al., 2001, p. 7).

3.1.1.1 Guided participation

A central aspect of collaboration in communities of practice and communities of learners is how young people learn from participating in an activity with adults or more-skilled peers. An analytical lens that turns attention to *how* this participation unfolds is *guided participation*.

Guided participation (Rogoff, 1990, 1991, 1995) refers to "the processes and systems of involvement between people as they communicate and coordinate efforts while participating in culturally valued activity," including side-by-side participation in activities (Rogoff, 1995, p. 142). Building on Vygotsky's theories on the *zone of proximal development*, guided participation draws attention to how bridges can be built from a child's understanding to new understanding by communication with a more-skilled companion (Rogoff, 1991, p. 351). However, it also *adds* to this perspective by emphasizing active involvement of the apprentice herself in this process.

Guided participation is not a specific theory of how learning could be supported. Instead, it is a lens that draws attention to significant aspects of participation, in terms of interactions between young people and their more-skilled companions (Rogoff, 2003, pp. 283–284). This includes, for example, how participants encourage and restrict the apprentice's behavior

(Rogoff, 1995), e.g., by direct instructions, arranging available resources and artifacts in a way that will benefit the apprentice, or through non-verbal cues (Rogoff, 1991). The apprentice, in turn, contributes to the activity, both by observing the more-skilled companion and adjusting his or her own participation in accordance. He or she also may observe the practitioner and watch for subtle, non-verbal cues to interpret ambiguous signals, or see whether their behavior is approved of or not (Rogoff, 2003, p. 286). Children's participation with more-skilled companions "itself changes their understanding" (1991, p. 363), and they may apply the knowledge and skills they acquire when similar situations arise.

While guided participation is most often used to study how children learn from participation in communities with adults, peers also play an important role. They are "available and active companions, providing each other with motivation, imagination, and opportunities for creative elaboration of the activities of their community" (Rogoff, 1990, p. ix). When seeing the classroom as a community of learners, in which they work together in a group, this is significant. Also, in contrast to learning in out-of-school communities, where guided participation is often studied, the classroom is shaped by the social norms and values of a formal learning environment. Therefore, the term *subteaching* is useful.

3.1.1.2 Subteaching

An aspect of guided participation that is relevant to explore when game design is introduced into the classroom is *subteaching*. A term coined by Tholander and Aronsson (2003), subteaching refers to students taking on the common behaviors of teachers (Mökkönen, 2012; Møller & Jørgensen, 2011). The phenomenon often is seen when students are working in groups, which is a way of working in which much of what usually has been the responsibility of teachers is transferred to students (Tholander & Aronsson, 2003).

When positioned as a subteacher, the student may guide and instruct other students in a way that resembles how teachers would do it. They might evaluate other students' work, or they might discipline other students and keep them on track with their tasks (Tholander & Aronsson, 2003). Students can position themselves as subteachers, or be positioned as subteachers by other students. It is not uncommon, however, for other students to resist subteaching efforts (Møller & Jørgensen, 2011). Research on subteaching shows that students positioned as subteachers are often academically ambitious and often are girls (Mökkönen, 2012; Tholander & Aronsson, 2003).

Subteaching is considered a useful analytical concept, as it draws attention to the institutional aspects of formal learning when analyzing guided participation. When game design is introduced into a formal learning environment, the social norms and values of the classroom need to be considered to understand students' social interactions.

3.1.2 Artifacts

Exploring learning from a sociocultural perspective often concerns the use of *artifacts*. With easy access to books and digital media, there is no longer a need to memorize large amounts of information (Säljö, 2006). There are, therefore, other questions more worthy of exploration when studying learning activities: How do people transform information into knowledge? How do people choose, evaluate, and organize information so that it will be relevant for a certain context? How do people create connections between different bits of information, so that it will be useful for current social practice (Säljö, 2001, p. 248)?

The use of *tools*, *resources*, or *artifacts* in learning processes is one of the most important concepts of sociocultural theory. These resources that students use have been labeled in different ways, and often, the terms *artifact* and *tools* are used interchangeably (McDonald, Le, Higgins, & Podmore, 2005). This thesis will use the term *artifacts* to be consistent with the theoretical framework.

While the use of artifacts in a classroom is of core importance, new digital tools are often introduced into the classroom without considering the use of already existing, more-traditional artifacts, e.g., pencils, paper, blackboards, and textbooks (Sørensen, 2009). However, the interplay of artifacts in the classroom and how they are used are of core importance when researching how digital tools affect students' learning activities (e.g., Arnseth, 2011). As stated by Säljö, learning is first seen in social interactions before becoming a part of individual learners, and it might be built into artifacts that will go back into society in different contexts (Säljö, 2001, preface). Artifacts are "simultaneously a record of the past and an agent for transmission of their meaning and use into the future" (McDonald et al., 2005, p. 114). On a similar note, computer games are artifacts that may say something about those who created them (Flanagan & Nissenbaum, 2014; Selander, 2008b). Thus, studying games made by students may provide insights into their knowledge-building processes.

However, as the main focus is on students' social interactions, the analytical tool

levels of artifacts (Wartofsky, 1979) can guide attention toward *how* students actually use artifacts. In Wartofsky's classification, primary-level artifacts include objects and tools that can be seen as an extension of a person, as well as the skills to use them. These tools are often used directly in production. In a classroom setting, primary-level artifacts can be tools that assist directly with communication, or can be computers used in the game design process. Secondary-level artifacts include representations, such as diagrams and maps, that "preserve and transmit acquired skills and modes of action" (McDonald et al., 2005, p. 115). This category is central to transmitting norms and beliefs, among other aspects (Cole, 1996), and mental tools such as rules and processes associated with classroom culture correspond to this level of artifacts (McDonald et al., 2005). Instructional webpages can be viewed as secondary-level artifacts. Tertiary-level artifacts "provide imaginative worlds where individuals can prepare for future genuine interactions and experiences by engaging in spontaneous play-activity without negative consequences" (Stout, 2008, p. 721), e.g., computer games.

In the present study, the emphasis is not necessarily on how different artifacts used by students can be placed in different categories; rather, Wartofsky's categorization contributes to *drawing attention to how artifacts are used by students*. A world map, for example, can be considered a secondary artifact, as the main affordance is to store and transmit geographical knowledge. However, while used by students, it may, instead, be the center of students' storytelling activities. Exploring how artifacts are used in classroom game design can point to significant characteristics of how the formal learning environment shapes the activity.

3.2 Combining sociocultural theory with research on interaction

To study how students' learning activities unfold, this thesis will combine the outlined sociocultural perspective with analytical principles from conversation analysis (CA).

3.2.1 Seeing learning in interaction

Conversation analysis -- a field stemming from research by sociologists Harvey Sacks, Emanuel Schegloff, and Gail Jefferson's beginning in the 1960s -- focuses on studying how talk-in-interaction is organized (Ten Have, 2009), such as turn-taking and repair⁷ (Sacks, Schegloff, & Jefferson, 1974). It seeks to "describe the underlying social organization—conceived as an institutionalized substratum of interactional rules, procedures, and conventions—through which orderly and intelligible social interaction is made possible" (C.

⁷ Analytical considerations will be explored further in the analysis portion of the *Methods and data* section of this thesis.

Goodwin & Heritage, 1990, p. 283). With conversation analysis having been originally concerned mainly with how participants organized their *talk*, later developments have included research in which embodied interactions seen in face-to-face interactions are also important (Ten Have, 2009), as seen in the work of Goodwin and Goodwin (e.g., C. Goodwin, 2000, 2007; C. Goodwin & Goodwin, 2004). However, as argued by Ten Have (2007), the basis is still *verbal* interaction, although gazes and gestures are considered important. CA also has influenced studies on talk-in-interaction using technology (Ten Have, 2009), e.g., as done by Heath, Hindmarsh & Luff (Heath, Hindmarsh, & Luff, 2010; Luff & Heath, 2012).

Conversation analysis has several traits that make it well-suited for this research project, in combination with sociocultural theory. The combination can be used to identify learning in interactions, in which learning can be seen as sequential changes, or as changes over time within interactional patterns (Melander & Sahlström, 2010). This can be seen in changes in how participants orient toward the content, e.g., in changes concerning how they talk about a topic (see also Engle & Conant, 2002; Melander & Sahlström, 2010). Also, conversation analysis focuses on *naturally occurring data* (Ten Have, 2007) -- not data produced in a lab or elicited by a researcher -- which is beneficial when analyzing the situated nature of learning. The data being used, such as video data and detailed transcripts, are *closer to the phenomena* being studied than many other approaches (Ten Have, 2007), which can be seen as a strength when analyzing the social and cultural aspects of interactions. Finally, while oral language is the main analytical focus of conversation analysis, language is studied *as used in interaction* (Ten Have, 2007), preserving the situated nature of learning. In the *Methods and Data* section, analytical considerations will be examined.

3.2.2 Exploring social interactions

To explore how students' social interactions are organized and unfold, the analytical concepts *activity frames* and *stancetaking*, with a focus on *epistemic stances*, will be employed.

3.2.2.1 Activity frames

Activity frames are a way of understanding how people make sense of what is going on within social interactions, and which rules and norms govern the practices at work (Goffman, 1974). In Goffman's influential work on *frame analysis*, he defines *frames* as "principles of organization which govern events – at least social ones – and our subjective involvement in them" (Goffman 1974, 10–11).

The concept of frames has been suggested to be a more dynamic alternative to the more static boundary hypothesis of Huizinga's *magic circle* (Huizinga, 1955), and this position is advocated by several game-studies researchers (Consalvo, 2009; Pargman & Jakobsson, 2008; Stenros, 2010). One of the most influential examples is Fine's (1982) research on the players of fantasy role-playing games. Fine, influenced by Goffman, uses the concept of *frames* while analyzing social interactions among players. Because of the social conventions that games establish, games might be very well-suited for frame analysis, Fine argues. Also, computer games provide *engrossment*, i.e., they make players voluntarily engage in "realms of experience," which are different from what they view as their natural habitats, although they are still grounded in reality (Fine, 1982).

While Fine emphasizes that he does not intend to use Goffman's (1974) framework point for point (Fine, 1982, p. 183), he expands on features of frame analysis in his method. Important to Fine are the *levels of meaning* in which players engage: On the first level, gaming is grounded in the "primary framework," described by Fine as "the commonsense understandings that *people* have of the real world" (p. 186). On the second level, the people who play games are *players* and are governed by the rules of the game. On the third level, players are the *characters* that they play in the game. Changing from one's primary framework to another level of meaning can be done through a process called *keying*, which "may alter only slightly the activity thus transformed, but it utterly changes what it is a participant would say was going on" (Goffman, 1974, p. 45). Seeing frame switching in a game context, this suggests that although a person might be highly engrossed in the game, playing as a *character* and with the reference frame of the game character, something might occur in the player's real world to make him or her switch back to the primary frame of the real world. This shifting is significant, as frames are not static, but dynamic, which is often seen when technology is introduced into the classroom (Silseth & Arnseth, 2016; Aarsand, 2008).

3.2.3 Stancetaking

While activity frames may be used to explore how students make sense of the activity they are currently participating in, an analytical concept that draws attention to social interactions between students – such as how they position themselves or others, make claims, and respond to other participants' utterances – is *stancetaking*. While *stance* has been defined broadly, in different contexts, it draws attention to understanding how language is actually used by participants in social interactions (Englebretson, 2007).

A way of understanding how this process occurs is by utilizing Du Bois' (2007) framework, called the *stance triangle*, in which stance consists of three dimensions: evaluation, alignment, and positioning. Based on this, he defines stance this way: "Stance is a public act by a social actor, achieved dialogically through overt communicative means, of simultaneously evaluating objects, positioning subjects (self and others), and aligning with other subjects, with respect to any salient dimension of the sociocultural field" (p. 163). He then puts it another way: "I evaluate something, and thereby position myself, and thereby align with you" (p. 163). In this definition, the aforementioned three concepts are important. The first, *evaluation*, is defined as "the process whereby a stancetaker orients to an object of stance and characterizes it as having some specific quality or value" (p. 143). The second, *positioning*, then is defined as "the act of situating a social actor with respect to responsibility for stance and for invoking sociocultural value" (Du Bois, 2007, p. 143), which can, for example, be *affective* (e.g., "I'm glad") and *epistemic* (e.g., "I understand"). The third, *alignment*, is viewed as "the act of calibrating the relationship between two stances, and by implication, between two stancetakers" (p. 144).

While verbal interactions are often emphasized when analyzing stancetaking (Englebretson, 2007), it also can be seen in participants' embodied interactions, such as how they position their bodies in relation to other participants or the tools they are using. Goodwin (2007) shows how stances can be displayed, e.g., through how artifacts are used and organized, and how participants place themselves in relation to the relevant aspects of the activity. They can show a *cooperative stance* by positioning their bodies in a way that shows they are oriented toward the common activity; a *moral stance*, in which participants display that they can be counted on as moral and trustworthy community members; and *affective stance*, in which emotions are displayed.

While many forms of stancetaking have been explored in detail in the literature, such as affective stances (Du Bois & Kärkkäinen, 2012; M. H. Goodwin, Cekaite, & Goodwin, 2012) and moral stances (Stivers, Mondada, & Steensig, 2011), perhaps the most significant form of stancetaking to study when exploring learning activities is *epistemic stances* (e.g., Kärkkäinen, 2003; Raymond & Heritage, 2006). Epistemic stances, therefore, will be outlined in more detail, as they can contribute to showing how students make assertions, accept or challenge other students' knowledge claims, and decide whom they consider to have the *right* or *responsibility* to know something in the learning activity.

3.2.3.1 *Epistemic stances*

Kärkkäinen (2006, p. 705) explains epistemic stances as “marking the degree of commitment to what one is saying, or marking attitudes toward knowledge,” as well as how a speaker obtains this knowledge and proves this with evidence. However, an epistemic-stance act also can be seen in relation to how participants position themselves, namely in a way that they can “appropriately experience, properly perceive, grasp, and understand relevant features of the events they are engaged in” (C. Goodwin, 2007, p. 70).

When studying how commitment is marked toward knowledge, several aspects are useful to study. For example, how students make and justify *knowledge claims* (e.g., Solem, 2016), such as through providing accounts or using artifacts to back up their claims, is central. Other significant aspects are how epistemic authority is negotiated and invoked (Heritage & Raymond, 2005). This can contribute to sustaining or challenging the knowledge asymmetry present in the classroom, such as who is seen as more skilled in the situation (e.g., Solem, 2016). This is a dynamic process in which speakers or respondents may *upgrade* or *downgrade* statements (Raymond & Heritage, 2006) based on who is considered to have the rights to “tell, inform, assert or assess something” (Stivers et al., 2011, p. 13). Those who have better access to information and more epistemic authority also might be considered to have more *epistemic responsibility*, in terms of what they should know, but also how they use this in interactions with other participants (Stivers et al., 2011).

In a classroom setting, analyzing epistemic stancetaking contributes to understanding the knowledge dynamics of the learning activity. It can be utilized when studying guided participation to see who is positioned as the most-skilled peers, and in subteaching, in how students may claim epistemic authority by drawing on the practices of teachers.

3.3 **Theoretical stand**

This section has outlined the core theoretical concepts utilized in this thesis – a *sociocultural view on learning* – as well as the analytical concepts being used to guide the attention to different aspects of the social interactions occurring between students, as well as their interactions with the tools, in different stages of the game design process.

In the *Introduction* and literature-review sections, presented earlier in this thesis, *learning* was a recurring term. However, the theoretical and analytical concepts presented in this thesis turn the focus from learning in itself to students’ *learning activities*. The sociocultural perspective contributes to this by pointing to how the classroom can be seen as a community of practice,

or community of learners, in which students are *apprentice game designers*. Guided participation turns the attention to how collaboration is structured among apprentices and more-skilled peers, often with the use of artifacts in the process. The dynamics of these learning activities have been explored through stancetaking, and how knowledge claims are made and epistemic responsibility is invoked, placed, or negotiated. Furthermore, activity frames contribute to understanding how students make sense of the activities on which they are currently working.

By emphasizing the social organization of students' learning activities, the present research project has a different emphasis than the constructionist ideas that often underpin research on learning from making. While the present research is inspired by one of the core ideas of constructionism – that students may learn from creating an external artifact in a project they find meaningful – the epistemological and ontological foundations of constructionism and sociocultural theory contain some differences. Constructionism is based on a constructivist perspective, in which learning is seen as occurring mainly internally within the learner, in contrast to sociocultural theory, which emphasizes learning through interactions (Säljö, 2001). However, these two perspectives may complement each other well, as they then draw attention to both the student and the community (Packer & Goicoechea, 2000, p. 235). By emphasizing the sociocultural aspects of the activity, they address the social and cultural aspects that has been requested focused on to a larger extent in constructionist research (Kafai & Burke, 2015).

4 Methods and data

The methods section of this extended abstract will start with an overview of the research design, before the empirical context and the different phases of the research project are outlined and described. The section will conclude with a discussion of research ethics and quality in research.

4.1 Research design

The main purpose of the study has been to explore the organization of social interaction in students' learning activities, utilizing *focused ethnography* (Knoblauch, 2005, 2013) and *conversation analysis*. However, the project also has been inspired by *design-based research* (Barab & Squire, 2004; Collins, Joseph, & Bielaczyc, 2004; F. Wang & Hannafin, 2005), as learning resources that would fit the target audience needed to be developed and implemented into the classroom to study students' learning activities when designing games.

4.1.1 Focused Ethnography

This research project methodologically can be described as *focused ethnography*.

Ethnography (e.g., Hammersley & Atkinson, 1995) can be defined as “the written description of the social organization, social activities, symbolic and material resources, and interpretive practices characteristic of a particular group of people” (Duranti, 1997, p. 85). This often is characterized by the researcher conducting a prolonged stay in the field, participating in a community, to ensure an insider perspective or emic view (Duranti, 1997).

However, this project differs from that form of ethnography in that it was a focused, short-term project in which data were collected not mainly through written field notes, but through a video camera. As *focused ethnography* (Knoblauch, 2005), a branch of ethnography, it is characterized by short-term field visits conducted at intervals. It is data-intensive in that it produces a large amount of data in a short time frame, often using electronically recorded data, such as video footage. According to Knoblauch (2013), the link between ethnography and video observation is not a coincidence. Considering that both ethnography and video are “observational in a basic sense” (p. 71), they can capture “natural situations” and orient to the social interactions of people in their natural environments.

One of the differences between ethnography in its original sense and focused ethnography is the use of video cameras to capture screen interactions (Knoblauch, 2005). Using video data has become increasingly common within educational research (Derry et al., 2010), offering several advantages. First, video data allow for repeated viewings, including analysis of the

data in slow motion or frame by frame, making it possible to observe details that might not otherwise have been remembered (Knoblauch, 2012). As the data can be viewed again and again, it is possible to view recordings in data sessions during which different researchers might use their specific knowledge in analyzing the material (Jordan & Henderson, 1995; Knoblauch, 2005). As the video data are recorded automatically, the researcher can do other activities in the field than just observe, such as retrieve background data (Knoblauch, 2005). Also, as a video is a temporal sequence of images, it allows for analyzing sequentiality and how social interactions unfold over time (Knoblauch, 2012). Thus, it is well-suited for combining with conversation analysis. However, there are also several challenges to using video technology, both in terms of technical challenges (e.g., Heath et al., 2010; Luff & Heath, 2012) and concerning the presence of the cameras, which will be examined later in this section.

4.1.2 Design-based research

While positioned as focused ethnography, this research project also draws inspiration from *design-based research*, a method that originates from the early 1990s (Reimann, 2011), when Collins (Collins, 1992) and Brown (1992) researched structured ways of implementing innovative design solutions into the classroom. Design-based research is an interdisciplinary approach in which research is carried out in a real-world context (Barab & Squire, 2004; Reimann, 2011) and is defined by F. Wang and Hannafin (2005, pp. 6–7) as “a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories.” Theory generation and a larger understanding of *learning ecology* are desired outcomes, which often include tasks and materials, resources, and tools to be used by the teacher (Cobb, Confrey, DiSessa, Lehrer, & Schauble, 2003).

There are mainly two ways in which this project was inspired by design-based research. First, learning resources were developed specifically for this project and implemented in the classroom. As there were no learning resources that could be used to teach Norwegian 11- and 12-year-olds how to design computer games related to the curriculum -- with a focus on game design, characters, storytelling, and world building -- this had to be developed before data collection started. Second, data collection also followed an iterative process common to design-based research, in which both the observation focus and the role of the researcher

would change throughout the course of data collection (F. Wang & Hannafin, 2005)⁸. This made it natural to be inspired by design-based research guidelines during the different stages of the research project.

However, a significant difference should be noted between design-based research and the aims of this research project. Reimann notes that when conducting design-based research, a main task of the researcher is to “establish that the shifts in students’ learning would not have occurred without the support provided by the instructional design, and that a specific competence has been developed through participation in the specific design experiment” (Reimann, 2011, p. 44). In the present project, however, the main goal is not to establish that students learn by using the learning resources developed, but rather to show *how their learning activities unfold* when game design is introduced into the classroom. However, establishing this understanding of students’ interactions still provides for a greater understanding of the classroom’s learning ecology, such as how students establish norms of participation, students’ use of tools and artifacts, and the role of the teacher in this project (Cobb et al., 2003, p. 9). As the project has many similarities to design-based research, and also is consciously inspired by this methodology, both in the design and implementation phases of the study, this is important to acknowledge.

4.2 The school and the classes

Data collection was conducted at a small, countryside school in the rural part of Eastern Norway. It teaches 6- to 12-year-olds in first through seventh grades. Each grade contains relatively few students. The seventh-grade class had six boys and six girls, and the sixth-grade class has seven boys and three girls.

Before the game design part of the research project started, the students were asked to fill out a short survey regarding their game-related habits (see *Appendix 2* for the questionnaire and *Appendix 3* for results). This was done to get an overview of students’ participation in different activities related to gaming, their experience level creating media content, and their familiarity with different computer-related practices. The descriptions below are based mainly on students’ answers from the questionnaire, but also complemented by observations from data collection.

⁸ This is explored in more detail later in this section.

It should be noted that several factors might have influenced how students chose to answer the questions, such as their identifications as gamers. The questionnaire did not differentiate between what is often called *casual games*, often played on mobile phones or tablets, and console and PC games, which are preferred by players who identify as *hardcore* gamers. An overview of young people's gaming habits is provided in the introduction to this thesis.

4.2.1 Seventh grade

Playing computer games is a common leisure activity among the seventh-graders. Half of the class reported playing games daily, while most of the other students reported playing several times a week. Only one of the students, a girl, said she played less than a few times a month.

The students listed several games that they like to play. *Minecraft* was cited by half the class – four boys and three girls. The football game *FIFA* also was cited by a large portion of the students: three boys and one girl.

While none of the students in this class reported having designed their own computer games, they often used the computer in other ways. Five boys and four girls reported that they used the computer to do homework. While three of the boys used the computer to talk to other people about games, no girls cited such activity. However, three of the girls said they liked to make up their own stories in their spare time, an activity none of the boys cited.

4.2.2 Sixth grade

In the sixth-grade class, half the students reported playing video games daily, while the other half reported playing games a couple of times a week. *Minecraft* was popular in this class as well, with two boys and two girls out of the class of 10 citing it. Two of the boys cited *FIFA* as a favorite as well, like the seventh-graders. Two of the boys reported playing *GTA*, *GTA 5*, or other games in this series.

In this class, one of the boys answered the question on whether he had ever designed his own computer game with the reply “Yes, many times.” However, while this was an open-ended question that asked for elaboration with “yes” answers, the student did not provide any information on how he did this or the tools he used. During data collection, it became clear that he used a version of *RPG Maker*, the same game-design software used in this research project.

Five of the seven boys, and one of the three girls reported using the computer to talk to others about games and to learn new things in general. Four of the boys and two of the girls reported using the computer to do homework.

4.3 Data and execution of the research project

The following section describes the different phases of the research project, from the preliminary phases, in which the initial framework was developed and contact was established with participants, to the final data-collection process.

The tables summarize the data corpus and the phases of the research project, which will be examined and referenced in this section. *Table 1* shows the different data sources that were utilized for the project. *Table 2* shows how the research project proceeded in terms of developing learning resources, preparing and conducting data collection, and organizing, coding, and transcribing data. The information presented in the tables will be examined in the text following the tables.

Type of data	Length of time/data produced
Video data	Video data from the three-member target group, front/interactions: 30 hours* (5 hours x 6 days) Screen data target group: 30 hours (same as front/interactions data) Hand-held camera: 15 hours** In total: 75 hours
Written data	Observation notes
Finished computer games	Seventh grade, "European explorers": 4 Seventh grade, "The Renaissance": 4 Sixth grade, "The Middle Ages": 4 Sixth grade, "The Viking Age": 4 Total: 16 games

Table 1: Data corpus

* The cameras usually were left on during the shorter breaks, as students often were inside, but turned off during longer breaks. Interaction data from target groups are therefore estimated to total roughly five hours per day.

** The hand-held camera was turned off during breaks, but it often kept rolling after it was put down when students asked for assistance.

Phase	Activity	Time
Developing learning resources	- Researching relevant topics - Creating game design challenges - Designing webpage - Creating video tutorials and written tutorials	Fall 2013 - Fall 2014
Gaining entry and access to the field	- First contact with the principal - First meeting with the teachers	Fall 2014
Initial observations	- First meeting with the students - Initial observations	October 2014
First phase of video-data collection	- Two-day video observation sessions conducted with sixth- and seventh-grade students (four days total)	November 2014
Second phase of video-data collection	- One-day video observation sessions conducted with sixth- and seventh-grade students (two days total)	January 2015
Organizing data and transcription and analysis of data	- Coding, analyzing, and transcribing the video data, with support from observation notes and students' computer games	Spring 2015 – Fall 2017

Table 2: Conducting the research project

4.3.1 Developing learning resources

Before data collection started, a webpage was developed with video tutorials, written tutorials, and six different challenges for students to complete when working on designing computer games in the classroom (*Figure 1*). The learning resources were developed by the author, informed by the author's background in game design and development.

Within design-based research, bringing new forms of learning into the classroom to study them is common (Cobb et al., 2003), but in this case, creating the learning resources mainly was pragmatic, as there were no other learning resources that could be used. The challenges included practical instructions on how to use the tools, as well as game design advice and best practices for game designers (e.g., Fullerton, 2008; Rogers, 2014; Schell, 2008) that were tailored to fit the target audience. Each step of the game design process had a subpage on the website related to the following topics: 1) Designing the story and the main character for a computer game; 2) Creating a game world; 3) Creating *non-player characters* (NPCs) for a

game world; 4) Adding dialogue to a game; 5) Adding events and game mechanics to a game; and 6) Playtesting a game. Extra challenges in terms of refining and developing games were added if any of the groups finished all the other tasks early.

For each challenge, the students would get a brief introduction with pointers on how the tasks should be solved. The students then would read a tutorial or view an instruction video on how to tackle and resolve the challenges with the provided tool to be used in the game design process, *RPG Maker VX Ace*.

The webpage was developed using the open-source content-management system *Drupal* (Drupal, 2013), while the instruction videos were recorded using the screen-capturing system *Screencast-O-Matic* (Screencast-O-Matic, 2016). All written tutorials were available for download as a PDF file from the webpage. The videos also were burned onto several DVDs, and the challenges and written tutorials were printed out and brought to the classroom as a precaution in case the network connection in the classroom failed.

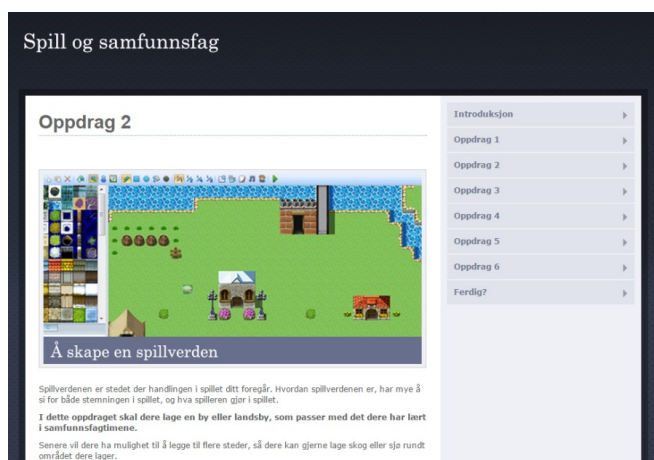


Figure 1: Screenshot from the webpage developed for the students to learn the tool, and to learn the different stages of the game design process.

The software, *RPG Maker VX* (Enterbrain, 2011), was created with the aim of being a tool for letting everyone create games within the genre of *role-playing games* (RPGs), which are characterized by a strong emphasis on storytelling, exploring the game world, and by often including many – often complex – game characters. As *RPG Maker* includes little programming, and is focused on storytelling, character development, world building, and

game design, this tool was considered the best option for collecting data to achieve the aim of this research project. It also made it possible to cover different stages of the computer-game development process in a relatively short time frame.

4.3.2 Gaining entry and access to the field

The school that was chosen had several traits that would be beneficial for the research project: The small classes made it easier to conduct video-based research and capture student interactions, and the school had previously shown interest in game-oriented learning-research projects. The school principal was contacted via e-mail and asked if any of the teachers from fifth grade to seventh grade would be interested in participating in the research project. He then forwarded the request to two of the teachers, who responded directly through e-mail. A meeting was set up at the school between the teachers and the researcher, in which the teachers were given more information about the project and could ask questions. During this meeting, the teachers decided they wanted to participate in the project.

While *entry* was gained to the field by formally being allowed to conduct the research project at the school, it also was necessary to gain *access* to get good data, i.e., study participants must approve observation of activities and interactions without censorship, which involves gaining participants' trust (Aarsand, 2016). The teachers and students functioned as *gatekeepers*, who were able to grant or deny access to the field (Hammersley & Atkinson, 1995; Silverman, 2014). When trying to obtain access, the first impression that the researcher gives might be crucial in determining whether the researcher will gain access and what kind of data he or she can obtain (Silverman, 2014). During the first meeting with the teachers, listening to their concerns and preferences was the main focus. The teachers emphasized two points: First, as the teachers and students already had a very tight schedule, data collection should be done when students were not too busy, e.g., just before Christmas would have been a bad time. Second, it was important to teachers that this would be a *learning* opportunity that dovetailed with the ongoing curricula. Thus, it was decided that data would be collected when students were working on the following topics, which also seemed fit as topics for computer games: *the Middle Ages*, *the Renaissance*, *European explorers*, and *the Viking Age*. This was based on social-studies competency aims related to *explaining a key topic* from time periods, including the Viking Age, *elaborating on central characteristics of epochs*, including the Middle Ages and the Renaissance, as well as to "present trips of discovery and exploration made by Europeans" (Utdanningsdirektoratet, 2013a, p. 8. See Appendix 5 for details). The decisions made here exemplify how the initial meeting might change the research plans (see

e.g., Hammersley & Atkinson, 1995), as the original plan was to focus on the topic of *global awareness*. The teachers were invited to review the learning resources that were developed, but did not suggest any changes to the material.

Before the observations started, the research project's plan was submitted to the *Norwegian Social Science Data Service* (NSD: Norsk samfunnsvitenskapelig datatjeneste, 2017), which approved the project, and information letters and consent forms were sent to the principal, teachers, parents, and students. The information letters (see *Appendix I*) contained information about the project and how data would be collected, stored, and handled to ensure that participants would remain anonymous and that collected data would remain confidential. It was emphasized that participation in the project was completely voluntary, and that the participants could withdraw from the project at any time. As the students were under 15 years old, their parents had to sign the consent forms. In addition, the students received information letters that were tailored for their age group. This was done to ensure free and informed consent of participation in the research project, as children should be seen as individual subjects who should be allowed to express their own opinions regarding participation (Norwegian National Research Ethics Committees, 2016). Ethical reflections and dilemmas will be further explored in the *Ethics* section.

4.3.3 Initial observations

The first observation session started a month after the meeting with teachers, which also was when the project was introduced to the students, who were able to ask questions about the project. The researcher asked students about their preferred computer games and gaming habits, which was a way to get to know the class better so that the learning resources for the project could be adjusted.

As the students would be designing computer games based on the historical topics they were currently studying in their social studies classes, initial observations were conducted while the class was introduced to their new topic: *European explorers* for the seventh-grade class, focusing on Ferdinand Magellan, Vasco da Gama, Marco Polo, and Christopher Columbus, and the *Middle Ages* for the sixth-grade class.

Notes were taken regarding group dynamics and the organization of the classroom, and an audio recorder was used to record the lessons.

4.3.4 Data collection

The next phase was to collect video data from the students' game design process. This was done in two phases, with one phase done in late November 2014 and the other in late January 2015.

The project was first conducted in the seventh-grade class. This class of 12 was divided into four groups, with three students per group. The teacher assigned the four groupings, which contained the same student combinations as the study groups that existed before the project. Each student group had then prepared a presentation on one of the European explorers, who then were featured in the games that these groups created, respectively. The sixth-grade class created games tied to the Middle Ages and were divided into groups by the teacher. As the class consisted of 10 students, the students worked in two groups of three and two groups that worked in pairs.

The students first were asked to fill out a short questionnaire regarding their background and experience with computers and game design. They then were instructed to open the previously developed instruction webpage. The URL was written on the blackboard, and they started by reading the introduction, which would guide the students in a step-by-step game design process. The students would work on the game design that day and the whole next day. One three-person group was chosen as the target group for data collection, and its interactions, including activity on the computer screen, would be filmed continuously during both phases of data collection. The group that was to be focused on was decided by the teacher, who was encouraged by the researcher to ensure that the chosen group would work well together and had good communication skills.

At the end of the second day, the students would engage in a *playtest* as part of the game design process. A playtest is a common part of designing a game and consists of letting the target audience play the game your team has developed, often being instructed to think aloud while playing or answering short questions about the game experience afterward (e.g., Fullerton, 2008). The students were instructed to first discuss what they wanted feedback on concerning the game they had been making. The students then would rotate from terminal to terminal to play as many of the other student groups' games as possible. One student from each team would remain at his or her team's terminal to observe and take notes during the playtest, as well as instruct students on how to play the game, as needed.

The second phase of data collection was conducted approximately two months after the first phase, with students working in the same groups as before. The seventh-grade students made games about the *Renaissance*, which they had been working on for the last couple of weeks. The sixth-grade students had been studying the *Viking Age* and made games about this theme in the same groups as before. The students only worked for one day on game design, as they already knew the process and software. As in the first phase, a playtest was conducted at the end of the day.

Three video cameras were used for data collection. Two cameras focused on the target group for data collection, with one camera placed on a tripod focusing on students' computer screens to capture screen interactions and one camera placed in front of the students to record their expressions, body language, social interactions, computer use, and dialogue. This camera was placed to frame a mid-shot, which is a static shot in which the interactions of two or three participants normally are captured (Luff & Heath, 2012, p. 262). To address the common problem of lack of synchronization between cameras (e.g., Martinez-Monés, Harrer, & Dimitriadis, 2011), it was ensured that the time-stamp function on the cameras was updated and turned on.

The third camera originally was intended to be stationary in the corner, to record interactions, but due to the classroom's layout and the placement of students, it was not possible to get a good overview of the classroom that included all the groups, not just the main focus group, and an overview of social interactions. Therefore, a handheld camera was used instead, making it possible to record all groups' interactions and carrying the camera while interacting with students (e.g., Sparman, 2005).

While ethical dilemmas regarding the use of video cameras will be discussed in the *Ethics* section, some technical challenges encountered will be mentioned here. First, it sometimes was difficult to get good quality recordings of what happened on the computer screens of the target groups, as the students often would move around on their chairs, move the computer, or walk around. One solution considered was screen-capturing software, but this would have caused the computers and game design software to run slower. While not ideal, the problem was addressed by using a tall tripod and putting the camera as high up as possible, so that the students could not stand in front of the camera. The camera also was checked regularly and adjusted so that the interactions captured made for high-quality footage.

A second challenge concerned the rather large handheld camera used during the first phase of data collection; it sometimes seemed to distract the students and was challenging to use while interacting with students. The small, handheld camera used in the second phase of data collection seemed to work better.

Third, many power cords were running across the floor, and students, teachers, and researchers had to pay attention to avoid tripping. Taping the power cords to the floor with duct tape could have lessened the inconvenience (Heath et al., 2010).

4.3.4.1 Classroom layout

Figures 2 and 3 depict the layouts of the classrooms where data collection was conducted.



Figure 2: The layout of the seventh-grade classroom on the first and second days of data collection (left), and on the third day of data collection (right).



Figure 3: The layout of the sixth-grade classroom on the first and second days of data collection (left), and on the third day of data collection (right).

The classrooms were equipped with artifacts commonly seen in classrooms, such as blackboards, textbooks, and maps (e.g., Sørensen, 2009). For the sixth-grade class, a large world map was hanging on the wall next to the table where the target group was working. The classrooms had corkboards where students would hang objects made in their classes, such as posters and timelines. Along the walls in the back of the classroom, several bookshelves were provided, where students store their books and notepads. Before data collection started, the classroom was reorganized to facilitate students working in dyads or groups of three. The placement of the desks, computers, and cameras is depicted above (*Figures 2 and 3*), with the blackboard and teacher's desk at the top. The entrance door is pictured on the right side of the layout diagram.

The camera to the left of *Table A* recorded the computer screen of the target group, while the camera to the right of *Table A* recorded their body language, interactions, and dialogue. An audio recorder was placed on the same table. *Table E* in the seventh-grade classroom and *Table C* in the sixth-grade classroom functioned as the researcher's observation posts during quieter moments and also was where the handheld camera was put when not in use. Details in the room that did not seem relevant (a sink, extra desks, etc.) are not included in the diagram.

4.3.5 Additional data

In addition to the video data, observation notes were taken throughout the process, especially to focus on significant events, with the date and time of the events noted. These notes helped

in the later organization of the data and contributed to forming the *sensitizing concepts* (Bowen, 2006) discussed in the *Analysis* section. Also, it was a useful way to reduce the researcher's influence on the interactions, as the researcher is seen as "doing something" instead of just observing the interactions (Heath et al., 2010). This, however, did not turn out to be a problem, as there was seldom time for just observing, which will be examined in a later section. The computer games that students made were collected afterward, and they functioned as supplements to the video data when analyzing the material (see *Appendix 4* for descriptions of students' computer games and *Figure 4* for an example screenshot from one of the student group's games).



Figure 4: Screenshot from one of the seventh-grade student group's computer games about the Renaissance.

4.4 Organizing and analyzing data

After the data were collected, they were organized in a *content log*, or an overview of the events from the video footage, together with timestamps marking when the events occurred (Derry et al., 2010, p. 18). This was supported by the notes taken during data collection.

When organizing the data, *sensitizing concepts* (Bowen, 2006) were utilized. Sensitizing concepts "draw attention to important features of social interaction and provide guidelines for research in specific settings" (Bowen, 2006, p. 3). Sensitizing concepts need not have clear definitions and attributes for coding and categorization, but "gives the user a general sense of reference and guidance in approaching empirical instances. Whereas definitive concepts provide prescriptions of what to see, sensitizing concepts merely suggest directions along which to look" (Blumer, 1954, p. 7). The sensitizing concepts are based on theoretical underpinnings, as well as empirical data. While CA is often considered to be a strongly

inductive approach (Ten Have, 2007), the process of analysis in this project followed an *abductive* approach, which “starts from an empirical basis, just like induction, but does not reject theoretical preconceptions” (Alvesson & Sköldberg, 2009, p. 4), in which sensitizing concepts from the theoretical foundation were utilized.

This initial analysis process started by organizing the material in the content log, inspired by Derry et al. (2010). The data were organized in three rubrics (*Figure 5*). The first column identified the tape or videoclip based on how it was labeled, as well as initial thoughts, observations, and analysis if important events occurred. The second column showed the timecode of the current event/sequence, while the third column included a short, narrative summary (Derry et al., 2010) that explained what occurred during the sequence, usually followed by a very rough transcription of dialogue deemed important. The event then would be labelled with keywords based on the sensitizing concepts, such as school culture, identity, playful talk, resources, and the teacher’s role.

Identifier of tape/ video clip	Timestamp code	Narrative summary of event	
TREDJE DEL (Dag 4, tape 2, klipp 103)	02:30	Katherine helps Alvin and Mathias making a story that fits the theme Helps the students find information for the game on Wikipedia Katherine: "Han kan ha vært en slags fosterfar for Olav () Thorjell kan dere bruke." <i>The role of the teacher</i> <i>Resources</i> <i>Home culture vs. school culture</i>	← Keywords based on sensitizing concepts
Analysis: This is VERY interesting in terms of home culture vs. school culture, the role of the teacher, and perceiving something that is fun as different from learning.	04:55	Katherine: "Stor D, stor D" Alvin: «Det er ikke skole nå!» Katherine: «Jo det er skole, dette er så absolutt skole!» Alvin: «Ja... jeg vet det.» Katherine: «Og hvis vi skal fortsette med dette her, så skal det være innenfor de rammene som jeg har satt opp.»	← Rough transcription (in Norwegian)

↑
Initial thoughts/
beginning analysis

Figure 5: Screenshot from the content log

In the coding process, *Microsoft Word* and *VLC Media Player* were used. Often, tools like *NVIVO* or *Atlas TI* are used for this process, but *Microsoft Word* and *VLC Media Player* were found to be more suited for this purpose after attempts were made to use the others. This is partly due to challenges encountered when using such large amounts of video data with this software, but mostly because *Word* and *VLC* proved to be a dynamic option, in which rough

transcriptions of dialogue, keywords, narrative summaries, and the researcher's comments could be combined easily. This is well-suited for the inductive nature of CA (e.g., Ten Have, 2007), as the process of organizing data was not confined by any technical limitations or other aspects of the software. Instead, the chosen tools proved to work satisfactorily for the purpose. Word had the needed options for creating tables and a search function, and VLC had the options for playing multiple video streams simultaneously (video and screen), as was done when working with video data from the target group, in which two cameras were used at the same time. VLC has a feature that makes it possible to display the camera's timestamp code, which made it easier to synchronize the video data from the two cameras. To fine-tune the synchronization, dialogue and gestures were used as a guide.

4.4.1 Transcribing video material

When transcribing the video data, several points had to be considered. Hammersley (2010, p. 556) notes that the researcher needs to decide how much to transcribe, how recorded talk should be represented (e.g., should pitch, pace, and dialects be represented?), whether pauses should be indicated, whether gazes should be marked, and how to indicate who is currently talking. Transcribing is part of the analytical process (Silverman, 2014), which is a selective process that reflects the researcher's goals (Ochs, 1979, p. 44).

As dialogue and social interaction were the main analytical units in this research project, this had to be reflected in how the data were transcribed. Transcript conventions from Jeffersonian Transcript Notation (Jefferson, 2004) were used (*see Table 3*). Elements that received particular attention included pauses, overlapping speech, non-verbal activity, rises and drops in intonation, increased or reduced speed in talking, emphasized talk, and laughing while talking.

Transcription key		
Adapted from Jefferson (2004)		
(.)	Full stop inside brackets:	Micropause of no significant length
(0.2)	Number inside brackets:	Timed pause
[]	Square brackets:	Overlapping speech
((int))	Double brackets:	Description of non-verbal activity
(xxx)	Bracketed xxx:	Talk that was too unclear to transcribe
(word)	Text within brackets:	Unclear talk/doubtful transcription
?	Question mark:	Inquiring intonation
↑	Upward arrow:	Rise in intonation
↓	Downward arrow:	Drop in intonation
> <	<i>Greater than/less than</i> sign:	Talk with increased speed
< >	<i>Less than/greater than</i> sign:	Talk with decreased speed
::	Colons:	Elongated speech
(h)	Bracketed h:	Laugh within the talk
<u>Word</u>	Underlined:	Emphasized talk
=	Equal sign:	Continuation of talk
°word°	Degree sign:	Quiet speech

Table 3: Transcription key

When using analytical concepts from conversation analysis, Jeffersonian Transcript Notation (2004) is commonly used, as it can capture the complexity of verbal language. However, when transcribing visual data, there is no standard way of doing this, although it is common to start with talk and add visual elements that are important for the analyses (Ten Have, 2007). Bezemer & Mavers (2011) have noted that the way multimodal interaction is transcribed reflects the “differences in the professional practices and the rhetorical and analytical purposes of their makers” (p. 191). Researchers need to be aware of choices in *framing*, the context of use that the transcript is set in; *selecting*, what the researcher selects to use from a larger data corpus; and *highlighting*, what the researcher chooses to be the focus of the transcription, although perhaps this was not the main focus of the interactions (Bezemer & Mavers, 2011, pp. 194–195).

The material was transcribed in the original language, Norwegian, in participants’ original dialect. Students’ names were changed to pseudonyms when processing the data. After the transcription was conducted, the transcripts were translated into English for use in journal articles. This was sometimes challenging, as the students often used idioms and expressions

that are difficult to translate. Here, a balance was sought between translating the *meaning* of the sentence, as well as the *wording* used by students.

As main areas of interest in the data were talk in interaction and the use of artifacts, drawings were sometimes added to the transcriptions, showing participants' orientation to each other and toward the artifacts. These were placed in the transcripts, along with dialogue, with lines indicating the occurrences in relation to verbal interactions (*Figure 6*). While ensuring anonymity is vital, visual images make it harder to keep the participants anonymous, and this presents an ethical challenge (e.g., Sparrman, 2005). To ensure participants' anonymity, screenshots from the video material were first imported into *Adobe Photoshop*, in which a filter was used to help trace the edges. Afterward, a *Wacom* tablet was used to redraw the picture by hand to preserve participants' anonymity.

Sometimes, screenshots of the data were included in the articles (*Figure 7*). This was done to make this part of the data accessible to readers and make it possible for readers to verify the analysis (Aarsand, 2016).

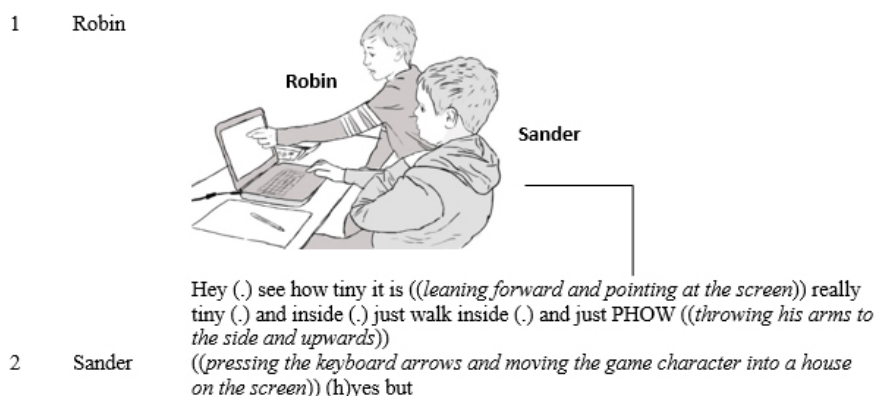


Figure 6: Drawings of participants within the transcript

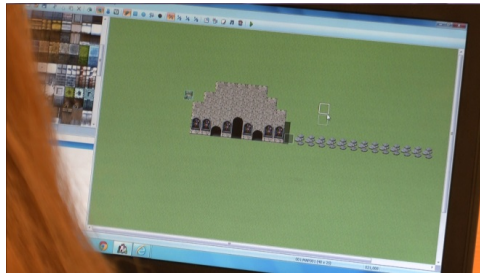


Figure 7: Screenshots of screen data

4.4.2 Selecting episodes for in-depth analysis

The episodes selected for in-depth analysis were based on recurring patterns in the data. For the articles, this includes episodes related to tensions between school and leisure time, knowledge building with a focus on guided participation, and the use of artifacts. The episodes selected best showed different aspects of these patterns, but were part of patterns seen in both classes and at different phases in the game design process. The following illustrations show what day the data collection of the episodes presented in the articles occurred, in which article they were presented, and the key themes for each episode.

Sixth grade: When the excerpts occurred



Day 1	Day 2	Day 3
<p>The Crusader's Travels (Article 3. Artifacts, embodiment, narrative)</p> 	<p>But this isn't school (Article 1. Tensions, activity frames)</p>	<p>Translate using Google (Article 2. Guided participation, artifacts, agency)</p> 

Figure 8: The episodes presented in the articles from the sixth-grade class, and on what day of data collection they occurred.

Seventh grade: When the excerpts occurred







Day 1	Day 3
<p>Boats like Assassin's Creed (Article 1. Joint focus of attention, embodied interaction, game references)</p> 	<p>It is my character! (Article 1. Tensions, identity)</p> 
<p>Was Magellan a soldier? (Article 2. Joint construction of knowledge, problem solving, artifacts)</p> 	<p>See how tiny it is (Article 1. Tensions, activity frames)</p> 
<p>Creating Magellan (Article 3. Artifacts, character development)</p>	<p>Leonardo da Vinci's teacher? (Article 2. Artifacts, problem solving, facts vs. fiction)</p> 
	<p>Which church? (Article 3. Artifacts, problem solving)</p> 

Figure 9: The episodes presented in the articles from the seventh-grade class, and on what day of data collection they occurred.

Figure 8 shows episodes presented in the articles for the sixth-grade class, taken from all three days when data was collected in this class. In Figure 9, Day 2 is not included, as none of the episodes selected in the articles for the seventh-grade class occurred on the second day of data collection. However, the selected episodes were based on recurring patterns in the data. For example, as seen here, the tensions that were the focus of Article 1 were seen in both the sixth- and seventh-grade classes, and in both phases of data collection.

4.4.3 Analysis

Based on the video data and transcripts, the data were analyzed, with an emphasis on how social practices can be seen through participants' visible interactions and dialogue. Based on the project's theoretical foundation, it was emphasized in the analysis that interactions are situated in and shaped by the historic, cultural, and material contexts in which they occur, considering the use of objects and artifacts (e.g., C. Goodwin, 2000).

As noted by Ten Have (2007), CA “involves both an ‘inductive’ search for patterns of interaction and an explication of the emic logic that provides for their significance” (p. 120). Analyzing data from CA might involve steps such as looking for *turn-taking*, focusing on how turns, pauses, and overlaps are constructed, especially noting “disturbances” in the turn-taking system; looking for sequences in the episode, such as *adjacency pairs*; and looking for *repair* occurrences (Ten Have, 2007, p. 121). In the present research project, analytical emphasis was put on turn-taking, sequentiality, and *proof procedure*, emphasizing participants’ own orientation to social interactions, and grounding the analyses in situated talk and action. This will be explored further.

Turn-taking, a “basic form of organization for conversation” (Sacks et al., 1974, p. 700), is related to the central concept of *sequentiality* and how participants display to each other how they understand the talk occurring during another person’s turn (Sacks et al., 1974). By analyzing the organization of the turn-taking, the researcher may see how participants display their own understanding of the interaction, which is called *proof procedure*, a fundamental component of CA, explained by Sacks, Schegloff, and Jefferson the following way:

“Since it is the parties’ understandings of prior turns’ talk that is relevant to their construction of next turns, it is THEIR understandings that are wanted for analysis. The display of those understandings in the talk of subsequent turns affords both a resource for the analysis of prior turns and a proof procedure for professional analyses of prior turns—resources intrinsic to the data themselves” (Sacks et al., 1974, p. 729).

What is emphasized here – the analytical focus on what is *relevant to the participants* in their situated social interactions – was a main consideration when analyzing the data (Francis & Hester, 2004; Sacks et al., 1974). Thus, what participants were oriented to became central, as well as how their actions were shaped by their understanding of the current situation – emphasizing the *situatedness of talk and action* (Francis & Hester, 2004, p. 31). Also, describing *what actually happens* in social interactions is emphasized, as well as making the analyses available for inspection by readers (e.g., Francis & Hester, 2004, p. 31). As the analyses should be founded on the talk and actions presented in the data, this also entails avoiding attempts to explain speakers’ intentions, thoughts, or feelings (Francis & Hester, 2004; Tholander & Cekaite, 2009).

In this research project, data often were analyzed in data sessions with researchers from different backgrounds. This is examined under *Quality in research* in the next section.

4.5 Ethical dilemmas and considerations

For Ph.D. students, ethical guidelines such as the ones provided by the Norwegian National Research Ethics Committees (2014) are often used as a checklist of what to do and not to do regarding research ethics. However, these guidelines are not fixed rules, but should be used as a tool for the researcher's reflexivity (Aarsand & Forsberg, 2009). Several of the dilemmas that were encountered during data collection did not have a straightforward answer based on the ethics guidelines. This section will explore some of the ethical dilemmas encountered in the research project.

4.5.1 Ethical dilemmas of being a researcher in a classroom

An important aspect of ethical considerations is what Tracy (2010, p. 847) refers to as *relational ethics*, "an ethical self-consciousness in which researchers are mindful of their character, actions, and consequences on others." The original intentions regarding the role of the researcher were challenged in the data-collection process, as the researcher's role was intended to be an *observer* who does not interfere with what goes on in the classroom, except when students encountered technical difficulties. The students were instructed to ask the teacher if they had academic questions related to the social studies theme. However, in practice, this was not possible. The teachers did not know how to use the software, and while the students had access to detailed videos and step-by-step instructions, this was not sufficient. The problems that students had often were related to other aspects than what was explained in the videos and tutorials. In addition, the students often used the learning resources in a different way than intended, using trial, error, and exploration, instead of going through the resources step by step. To not interrupt the students' flow and game design progression, the students were aided when they asked questions, changing the role of the researcher from an *observer* to a *participant observer*. This had noteworthy implications: While an observer always has some impact on the data that's produced, the level of impact will be determined by the researcher's level of involvement.

When conducting *participant observational studies*, it is important to gain access to the field in a good way, build participants' trust, and find a suitable role in the field (L. Cohen, Manion, & Morrison, 2013). Also, in design-based research, close collaboration with participants is an absolute necessity (F. Wang & Hannafin, 2005). This includes establishing mutual trust between participants and researchers. It is important that all participants, at all times, know what is expected of them from the other participants. As the role of the

researcher was not clearly defined, this created some challenges in terms of the relations with *teachers* and *students*.

The teachers saw the students' *learning opportunities* as the most important. To them, this project was an opportunity for the students to learn as much as possible about the social-studies topics they were currently studying, and they expected that the researcher would make sure that students' learning outcomes would be ensured. This proved a challenge, as the researcher's aim was to be an observer, minimizing interactions as much as possible. Also, the researcher's role with teachers *other* than the two who were asked to be involved with the project proved to be a challenge. Often, the teachers at the school would teach each other's classes and would, therefore, be in the classroom when students were designing computer games. Some of these teachers did not seem sure about what their role would be, and two of the teachers even apologized for not knowing about the software and being unable to help students with the technical aspects of the game design process. In these cases, it was important to reassure these teachers that they were not expected to know the software or the game design process, but that it would be a large help and highly appreciated if they were in the classroom, talking to the students and helping them with the historical content on which they were working.

The researcher's identity, as perceived by the *students*, also posed challenges, such as when they saw the researcher as a *teacher*. This happened especially with the sixth-grade students when none of the teachers was present. During these times, the students would ask the researcher for permission to do such things as go to the bathroom, or stay inside to work instead of going outside during recess. This was a problem, as the researcher's role not only changed from observer to participant observer in the game design process, but also to a makeshift teacher, a role the researcher had not prepared to take. Therefore, it was difficult to figure out how to handle these situations in ways that wouldn't cause any problems. As there were usually teachers present in the classroom, this was not a frequent issue and was dealt with by finding pragmatic solutions that disrupted students' work as little as possible, while considering how the teachers would have handled the situation.

In terms of getting access to the data, it should be noted that while Corsaro & Molinari (2000) noted that being seen by children as a less competent adult made it easier to be accepted by children, the opposite was true in this project. With a background in game design and game studies, the researcher was, to a larger extent, seen as a *competent adult* who was expected to

understand references made about games such as *Minecraft*, *Pokémon*, *FIFA*, *Grand Theft Auto*, and *Assassin's Creed*. While this might have had implications for the interactions between students and the researcher, the data used in this research project is mainly video recordings of students working together in groups, interacting with each other and sometimes with the teacher. Thus, while this is important to note, it was not considered to be problematic.

4.5.2 Ethical considerations of using video cameras

A question that must be considered when conducting video-based research is *how people are affected by having a camera present*. According to the experiences of Jordan and Henderson (1995), people quickly become accustomed to the presence of the camera – especially if video is recorded by a camera without an operator. Children and youths today are also part of a participatory culture in which digital tools such as video-recording devices are part of their everyday lives (Jenkins et al., 2009). Also, the use of small, handheld cameras can reduce interference with the research environment (Pink, 2007). Still, to minimize the impact of the camera, the students were allowed to look at the cameras and have fun with some of the equipment, such as looking at what was being filmed through the camera display and listening to the sound being recorded through the headset used to check sound quality.

Most of the time during the data-collection process, the students seemed to forget that cameras were present. However, they sometimes were reminded, such as when students would ask whether the cameras were on when they entered the classroom, or suddenly became embarrassed after engaging in playful talk or actions, such as singing or dancing, remembering that this would be recorded too. The teachers sometimes also commented that they forgot that the cameras were there. It should be noted that the target group was asked several times if they remained OK with being filmed, and they always said it was OK with them. Some students even loved interacting with the cameras, having fun talking to the cameras or pretending to be recording a private *video blog*. These factors indicate that the students were not bothered by having cameras present.

The students mostly would play with the cameras before class started or during recess, or at the end of the day, when they were getting tired of sitting in front of a computer screen. This is consistent with the experiences of other video researchers, who have noted that participants mostly react to the camera at the beginning of an activity or during breaks (Heath et al., 2010).

4.5.3 Exiting ethics

A point that should be noted is related to *exiting ethics* -- the ethics that apply after the researcher has finished data collection -- concerning how the researcher leaves the field and disseminates the results (Tracy, 2010). Ensuring participants' anonymity in the dissemination of results has been emphasized and described in an earlier section. However, a challenge arose as the participants very much wanted to see clips of the video material and asked about this several times during data collection. As the data should be kept safe, the data were kept on an external hard drive in a locked cabinet in a locked office, following NSD protocols (NSD: Norsk samfunnsvitenskapelig datatjeneste, 2017). If students were to receive a video, they would be in control of part of the data. Therefore, the teachers were asked whether they would prefer to get one DVD that the class could watch together, or if they wanted one DVD for each participant. As they would prefer one DVD for each participant, four-minute videos with short video clips for both grades' classes were put together, showing when students were having a good time, in addition to short recorded videos from the students' finished computer games. The ethical guidelines concerning returning some benefit to participants (Norwegian National Research Ethics Committees, 2014), as well as respecting participants' wishes, were taken seriously. However, only video clips that were not deemed harmful if viewed by others were included, and the name of the school was not disclosed anywhere in the clips.

4.5.4 Presenting the data

Ethical guidelines are also concerned with how data are *presented* -- not only in terms of anonymity, but also to ensure that participants are not portrayed in a context that is not ethically sound (Norwegian National Research Ethics Committees, 2016). In addition, honesty and transparency are important guidelines (Norwegian National Research Ethics Committees, 2014). These points are important to be aware of when presenting data related to educational technology.

Selwyn (2016) has noted that the way educational technology is talked about often is enthusiastic and exaggerated, and that researchers within this field often choose to "tell essentially optimistic stories of digital technology and media – highlighting what could (and what should) be happening in educational settings" (Selwyn, 2011, p. 211). Many researchers of educational technology do have strong personal beliefs in the tools and technologies being researched, and they are often too close to the technology to be able to "make the familiar strange" (Selwyn, 2012, pp. 214–215). These are valid points that should be noted in relation

to this thesis, as this project was conducted by a researcher with a background in computer-game design and game-based learning.

Within qualitative research, the researcher is considered to be the primary instrument of data collection and analysis (Merriam, 2009), and *self-reflexivity*, or being honest and authentic about who one is as a researcher (Tracy, 2010, p. 842), is of vital importance. When being self-reflexive, a researcher should be honest and open about his or her strengths and shortcomings (Tracy, 2010). The earlier discussion on the ethical dilemmas of being a researcher in the classroom explained how a background in and familiarity with games could influence interactions with study participants. A background in *serious game design* and a positive attitude toward both games for education and games in general were part of the initial motivation for conducting the research project. However, the focus throughout the research project has been on detailed study of participant interactions to unpack *what actually happens* when game design is introduced into the classroom. Adopting a nuanced view of the benefits and challenges of game-based learning is vital to advancing the field. The goal is for this to be reflected in the articles in this thesis, focusing on patterns in the data that show both the challenges and possibilities of classroom game design.

4.5.5 Quality in research

An important criterion for research ethics is that the research is *high quality* (Norwegian National Research Ethics Committees, 2014). Common criteria for research include the terms *reliability*, or the “fit between what the researchers record as data and what actually occurs in the natural setting that is being researched” (Cohen, Manion, & Morrison, 2013, p. 202), and *validity*, i.e., the honesty of the researcher, the richness of the data, the way the researcher approaches the participants, and the researcher’s objectivity (L. Cohen et al., 2013). However, due to the nature of qualitative research, Tracy (2010) has argued for a different set of markers of quality in qualitative research: *worthy topic*, *rich rigor*, *sincerity*, *credibility*, *resonance*, *significant contribution*, *ethics*, and *meaningful coherence*. While most of these topics have been addressed elsewhere in this extended abstract, the topics of *credibility* and *resonance*, including *generalization*, will be examined here.

4.5.5.1 Credibility

Credibility, according to Tracy (2010, p. 842), refers to the “trustworthiness, verisimilitude, and plausibility of the research findings,” which, in qualitative research, is gained through thick descriptions, crystallization or triangulation, multivocality, and partiality (pp. 842 – 843). *Thick descriptions* (e.g., Cunliffe, 2010) were a key to achieving credibility in the

present research project. As Tracy (2010) writes, researchers should *show* instead of *tell*, meaning they should be accurate and provide enough details so that readers can reach their own conclusions as to what is going on in the field. This also was a reason for including relatively long transcripts with the articles.

While several methods can be used to ensure credibility, including *triangulation* and *member reflections* (Tracy, 2010), the main focus here is *crystallization*. This is less rigid than triangulation and refers to collecting multiple types of data using various methods and theoretical frameworks, as well as getting input from different researchers, with the goal of getting a more complex and in-depth understanding of what is being researched (Tracy, 2010). As explained in earlier sections, this project draws on different, but compatible, theoretical frameworks and methodologies. Just as important, however, is receiving input from and having discussions with researchers from several different fields, providing a variety of perspectives. The data and ideas in this thesis have been presented in various forms to various researchers, including the National Graduate School in Education (NATED) (UiO: Faculty of Educational Sciences, 2016). Being a member of the research group *Studies in Pedagogical Practices (SiPP)* (NTNU: Department of Education and Livelong Learning, 2017) has provided many opportunities for discussions about data and getting feedback on article drafts, with the *Child and Youth Seminar* and the *Discourse Seminar* being important arenas. Researchers from different departments and faculties have participated in these seminars.

During the course of this Ph.D. project, data have been presented at several conferences: *Media Education Futures* in Tampere, Finland (2014); the *ecoMEDIA Conference* in Hamar, Norway (2014); the *European Conference on Games Based Learning (ECGBL)* in Steinkjer, Norway (2015), where a paper was presented and published (Oygardslia, 2015a); and the *International Conference on Interactive Digital Storytelling (ICIDS)* in Copenhagen, Denmark (2015), which included a poster paper published at the conference proceedings (Oygardslia, 2015b). This has been an opportunity to discuss and receive feedback from researchers with diverse backgrounds.

As research on design, games, and education is a global field (e.g., Selander, 2008b), getting global experience has been emphasized. This included a two-week summer-school course in games and play research at Utrecht University, Netherlands; a course in design-based research

at Aalborg University, Denmark; a Nordic course in game-oriented learning design, which was conducted in Stockholm, Copenhagen, and Oslo. A five-month-long research stay was conducted at the *Research Center for Game Studies (RCGS)* at Ritsumeikan University, in Kyoto, Japan, which included classes, seminars, study groups, and conferences, in addition to presenting the present research project and receiving feedback from faculty and students connected to the university.

4.5.5.2 Resonance

Resonance within research refers to the “research’s ability to meaningfully reverberate and affect an audience,” and it can be achieved through aesthetic merit, evocative writing, formal generalizations, and transferability (Tracy, 2010, p. 844). Regarding aesthetic merit, a written text should be comprehensible to its target audience, but also move the reader – it “surprises, delights, and tickles something within us” (Tracy, 2010, p. 845). The project was presented in the competition *Forsker Grand Prix* on NRK, in which the participants learned several techniques regarding disseminating one’s research in a way that audiences outside academia will find intriguing. Aspects of these techniques relate to the concept of *transferability*, which, according to Tracy (2010), is achieved when “readers feel as though the story of the research overlaps with their own situation and they intuitively transfer the research to their own action” – an effect that can be created through rich description, accessible writing, evocative storytelling, and the use of direct testimony (p. 845). Tracy (2010) relates the concept of transferability to *naturalistic generalization*, in which “research achieves resonance across various populations and context(s), even if it is based on data from a unique population during a specified moment in time” (p. 845). Generalizability often has been used as a criterion for quality (e.g., Maxwell, 1992) and can be explained as the extent to which the research and theories generated can be useful in understanding similar situations (L. Cohen et al., 2013). As it is difficult to extend the findings from a small sample to a larger population, generalization within qualitative research differs from that of quantitative research, in that while quantitative researchers often seek to generalize facts, qualitative researchers are often more interested in generalizing processes (Silverman, 2014). A useful way of perceiving generalizations in qualitative research is through *analytic generalizations*, which can be done when your findings can extend to situations outside your own study, based on the relevance of similar theoretical concepts or principles (Yin, 2014). As the findings and ideas have been presented to several researchers and research groups, indicators of naturalistic and analytic generalizations can be seen in how the findings seem to resonate outside of this study.

5 Summary of the articles

This section will summarize the three articles included in this thesis, which will be used as a basis for the discussion following the summaries.

5.1 'But this isn't school': Exploring tensions in the intersection between school and leisure activities in classroom game design (Article 1)

Article 1: Øygardslia, K. (in press). 'But this isn't school': Exploring tensions in the intersection between school and leisure activities in classroom game design. *Learning, Media and Technology*.

While there are many possibilities in learning from design, there are also challenges that need to be considered for game-based learning in classrooms to work well. This article explores one of these challenges, the tensions that may arise when game design is introduced as a learning activity into classrooms. The research question for this article is: What characterizes these tensions, and how do these tensions unfold while the students are designing games based on their social studies curriculum?

The article used the following theoretical terms to explore this research question: *activity frames*, *positioning*, and *stancetaking*. *Activity frames* turn the focus to how students orient toward the activity based on how they perceive "what is currently going on" in the situation. *Positioning* and *stancetaking* are used to explore students' interactions within these activity frames and how these frames are dynamically changing.

The findings presented in this article state that the tensions might be due to students positioning themselves as either *students*, *game designers*, or *characters*. Through a process called *keying*, participants may switch to different *levels of meaning*, changing how they perceive what is going on in the current situation. As students, in what can be seen as their *primary framework*, the participants orient toward the activity mainly as governed by the norms and values of the classroom. From here, they may switch to an activity frame in which they consider themselves mainly as *game designers*, emphasizing the design aspects of the activity. Finally, they may key to a level of meaning in which they position themselves as *characters*, referring to the characters in the game as themselves. This might be due to the *engrossment* often seen when playing games, which here also occurs when *designing games*.

When students position themselves in different activity frames, it may cause tensions, as the students do not agree on what the activity they are doing is really about. However, these activity frames are dynamic and shift quickly. It is suggested that the students themselves may

contribute to reducing unproductive tensions, by clearly expressing their intentions, and positioning their bodies and the resources used in the activity in a way that ensures a joint orientation among the participants.

Understanding the tensions arising when game design is introduced into classrooms might contribute to organizing the activity in a way that draws on students' own interests, while keeping curricular aspects of the activity in mind.

5.2 Pointing, praising, and pondering: Unpacking game design as a learning activity in social studies classes (Article 2)

Øygardslia, K. (2017). Pointing, praising, and pondering: Unpacking game design as a learning activity in social studies classes. *Manuscript submitted for publication*.

This article explores how students build knowledge when collaborating to design games based on historical topics. The following research questions are explored: What characterizes students' collaborative learning activities when making their own computer games that relate to the history part of their social studies curriculum? How do students find and evaluate information related to the social studies topic and the tools they use?

The research questions are explored with a basis in *guided participation*. This is done to show not only how more-skilled peers contribute to the activity by guiding, instructing, and showing other students how to use the software, but also to show how the students in the situation – here called *apprentices* – contribute by actively participating in the activity, observing their partners, and adjusting their participation in the activity based on this. The article also examines *subteaching*, a term that draws the attention to a form of guided participation in the classroom, in which students take on common teacher tasks, such as instructing and evaluating the work of other students. Also, *epistemic stance* is used as an analytical term to understand how students take on the position as being more skilled in the activity than others, or demonstrating epistemic authority and placing epistemic responsibility, as well as how other students react to this.

In the article, three episodes are presented that demonstrate different aspects of guided participation. The first episode shows guided participation *between students* when learning the tools, while the second episode shows how students navigate information with the help of their *teachers*. The third episode shows how students draw on the behaviors of teachers while jointly constructing knowledge.

It is argued that students in collaboration build knowledge through artifacts and discussions, which is done as the students discover that they need new knowledge of social studies topics or digital skills to proceed with their games. Through guided participation and subteaching, the students shift from newcomers, i.e., *game designer apprentices*, and become more skilled in the activity, then help other students participate in the activity in a more central manner. However, as the students can pursue their own interests in the game design process, the positions of those who are more skilled in the activity quickly change.

While social studies content usually is the point of departure for game design activity, students sometimes may mix facts with fiction in the process, but students' ways of positioning themselves and others as subteachers, and expecting evidence for claims being made, contribute to emphasizing the activity as a school activity.

The article shows how epistemic authority is negotiated, claimed, and placed. Students are expected to demonstrate skills or knowledge if they want to claim epistemic authority.

5.3 'Move over, I will find Jerusalem': Artifacts in game design in classrooms (Article 3)

Øygardslia, K., & Aarsand, P. (2017). 'Move over, I will find Jerusalem': Artifacts in game design in classrooms. *Manuscript submitted for publication*.

Artifacts are central to social practices and are integral to learning in a classroom. While it is necessary to understand the setting in which learning activities occur, educational technology is often implemented into classrooms without considering the network of artifacts that is already established. This article explores the role of artifacts in game design, with a basis in the following research question: What artifacts do students use and how do they use them while designing history-themed computer games in the classroom?

The research question is explored from a *sociocultural perspective*, emphasizing how the students use artifacts to develop and store knowledge, and how new and established artifacts contribute to the social organization of learning activities. To draw attention to *how* students use artifacts in the game design process, Wartofsky's *levels of artifacts* are used. This analytical tool divides artifacts into categories based on their function within the practice in which they are used. This includes *primary* artifacts, which directly assist with production; *secondary artifacts*, which cover representations such as maps or diagrams; and *tertiary artifacts*, entailing imagined or possible worlds. This category includes computer games, and it can be argued that designing computer games means building third-level artifacts.

The article argues that the students dynamically shift between using different artifacts in the game design process, and that having a variety of artifacts on different levels is vital to students' knowledge building. In the process of designing games, artifacts are used by the students collaboratively to build knowledge about the social studies topic. This is again built into the student-produced games, combined with their own understanding of computer games. The actual role of the artifacts may change quickly during the activity – a map on the wall, for example, may start out as a secondary artifact being used by the students to locate geographical locations, but soon be used by the students as their center of attention when creating the game story, thus more resemble a tertiary artifact where play and imagined worlds are the central aspects.

While some studies have speculated that the relevance of textbooks might be challenged as digital artifacts are introduced into classrooms, it is argued in the present article that the

textbook still has epistemic authority. The textbook is often used as a starting point for activities, but also to *validate* the information that students are obtaining from other artifacts.

The article concludes by arguing for the importance of seeing classroom game design as something happening not only on a screen and considering the wide variety of artifacts that students can use, such as world maps on the wall, textbooks, and timelines.

6 Discussion

The introduction to this thesis presented a scenario of what you might have seen if you entered a classroom where students designed their own games about history topics. It posed the questions of what was really going on in the classroom in this game-design process. This thesis, including the three articles presented, has attempted to shed light on these activities by presenting episodes from the classroom that all show recurring aspects of the activity seen in the data. Through these presentations and analyses, the aim has been to explore the following overarching research question: *How do students' learning activities unfold when game design is introduced into formal education?*

Based on the findings from the articles and the data corpus, the following summaries can answer the study's sub-questions, creating the basis for further examination of the findings afterward.

1) *How do tensions between school and leisure time unfold in game design activities in the classroom?*

Tensions can be generated between students as they position themselves within different *activity frames*, emphasizing different aspects of the activity and what the task they are doing is really about. They can take on different positions, such as *students*, emphasizing the school-based aspects of the activity; as *game designers*, focusing on the design; or as *characters*, immersing themselves in the game world, even to the extent that they refer to the game characters as themselves.

While this was the main focus of Article 1, this aspect of students' social interactions was a recurring pattern in the data. While some students were thrilled to discover how zombies or paladins could be added to the game world, this was clearly opposed by other students, who argued that it did not fit the curricular topic. In Article 2, tensions between students were not emphasized, but the excerpts still show how the students took different positions and how these positions dynamically shift, e.g., how students go from finding information about Leonardo da Vinci's teacher to focusing on the design aspects of the activity in how they create the game story. In the third article, the students went from locating world cities on a map, to immersing themselves in building a Crusader's travel route.

The fact that these activity frames were so quickly and dynamically shifting points to how classroom game design does not completely blur the lines between students' interests and academic learning, but instead allows students to draw upon both. This may

sometimes cause tensions, although students also may be able to create an activity frame in which they balance learning curricular content with the design aspects of the activity.

2) *How do students build knowledge through collaboration in the game design process?*

The data showed that students' learning activities were characterized by *guided participation*, in which more-experienced peers helped build bridges between students' current understanding to a developed understanding of the activity in a way that made them able to participate in the activity in a more central way. This was done through instruction by others, demonstrating how to use software, and arranging material resources.

None of the students, except one, had any familiarity with the software. The students were game design apprentices in a community of learners, constructing knowledge about tools or history topics at the time this was needed. Thus, the position of who was the more skilled at the activity were changing quickly as the activity changed. While the teachers had an important role in guiding the students in terms of navigating social studies information, and contributing to effective collaboration by pointing out the importance of ensuring that all group members were active in the process, the students knew that their peers would be better at game design and using the software, and would rather turn to them for guidance. However, the students still would be influenced by teachers in another way: In their collaborative learning activities, they often positioned themselves as *subteachers*, taking on the common practices of their teachers, such as instructing other students, keeping them on track, and evaluating their work. The students' positioning as subteachers usually was related to their ability to claim epistemic authority by demonstrating skills, e.g., by showing how software should be used, or through using artifacts, such as textbooks.

This research question was explored mainly in Article 2, but these aspects of students' collaborative learning also were seen in the other articles. In Article 1, for example, Robin and Sally's evaluations that Sander's game world was not historically correct resembled subteachers' evaluations, although their subteaching act was resisted by Sander. In article 3, Casper's comment "Are you stupid or what? Jerusalem is down here. Move over, I will find Jerusalem for you" can be seen as an -- albeit somewhat crass -- evaluation of Peter's knowledge base before demonstrating where the city was located on a map.

3) How do students use artifacts in the game design process?

Students' learning activities were characterized by the use of artifacts, often in a way that drew on the norms and values of the classroom. This includes textbooks, maps on the wall, and timelines or PowerPoint presentations that they created themselves. It shows the importance of emphasizing the learning environment in which game design occurs, as game design is not only done on a computer. Instead, the students used a wide range of artifacts, both on and around the computer, as well as other places in the classroom.

While the use of artifacts was the main focus of Article 3, it also was an important aspect in the other two articles included in the thesis. In particular, it had strong implications for how the students backed up their assertions, and thereby claimed epistemic authority. This is shown, for example, in Article 2, in which textbooks are used by Marcus to back up his claims when stating that Magellan was a soldier first.

While the way students used artifacts was shaped by the classroom context, the way the artifacts were used was not always as intended and could contribute to quick changes in activity frames. This was, for example, seen in how the world map in Article 3 was used by Casper and Peter to create the story of the Crusader fighting crocodiles in the Black Sea. The importance of narrative, which is emphasized as a core factor in game-based learning, was also seen when designing games in the classroom.

After analyzing students' social interactions, one aspect can be seen across all articles in one way or another: While game design and other game-based learning activities often intend to bridge young people's interests with academic learning, the activity is shaped by the environment in which it occurs – social norms and values in the classroom, students' expectations of what classroom learning should be like, and the wide range of artifacts already established in the classroom. It can be argued that while a main argument for introducing game design into the classroom is that it draws on students' participation in out-of-school, participatory sites, the nature of the activity changes after entering the classroom. The activity partly becomes a hybrid of school and leisure, situated in an activity frame that blends the two realms. On the other hand, the students make clear distinctions between the two sites, allowing for the creation of both bridges and borders to be made by students. In the next section, this will be further studied– first, by exploring students' knowledge building while building games, emphasizing how the classroom context and the design-oriented and often-playful nature of game design influence each other. Then the argument on bridging academic

learning with young people's interests will be further explored in light of the findings presented.

6.1 Building knowledge while building games

In this project, students have been seen as game design apprentices in a community of learners, collaboratively building knowledge in the process of building games. Building knowledge in a design process is a topic that has received attention in research on learning through design. The *Designs for Learning* perspective focuses on how knowledge is formed through collaboration and transformed into a representation (Selander, 2008b), such as computer games, while constructionism emphasizes that learning may work better if students are engaged in creating external artifacts. In the literature review section of this thesis, *Playing and designing games as learning activities*, possibilities from educational makerspaces were outlined, such as making education relevant for young people based on their interests, providing better learning opportunities for uninterested students, collaborating across skill levels, developing 21st century skills, and making a space for learning where students have a positive attitude towards failing (Halverson & Sheridan, 2014; C. Martin & Murray, 2006; Sheridan et al., 2014). The data discussed in this thesis support several of these claims, such as collaboration of skill levels and how students together learned game design tools and worked on digital skills in the process. Other alleged effects, on the other hand, were *not* seen: While Martin (2015) described makerspaces that were failure-positive to the extent that participants were disappointed when what they attempted to do worked right away, students in this project clearly displayed frustration when what they attempted to do did not go as planned.

An argument for game-based learning that fits well with ideas for bringing the maker movement into educational realms is the opportunity to go beyond a “one size fits all” approach to education and open many pathways to participation (Squire, 2008). The students' *agency* is central, which is a prominent theme in Nordic research on learning across contexts (Erstad et al., 2016). Learner agency implies that students can make meaningful choices to impact their learning (Lindgren & McDaniel, 2012, p. 346), and from a sociocultural perspective, agency needs to be seen in relation with the sociocultural practices in which the activity is situated (J. Martin, 2004, p. 136).

It is within this intersection that students' knowledge building unfolds. Shaped by the affordances of the software, the context of the classroom, and students' orientation toward this

activity, students exercised their agency to pursue what they found interesting, but also sometimes restrained other students' agency to go beyond what they considered valid classroom activities. And often, it was due to this tension that knowledge building was sparked.

Previous research by Wegerif and Mercer had argued that when different perspectives meet and statements are challenged by other students, it may provide fruitful opportunities for collaborative knowledge building (Mercer, 2004; Wegerif, 2007). This is supported by the findings in this research. When a student made a suggestion or took an epistemic stance in the design process, other students expected – sometimes even *challenged* each other – to back up suggestions or claims with evidence. While they would sometimes use personal accounts, as Samantha did when stating that she had been to the Santa Maria Church in Florence, this usually was not accepted by other students: They would use artifacts to back up their assertions instead, as this would give them the epistemic authority to make their claims. However, it had to be done in a way that included other students. In Article 1, for example, Fiona had been reading in her textbook just before suggesting how their story of Giordano Bruno should be made. There was a distinction here from other episodes, in which the students' use of textbooks would provide epistemic authority, as she was the only one with access to the textbook, and put it down before making her claim. Other episodes showed the importance of making resources available for all, taking embodied epistemic stances in which all had access to information, and pointing and making eye contact in the process (*see Figure 10*).

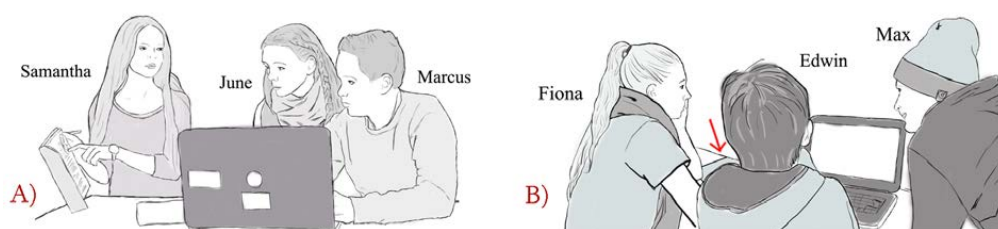


Figure 10: Differences in students' epistemic stances. In image B, the textbook has been colored so that it can be seen more clearly, marked with a red arrow.

Using artifacts to back up their claims was vital to how the students built their knowledge base on historical topics. They used elements from textbooks, online sources, maps on the

wall, and Google Translate, along with their own experiences and interest to reconstruct historical events and eras, discussing and negotiating how to depict game elements to make them meaningful. Peter and Casper climbed onto chairs to point out Rome and Jerusalem on the map on the wall as they reconstructed a possible journey of a Crusader during the Middle Ages. June, Samantha, and Marcus closely examined a picture of Magellan to reconstruct it in their game. Together with their teacher, they evaluated online sources to find information. When they wanted to build the Santa Maria Church, they found two churches with the same name and critically compared the image in the textbook with images they found online to determine which was the correct church. When Scott wondered whether they should add sea monsters to their game, their discussion did not focus on whether sea monsters actually existed, but on whether people *believed in* sea monsters in the Middle Ages, thereby staying true to the mindset of the era during which their game is based.

In many ways, this method of working with historical topics follows many of the ideals of learning in a community of learners, as interest-driven, situated, and collaborative (Rogoff et al., 2001). This is also an ideal of game-based learning, as noted by Gee's (2007a) learning principle of *just in time* learning, or Shaffer's (2006) thoughts on *epistemic games*, in which students can take on different epistemic roles, e.g., different professions. In this regard, the way students work with historical topics is noteworthy. Shaffer said lectures based on reading and reciting texts – as are common in history classes – do not represent historians' work processes as well as games might do (Shaffer, 2006, p. 30). As he notes, "No amount of correctly remembered facts will prepare students to sift through the historical record of newspaper articles, partisan reports, contemporary documents and later historical accounts and from this information construct and defend a historical interpretation" (Shaffer, 2006, p. 31). However, as seen in the students' learning activities, this is a significant characteristic of students' social interactions in their game design activity, when they use artifacts not only to find and interpret information that will be transformed into knowledge, but also to make or defend knowledge claims.

However, in the process of making newfound information relevant to their games, this would often be influenced by students' preferences for *storytelling*. While the story often was founded in students' accounts of historical topics – e.g., making pubs in the game world was justified by the fact that brewing beer was required by law in the Middle Ages – the data show a clear pattern of how to make fictional stories fused with knowledge building. For example, while it is historically accurate that King Olav fled to Russia, it is unlikely that the army he

gathered to fight the Danish king consisted of men he recruited from Russian pubs, who were “so drunk that they said yes.” Both during the development process and in the playtesting, students emphasized the importance of making a good game story and would even hold each other accountable to this with comments such as, “I told you we should have focused more on the story!”⁹ Thus, it supports the research outlined in the literature review, which emphasizes narrative and storytelling as important for student engagement (Dondlinger, 2007; Malone, 1981; Robertson & Howells, 2008), and as something that at times may take precedence over content learning (Ke, 2014). However, the way that students shifted between knowledge building related to their social studies curriculum and creating fiction was a highly dynamic process with sudden shifts in activity frames. Students could, for example, go from challenging each other to locating geographical locations on a map, and to creating stories about fighting crocodiles in the Black Sea.

As this fusion of curricular content and stories – or formal learning and interests – was such a clear characteristic of students’ knowledge-building activities, a likely question to ask is: What consequences does this have for the activity? Does it matter that the students build games in which Mona Lisa is the daughter of Leonardo da Vinci’s teacher, or in which the Crusaders fight crocodiles in the Black Sea on their journey to Jerusalem? These questions may be relevant for future researchers to explore. For now, however, it will be noted that when designing games about historical topics, there always will be a tradeoff between making the games historically correct and making them *fun* (Schrier, 2014, p. 75). When this is the case even for educational games, it is not surprising that this is also done by students as apprentice game designers. From exploring students’ social interactions, however, the noteworthy aspect is that the students, when collaborating to build game worlds, could learn from challenging, negotiating, and finding evidence for knowledge claims made to develop their game stories.

6.2 Connecting leisure and school with game design

An often-stated reason for learning with computer games is to bridge young people’s interests with academic learning (Ito et al., 2010, 2013; Jenkins et al., 2016). Young people’s interests matter, and should be kept in mind also in formal education. Advocates of game-based learning often have argued that games have properties that make them well-suited for

⁹ Some of the students’ comments regarding stories include:

Vera: “Will this game have a story, or is it just going to be one of those silly games?”

Scott: “We can do that afterward – but first we need to fix the story.”

Marius: “That is what I said! I told them both that we should have worked more on the story!”

learning. This thesis instead turns the focus from the games themselves to what *students do* when designing games.

In *Connected Learning: An Agenda for Research and Design*, Ito and colleagues argue that connected learning is “realized when a young person is able to pursue a personal interest or passion with the support of friends and caring adults, and is in turn able to link this learning and interest to academic achievement, career success or civic engagement” (Ito et al., 2013, p. 4). Often, cultivating young people’s interests has been done through youth clubs and in other out-of-school settings, as schools do not have the resources to cover a wide range of students’ interests (Jenkins et al., 2016). However, researchers interested in connecting learning with young people’s interests also have found that young people themselves might be reluctant to acknowledge these attempts to bridge interests and academic learning. For example, young people may be uncertain whether their knowledge and interests from out-of-school spaces can safely be acknowledged in a classroom setting. As noted by Jenkins, while it can be empowering, it is “also an incredibly vulnerable moment, when the slightest negative message will be heard loudly” (Jenkins et al., 2016, p. 116). These are challenges that need to be overcome for interest-driven learning to be successful in the classroom.

The data in this research project show that students *do* draw on their interests. However, as activities happen in formal learning environments, it was clearly seen how activities were based not *only* on students’ interests, but also on the social norms and values of the classroom and their perceptions of what classroom learning should be about. Thus, while the ideal for connected learning is for a young person to be able to “pursue a personal interest or passion” (Ito et al., 2013, p. 4) and turn this into academic achievement, it can be argued that while the activity might have a basis in what the student has a passionate interest for, the activity will not be the same as it would be outside a formal learning environment, i.e., the activity turns into something else when it enters the classroom.

The students themselves often would explicitly contribute to bridging their school tasks with their interests in computer games by drawing upon common game references. Sometimes this was playful and unrelated to the task¹⁰, but other times, it was a way to connect the task they were working on with their game interests, as when Marcus claimed that the boats in the

¹⁰ For example, Simon would present his game, saying «And here we have Link from Zelda,” to which Sander would reply “Hi, LINK! Can I see your bow?” demonstrating that he recognized the reference.

Renaissance perhaps looked like boats from an *Assassin's Creed* game. Kafai and Burke (2015) noted that when making games for learning, students make games primarily for their peers, and how students draw on common game references might show this orientation toward their leisure-gaming activities.

However, the students not only built bridges, but also sometimes actively created *borders* based on how they thought school activities *should be*. The articles showed how the students positioned themselves in different activity frames that suggested what should be important in the activity, taking on positions in which either content or design was emphasized. However, they also drew borders, making distinctions between what they viewed as school work and leisurely fun, as Alvin's statement "But this isn't school" made clear.

As the students themselves negotiated what the activity they were doing was really about, a relevant question to ask is what implications this might have for taking game design into the classroom. Akkerman & Bakker (2011) noted that tensions are common when elements from other domains are introduced into the classroom. However, opportunities for learning might also arise as different sociocultural practices confront each other (e.g., Hyvärinen, Kangas, & Krokfors, 2016). It might make students reflect on both their own and others' practices, thereby considering new perspectives and different viewpoints, and can make them reflect on and negotiate their own identities as learners (Akkerman & Bakker, 2011). In many ways, these confrontations can even be seen as essential to creating new practices that are hybrids between two domains (Akkerman & Bakker, 2011; Engeström, Engeström, & Kärkkäinen, 1995). However, for the new practice to be fruitful, it can be necessary to minimize unproductive tensions, e.g., through communicative strategies (Akkerman & Bakker, 2011), and ensuring that the goals of the activity are clear (Robertson & Howells, 2008).

The data corpus indicated that student groups who were able to maintain a joint focus of attention and productive collaboration ensured that everyone in the group had access to the same resources for making decisions and promoted collaboration through their pointing, gazing, and embodied positioning (e.g., C. Goodwin, 2007). Other times, students failed to achieve this, and it was often in these cases when students said they wished they could work alone instead of in groups. It is likely that establishing ground rules for communication – such as those advised by Mercer, Wegerif, and Dawes (1999) – could be a way of reducing counterproductive tensions. This could, for example, entail promoting what the authors call exploratory talk, in which "*knowledge is made publicly accountable and reasoning is visible*

in the talk” (Mercer et al., 1999, p. 97, italics in original). This corresponds well with the findings in this thesis project, regarding what characterized the social interactions of the student groups who collaborated efficiently.

Finally, it is noteworthy that bridging young people’s interests with academic learning might make those who are considered the “experts” differ in how this is commonly seen in classrooms. Tholander and Aronsson (2003), in their studies on students acting as subteachers, noted that these students were academically ambitious and almost always girls, which also has been supported by other studies (Mökkönen, 2012; Møller & Jørgensen, 2011). This research project indicates, however, that when students are game designers, this dynamic changes. As seen in Articles 1 and 2, the students who were subteachers – instructing, praising, and sanctioning peers – often were boys. This might have implications for classroom dynamics. In Norway, at the time of this writing, female students have better grades than male students in most subjects (Utdanningsdirektoratet, 2014, 2015, 2016). Jenkins (Jenkins et al., 2016) has noted that students might be high achievers in interest-driven activities in affinity spaces, although they are not necessarily considered to be good students, and previous studies have shown that students who were considered “good students” were given considerably more attention in class than other students (Säljö, 2001). As Selwyn (2012) noted, educational technology not only should make classroom learning more *effective*, but also should make it more *fair*. Therefore, it can be noteworthy to look further into whether interest-driven activities can be a way to reach students who either do not find classroom learning relevant, or who are not considered to have the skills that traditionally are valued in a classroom setting.

6.3 Students and game designers

It has been argued in this section that when game design is introduced into a classroom, the nature of the activity changes as students need to balance game design with competency aims. The activity is no longer *only* interest-driven, but is also shaped by the curriculum, classroom norms and values, the artifacts present in the classroom, and collaborations with students’ peers. However, while this *does* have implications for the argument of bridging academic learning with their interests, this is not necessarily something negative. Based on the findings in this project and the reviewed literature, the following can be speculated: If it is acknowledged by students and teachers that the activity *is* something different from young people’s participation in out-of-school, interest-driven communities, it may contribute to reducing some of the vulnerability that students may experience when taking something they

care about to school and opening it up to scrutiny and evaluation by peers and teachers alike. Acknowledging that game design in a formal learning environment not only takes place on a computer screen, but also through interactions with a wide range of artifacts in which the textbook still has epistemic authority, likely can satisfy teachers who are reluctant to implement game design as a learning activity in the classroom, as well as students who are comfortable with “traditional” learning.

Establishing a new activity frame in which students have agency to pursue their interests, but with a clear foundation in social studies competency aims, is a process that may take time and require active participation from all parties involved. If this goal is achieved, however, students can participate in learning activities operating within the boundaries of classroom learning, but where they can draw on their own interests and out-of-school experiences. This thesis aimed to show how students’ learning activities unfold when game design is introduced into the classroom.

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8 Appendices

8.1 Appendix 1: Information letters and consent forms

8.1.1 Letter and consent form to the teachers

Kristine Øygardslia
Pedagogisk Institutt
Norges teknisk-naturvitenskapelige universitet
7491 Trondheim



Forespørsel om deltakelse i forskningsprosjektet «Elever som spilldesignere: Design av dataspill i klasserommet»

Kjære kontaktlærer ved mellomtrinnet,

Mitt navn er Kristine Øygardslia, og jeg er PhD-stipendiat i pedagogikk ved NTNU, Trondheim. Jeg arbeider med et prosjekt der jeg ser på hvordan design av dataspill kan brukes som en del undervisningen i grunnskolen. Formålet med prosjektet er å studere hvordan design av dataspill kan brukes for å oppnå mål i læreplanen, og samspillet mellom elever i denne prosessen. Jeg ønsker derfor å invitere deg som er kontaktlærer ved mellomtrinnet til å delta i prosjektet sammen med din klasse.

Forskningsprosjektet er delt inn i to faser. I første fase vil jeg be elevene fylle ut et spørreskjema om deres erfaringer ved bruk av spill. Dette vil brukes for å få informasjon om elevene som deltar. Så vil elevene bli satt i grupper på tre som skal arbeide med å skape et dataspill knyttet til læreplanmål i samfunnsfag, knyttet til temaet dere arbeider med. Denne fasen av prosjektet tar to dager. I andre fase vil elevene igjen designe et spill. Dette vil fortsatt være knyttet opp mot læreplanmål i samfunnsfag, men denne gangen kommer elevene til å bygge videre på det de lærte i første fase av prosjektet. Også denne fasen av prosjektet tar to dager.

Til bruk i prosjektet er det utviklet et sett med læringsressurser. Dette består av en webside med oppgaver som elevene skal løse, i tillegg til læringsvideoer og oppskrifter som elevene kan bruke for å lære å designe spill. Oppgavene tar utgangspunkt i å lage historie, karakterer og spilldesign knyttet opp mot temaet din klasse i denne perioden arbeider med i samfunnsfag.

Før prosjektet starter, vil jeg ha en gjennomgang av læringsressursene og oppgavene sammen med kontaktlæreren for hver klasse. Du vil da ha mulighet til å komme med forslag til endringer i undervisningsmaterialet. Din rolle i prosjektet vil være å veilede elevene faglig, og gjerne gi elevene tilbakemeldinger underveis på arbeidet de gjør. Det er ikke nødvendig at du som lærer har noen forkunnskaper om spilldesign eller verktøyet som brukes.

Lyd og bilde vil bli tatt opp ved hjelp av videokamera og programvare for å ta opp skjermbilder. Fokus for prosjektet er ikke enkeltpersoner, men arbeid i grupper. All data vil

bli lagret på en passordbeskyttet disk som vil være innlåst i et skap på Pedagogisk institutt når den ikke er i bruk. Jeg vil presisere at deltakelse er helt frivillig, og du og elevene når som helst har mulighet til å trekke dere fra prosjektet.

Data vil bli publisert i vitenskapelige artikler, på konferanser og arbeidsseminarer. Samtlige navn (elever, lærere og skole) vil bli anonymiserte slik at disse ikke gjenkjennes. Etter at prosjektet er fullført, beregnet til å være august 2017, vil datamaterialet bli slettet. Prosjektet er meldt inn til Norsk Samfunnsvitenskapelig Datatjeneste (NSD), og prosjektet vil til enhver tid følge gjeldende retningslinjer for personvern og forskningsetikk.

Jeg håper du vil stille deg positiv til forespørselen, og at du undertegner svarslippen nedenfor og returnerer den til meg via den ferdigfrankerte konvolutten som ligger vedlagt. Ta gjerne kontakt med meg eller min veileder dersom du har spørsmål, eller ønsker å få utdypet noen av punktene i dette informasjonsskrivet.

Vennlig hilsen,
Kristine Øygardslia
Telefon: xxx xx xxx
E-post: kristine.oygardslia@svt.ntnu.no

Pål Aarsand (pal.aarsand@svt.ntnu.no)
(Veileder)

Klipp her:

Jeg har mottatt informasjon og gir tillatelse til at min klasse deltar i forskningsprosjektet
Elever som spilldesignere: Design av dataspill i klasserommet.

Sted/dato:

Navn:

Klasse:

Signatur:

8.1.2 Letter and consent form to the parents

Kristine Øygardslia
Pedagogisk Institutt
Norges teknisk-naturvitenskapelige universitet
7491 Trondheim



Forespørsel om deltakelse i forskningsprosjektet «Elever som spilldesignere: Design av dataspill i klasserommet»

Kjære foreldre og foresatte,

Mitt navn er Kristine Øygardslia, og jeg er PhD-stipendiat i pedagogikk ved NTNU, Trondheim. Jeg arbeider med et prosjekt der jeg ser på hvordan utvikling av dataspill kan brukes som en del undervisningen i grunnskolen. Formålet med prosjektet er å studere hvordan design av dataspill kan brukes for å oppnå mål i læreplanen, og samspillet mellom elever i denne prosessen. For å kunne gjennomføre prosjektet behøver jeg tillatelse fra dere som foreldre/foresatte, der dere samtykker at deres datter/sønn kan delta.

Forskningsprosjektet er delt inn i to faser. I første fase vil jeg be elevene fylle ut et spørreskjema om deres erfaringer ved bruk av spill. Dette vil brukes for å få bakgrunnsinformasjon om deltagerne. Så vil elevene bli satt i grupper på tre som skal arbeide med å skape et dataspill knyttet til temaet som klassen arbeider med i samfunnsfag i denne perioden. Denne fasen av prosjektet tar to dager. I andre fase vil elevene også designe et spill. Dette vil fortsatt være knyttet opp arbeidet i samfunnsfag, men denne gangen kommer elevene til å bygge videre på det de lærte i første fase av prosjektet. Også denne fasen tar to dager.

Elevene og deres aktiviteter vil bli filmet ved hjelp av videokamera og programvare for å dokumentere hva som skjer på skjermen. Fokus for prosjektet er ikke enkeltpersoner, men arbeid i grupper. All data vil bli lagret på en passordbeskyttet disk som vil være innlåst i et skap på Pedagogisk institutt når den ikke er i bruk. Jeg vil presisere at deltakelse er helt frivillig, og eleven når som helst har mulighet for å trekke seg fra prosjektet.

Data vil bli publisert i vitenskapelige artikler, på konferanser og arbeidsseminarer. Samtlige navn (elever, lærere og skole) vil bli anonymiserte slik at disse ikke gjenkjennes. Etter at prosjektet er fullført, beregnet til å være august 2017, vil datamaterialet bli slettet. Prosjektet er meldt inn til Norsk Samfunnsvitenskapelig Datatjeneste (NSD), og prosjektet vil til enhver tid følge gjeldende retningslinjer for personvern og forskningsetikk.

Jeg håper dere stiller dere positive til forespørselen, og undertegner svarslippen nederst på neste side og returnerer den til klassens kontaktlærer som vil gi disse videre til meg. Ta gjerne kontakt med meg eller min veileder dersom du/dere har spørsmål, eller ønsker å få utdypet noen av punktene i dette informasjonsskrivet.

Vennlig hilsen,
Kristine Øygardslia
Telefon: xxx xx xxx
E-post: kristine.oygardslia@svt.ntnu.no

Pål Aarsand (pal.aarsand@svt.ntnu.no)
(Veileder)

Klipp her:

Jeg har mottatt informasjon og gir tillatelse til at mitt barn deltar i forskningsprosjektet *Elever som spilldesignere: Design av dataspill i klasserommet*.

Sted/dato:

Barnets navn:

Klasse:

Foreldre/foresattes signatur:

8.1.3 Letter and consent form to the principal

Kristine Øygardslia
Pedagogisk Institutt
Norges teknisk-naturvitenskapelige universitet
7491 Trondheim



Forespørsel om deltakelse i forskningsprosjektet «Elever som spilldesignere: Design av dataspill i klasserommet»

Mitt navn er Kristine Øygardslia, og jeg er PhD-stipendiat i pedagogikk ved NTNU, Trondheim. Jeg arbeider med et prosjekt der jeg ser på hvordan design av dataspill kan brukes som en del undervisningen i grunnskolen. Formålet med prosjektet er å studere hvordan design av dataspill kan brukes for å oppnå mål i læreplanen, og samspillet mellom elever i denne prosessen. Jeg ønsker å invitere kontaktlærere og elever ved 6. og 7. trinn til å delta i forskningsprosjektet, og ønsker derfor å be om din tillatelse som skolens rektor til å gjøre dette.

Forskningsprosjektet er delt inn i to faser. I første fase vil jeg be elevene fylle ut et spørreskjema om deres erfaringer ved bruk av spill. Dette vil brukes for å få informasjon om elevene som deltar. Så vil elevene bli satt i grupper på tre som skal arbeide med å skape et dataspill knyttet til læreplanmål i samfunnsfag. Denne fasen av prosjektet tar to dager. I andre fase vil elevene igjen designe et spill. Dette vil fortsatt være knyttet opp mot læreplanmål i samfunnsfag, men denne gangen kommer elevene til å bygge videre på det de lærte i første fase av prosjektet. Også denne fasen av prosjektet tar to dager.

Til bruk i prosjektet er det utviklet et sett med læringsressurser. Dette består av en webside med oppgaver som elevene skal løse, i tillegg til læringsvideoer og oppskrifter som elevene kan bruke for å lære å designe spill. Oppgavene tar utgangspunkt i læreplanmål i samfunnsfag, knyttet opp mot det temaet som elevene arbeider med i samfunnsfag i denne perioden. Prosjektet er også tett knyttet opp mot læreplanmål innen digital kompetanse, siden elevene vil bruke digitale verktøy i alle ledd av prosjektet.

Før prosjektet starter, vil jeg ha en gjennomgang av læringsressursene og oppgavene sammen med kontaktlæreren for hver klasse. De vil da ha mulighet til å komme med forslag til endringer i undervisningsmaterialet. Lærernes rolle i prosjektet vil være å veilede elevene faglig, og gi elevene tilbakemeldinger underveis på arbeidet de gjør.

Lyd og bilde vil bli tatt opp ved hjelp av videokamera og programvare for å ta opp skjermbilder. Fokus for prosjektet er ikke enkeltpersoner, men arbeid i grupper. All data vil bli lagret på en passordbeskyttet disk som vil være innlåst i et skap på Pedagogisk institutt når den ikke er i bruk. Jeg vil presisere at deltakelse er helt frivillig, og at lærerne og elevene når som helst har mulighet til å trekke seg fra prosjektet.

Data vil bli publisert i vitenskapelige artikler, på konferanser og arbeidsseminarer. Samtlige navn (elever, lærere og skole) vil bli anonymiserte slik at disse ikke gjenkjennes. Etter at prosjektet er fullført, beregnet til å være august 2017, vil datamaterialet bli slettet. Prosjektet

er meldt inn til Norsk Samfunnsvitenskapelig Datatjeneste (NSD), og prosjektet vil til enhver tid følge gjeldende retningslinjer for personvern og forskningsetikk.

Jeg håper du vil stille deg positiv til forespørselen, og at du undertegner svarslippen nedenfor og returnerer den til meg via den ferdigfrankerte konvolutten som ligger vedlagt. Ta gjerne kontakt med meg eller min veileder dersom du har spørsmål, eller ønsker å få utdypet noen av punktene i dette informasjonsskrivet.

Vennlig hilsen,
Kristine Øygardslia
Telefon: xxx xx xxx
E-post: kristine.oygardslia@svt.ntnu.no

Pål Aarsand (pal.aarsand@svt.ntnu.no)
(Veileder)

Klipp her:

Jeg har mottatt informasjon og gir tillatelse til at klasser ved min skole deltar i prosjektet
Elever som spilldesignere: Design av dataspill i klasserommet.

Sted/dato:

Navn:

Skole:

Signatur:

8.1.4 Information letter to the students

Kristine Øygardslia
Pedagogisk Institutt
Norges teknisk-naturvitenskapelige universitet
7491 Trondheim



Hei!

Jeg heter Kristine Øygardslia, og jeg jobber på universitetet NTNU i Trondheim. Her holder jeg på med et forskningsprosjekt der jeg ser på hva elever kan lære seg av å designe sine egne dataspill på skolen. Derfor har jeg lyst til å komme til klassen din og se på at dere lager spill sammen!

For at dere skal lære å lage spill, har jeg laget noen læringsvideoer til dere og noen oppgaver dere må løse. Dere kommer til å jobbe i grupper på tre, og jeg vil filme noen av dere mens dere designer spill knyttet til læreplanmål i samfunnsfag. Dette halvåret kommer dere til å bruke to dager på å lage spill, og etter noen måneder skal dere bruke det dere lærte til å lage et nytt spill, også denne gangen over to dager.

Det er helt frivillig å delta i prosjektet, og du kan trekke deg når som helst. Jeg håper du vil bli med!

Hilsen Kristine Øygardslia
Stipendiat Pedagogisk Institutt, NTNU

8.2 Appendix 2: Questionnaire

Spørreskjema

Fornavn:

Kjønn:

1. Hvor ofte spiller du dataspill? Tegn en ring rundt det som stemmer.

Hver dag Noen ganger i uken Noen ganger i måneden Sjeldnere

2. Hvilke spill liker du å spille?

3. Har du noen gang forsøkt å lage ditt eget dataspill? Hvis du har gjort det, skriv litt om hva du lagde og hvordan du gjorde det.

4. Hvilke av disse aktivitetene gjør du noen ganger på fritiden? Tegn en ring rundt det som passer.

Skrive fortellinger Tegne på datamaskinen Finne på historier til spill

Lære meg nye ting på Internett Finne opp egne verdener

Snakke med andre om spill på Internett Bruke datamaskinen til å gjøre lekser

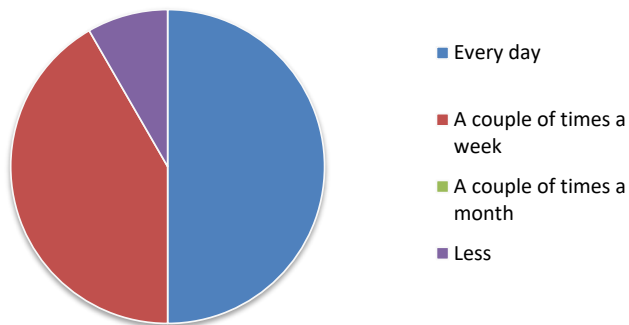
Lage spill på datamaskinen

8.3 Appendix 3: Summary of results

1. How often do you play computer games? Circle the answer that fits best.

Every day A couple of times a week A couple of times a month Less than a couple of times a month

Seventh-grade class



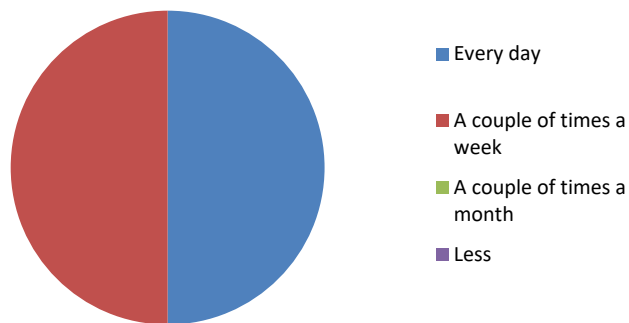
Girls



Boys



Sixth-grade class



Girls



Boys



2. What games do you like to play?

This was formulated as an open-ended question. It was made explicitly clear that *games* referred to all kinds of digital games, including iPad games, console games, and mobile games, in addition to computer games.

Seventh-grade class

Although this was formulated as an open-ended question, some game titles were repeated. Four of the boys wrote that they liked to play *Minecraft*, while two of the girls said the same. Also, three boys and one girl liked to play the football game *FIFA*. Two of the boys liked to play *Sims*. One of the girls did not like to play any computer games at all.

Sixth-grade class

In the sixth-grade class, two of the girls and two of the boys liked to play *Minecraft*. Two of the boys liked to play *FIFA*, and two also said they liked to play *Grand Theft Auto (GTA)*, *GTA 5*, or other games in the *GTA* series.

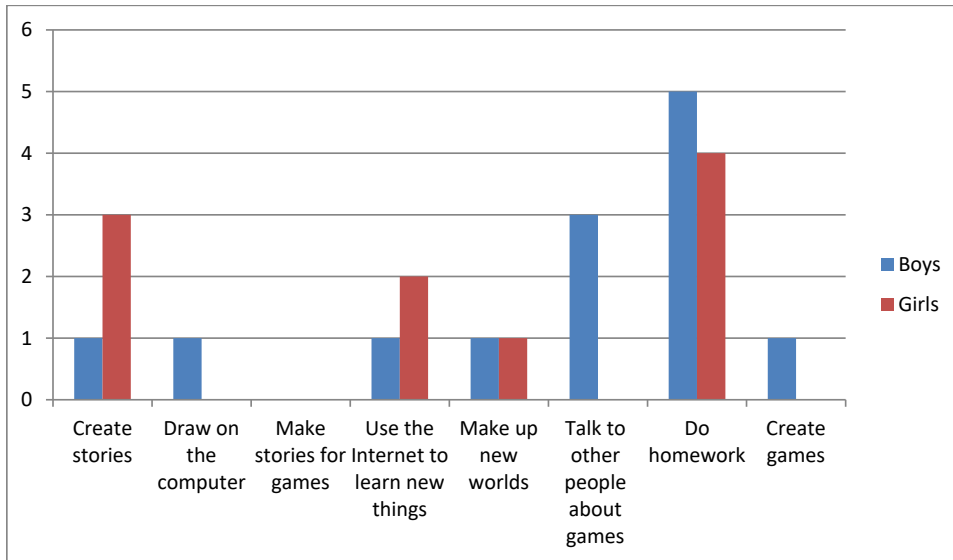
3. Have you ever tried to create your own computer game? If so, write a little about it.

This was formulated as an open-ended question. The responses could, however, be categorized into the rough categories “Yes” and “No.”

In the seventh-grade class, none of the students had ever tried to create his or her own computer game. In the sixth-grade class, however, one of the boys said he has created several computer games (“*Yes, many times*”), but without elaborating how and with what tools.

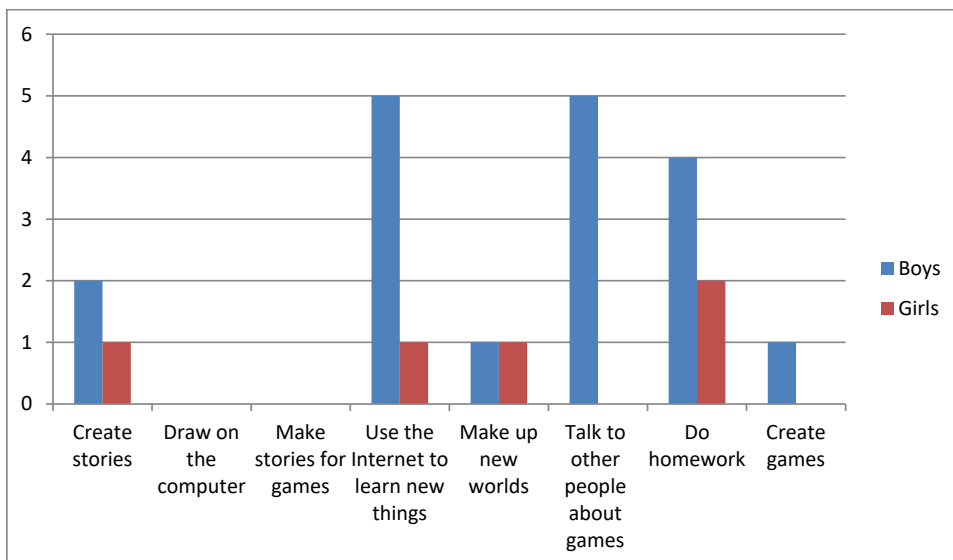
4. Which of these activities do you sometimes do in your spare time? Circle what fits.

Seventh-grade class



While one of the boys in the seventh-grade class circled that he used to create games in his spare time, he also wrote explicitly in question three that he had never tried to create his own game, indicating a contradiction within the data.

Sixth-grade class


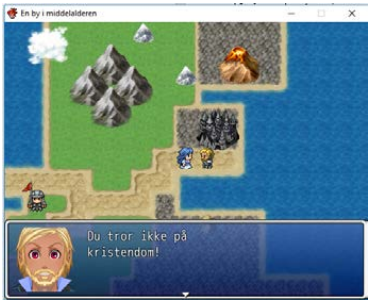



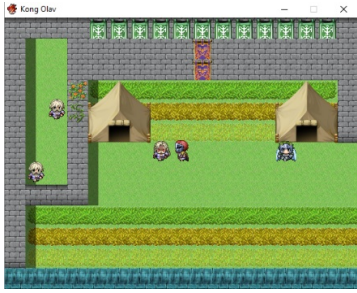
8.4 Appendix 4: Descriptions of students' history-based video games

The following section presents synopses of participating students' games. The information in the summaries was obtained through a combination of playing the games, observing the video data, and viewing the students' game files.

Sixth-grade class, first game design phase



Topic: The Middle Ages



Designers	Title and summary	Screenshot
Peter, Casper, and Samuel (Target group)	<p>The Journey to Jerusalem</p> <p>The protagonist, Henrik, is asked by a non-player character (NPC) if he wants to join the Crusades: "What do you want to do with your life, Henrik?" His choices: "Join the Crusades" or "I don't want to do anything." If the player chooses "Join the Crusades," the NPC states: "That's great; let's conquer Jerusalem." The player then can travel on a boat, either an ordinary boat or one shaped like Santa Claus. When he reaches land, he sometimes will need to fight Polish bandits.</p>	
Vera, Scott, and Marius	<p>A Town in the Middle Ages</p> <p>The protagonist, Luna, starts her journey in a town mostly inhabited by knights. As she is not a Christian, the guards are ordered to catch her. The students said the goal is to find and kill the king before he kills her. Luna can explore the area by boat, or enter a pub, inn, cave, or houses inhabited by knights.</p> <p>Screenshot translation: "You do not believe in Christianity!"</p>	
Irene and Samara	<p>Sunniva's Journey to the King</p> <p>In this game, the protagonist, Sunniva, goes on a quest to find an evil king who has stolen the belongings of her friend Karl's family. Journeying by boat, and meeting several people on islands along the way, the game is won if she can sneak past the guards and into the king's castle, find a knife, and kill him.</p>	

<p>Alvin and Mathias</p>	<p>King Olav King Olav needs to get to the Battle of Stiklestad* before sunset. He travels by airship and goes on a quest looking for gold that he can exchange for a map.</p> <p>* The video data show that the students were confused about the time periods, and what would apply to the Middle Ages.</p>	
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Seventh-grade class, first game design phase

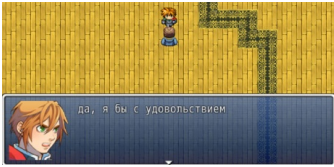
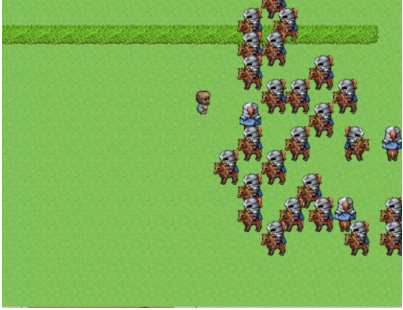

Topic: European explorers



Designers	Title and summary	Screenshot
<p>June, Samantha, and Marcus (Target group)</p>	<p>Sailing Around the World The protagonist starts out in his hometown of Sabrosa. He travels by boat to Spain, where he presents himself as Fernando de Magellan and asks to speak to King Charles, who agrees to talk with him – “Just follow the path, and you will find him.” He can travel further by boat, but if he reaches a group of islands, the Philippines, he dies.</p>	
<p>Simon, Robin, and Marion</p>	<p>Marco Polo's Journey The protagonist, Marco Polo, is asked to find holy oil in Jerusalem. On his way to Jerusalem, he can meet and talk to several people. (Some characters do not have any connections to the story, such as one who says, “Hi, I'm Robin. You already know me. I'm in your class.”) When he gets to Jerusalem, he can pay a nun 50 gold pieces to obtain the holy oil.</p>	 <p>(Text: Hello! I wondered if you could get holy oil from oil that burned over the grave of Jesus in Jerusalem? Yes/No)</p>

<p>Edwin, Max, and Fiona</p>	<p>Christopher Columbus Exploring Columbus is asked by a non-player character, Fernando, if he can help him find his friend Suzanna. He talks to a character who tells Columbus that Suzanna has been kidnapped and is being held on an island in the Atlantic Ocean. He gets on a boat, and when he finds the island, a person tells him that they have Suzanna and that she is being held at a secret place. However, he finds a person who wants to help and tells Columbus that he must travel by boat to the West Indies. If he talks to the wrong person, the game goes to the "Game Over" screen, but if he finds Suzanna, the player wins.</p>	 <p><i>(Text: We've got Suzanna! She is at a secret place!)</i></p>
<p>Sander, Sally, and Helena</p>	<p>Vasco da Gama The player character, Vasco da Gama, starts out in Portugal. He is asked by an NPC, Catarina (who turns out to be his wife), to find her sister Mala in Africa. He travels to Africa by boat, and when he finds Mala, she asks him to deliver a letter to her sister. If he travels in a different direction, he will get to India, where he can talk to people and enter a large castle with several rooms. Here, the player can save the game by taking a nap in one of the beds. If he touches a chicken in India, he dies.</p>	 <p><i>(Text: Are you Vasco da Gama, also known as the husband of my sister? Yes, I am; No, are you crazy!?)</i></p>


Sixth-grade class, second game design phase.



Topic: The Viking Age.


Designers	Title and summary	Screenshot
<p>Peter, Casper, and Samuel (Target group)</p>	<p>Saint Olav King Olav has to flee, as the Danish King and his army is coming. He goes to a pub in Russia and recruits a soldier for his army. He then goes into the Battle of Stiklestad. If he touches a horse, the player sees the “Game Over” screen.</p>  <p>(Text in Russian: “Yes, I want to very much.”)</p>	
<p>Vera, Scott, and Marius</p>	<p>Harald Hardråde The game is about the Viking King Harald Hardråde. The player starts in Miklagard*, where the character can explore markets and houses, talk to people, and collect items, including gold, from the palace of an emperor who died. He can take a boat to Norway, where he meets Magnus, King of Norway. The player can tell Magnus that he is Olav’s brother and become king of Norway with Magnus in exchange for gold.</p> <p>*The Norse name for Istanbul</p>	
<p>Irene and Samara</p>	<p>The Monastery Is Burning The player is Olav, who starts out in a Viking village and travels by boat to England. If the player enters a monastery and finds a torch, he can burn down the monastery. The dialogue with a hooded NPC outside the</p>	

	<p>monastery, most likely a monk, goes like this:</p> <p>Olav: “Hi, I’m Olav. I will burn down this monastery.” NPC: “Why will you do that?” Olav: “Because I want to own your land, and I want some of your things.”</p>	 <p>(Text: Should I light the monastery on fire? Yes/No)</p>
<p>Alvin and Mathias</p>	<p>The Vikings Out into the World The player character is a Viking who travels by boat and talks to people who are terrified of him and beg him not to kill them.</p>	

*Seventh-grade class, second game design phase.
 Topic: The Renaissance*

Topic and designers	Title and summary	Screenshot
<p>June, Samantha, and Marcus (Target group)</p>	<p>The Renaissance The game is set in Florence during the Renaissance, and the player has the opportunity to visit the Santa Maria Church. The main character, Leonardo da Vinci, is taken by an NPC to the house of Andrea del Verrocchio, Leonardo da Vinci’s teacher. He then is asked to paint Mona Lisa, who is depicted here as the daughter of del Verrocchio. If he accepts, a year passes in the game, and the portrait is finished. Then the game is won.</p>	

<p>Simon, Robin, and Marion</p>	<p>The Renaissance! The main character agrees to help an NPC and is asked to go on a journey by boat. When he gets on land, he enters a house where he is told that he has to answer a question to be able to continue. The question is “When did Leonardo da Vinci die?” If he answers correctly, she tells him that the king will tell him where to go next: the top-right corner of the room. If he goes there, he will be asked three questions related to the Renaissance: Who built the dome of St. Peter’s Basilica? Where did Raphael come from? Where was Leon Battista Alberti educated? If the player succeeds, he or she gets congratulated for beating the game.</p>	 <p>(Text: OK, When did Leonardo Da Vinchi [sic] die? May 17, 1500, or April 15, 1452?)</p>
<p>Edwin, Max, and Fiona</p>	<p>The Renaissance The player plays Giordano Bruno. He starts out in Florence, where he is asked if he agrees that the sun is the center of the universe, and not the Earth, and whether it would be a good idea to tell the pope. He then can travel to Rome by boat.</p> <p>In Rome, he meets the pope, and the following dialogue is initiated: Bruno: “Hi, I believe that the sun is the center of the universe, not the Earth.” Pope: “No, you cannot joke about something that serious! YOU ARE SENTENCED TO DEATH because you meddle with things you should not meddle with. BURN HIM AT THE STAKE!”</p> <p>Bruno then automatically walks over to the fireplace, and the “Game Over” screen appears</p>	 <p>(Text: “Hi, I believe that the sun is the center of the universe, not the Earth.”)</p>

<p>Sander, Sally, and Helena</p>	<p>The Renaissance The protagonist is a newcomer to Florence, where he can learn how to paint and create sculptures. He can visit the House of Painters, the Island of Loneliness, and a church. The game features a custom-made start screen, changing soundtrack, and changing weather.</p>	
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8.5 Appendix 5: Related competency aims

The following competency aims are retrieved from the Norwegian Social Science Curriculum (Utdanningsdirektoratet, 2013b):

Basic skills, p. 6:

“Digital skills in Social science involves the ability to use digital resources to explore websites, search for information, practice the use of source criticism and select relevant information about subjects related to the social sciences. These skills also cover the use of digital presentation and collaboration tools to prepare, present and publish multimedia products. Digital skills also involve being able to communicate and cooperate through digital channels about social science themes and comply with the rules and norms for web- based communication, including personal data protection and copyright law. The development of digital skills in the subject of Social science involves learning to use digital tools and digital media to acquire knowledge in the subject and demonstrate one’s competence and one’s ability to improve knowledge in the field. Digital skills in the subject of Social science are learned through a process that begins with the use of digital tools to find and communicate the content of one’s findings. The ability to use varied search strategies will develop further so pupils can make critical choices and express themselves in a professional manner and reflect over ones choices.”

History, p. 8, with the most relevant aims for this project italicized by the author:

“The aims of the studies are to enable pupils to:

- *tell others about the main characteristics of social development in Norway from the Viking period and to the end of the Danish-dominated period, and explain in detail a key topic from this period*
- give an account of how the Nordic states and Russia established the borders between them along the Northern Cap until the first half of the 1800s and give an account of how this affected the culture and living conditions of the Sami people and their relationship at this time with these states
- elaborate on which national minorities exist in Norway and describe the main characteristics of the history and living conditions of these minorities
- describe the living conditions and social development of women and men regarding gender equality in Norway
- situate previous river cultures along a timeline and on a map and present the central characteristics of these cultures
- examine Greek and Roman communities in antiquity and find examples of how their cultures have influenced our own period of history
- *elaborate on central characteristics of the following epochs: the Middle Ages, the Renaissance and the Enlightenment in Europe and discuss reasons for this division into periods*
- *use historical maps and present trips of discovery and exploration made by Europeans, describe cultural encounters and how the different cultures perceived these encounters”*

The following is retrieved from the Framework for Basic Skills, pp. 12-13 (Norwegian Directorate for Education and Training, 2012):

“2.4 Digital skills as basic skills

What are digital skills?

Digital skills involve being able to use digital tools, media and resources efficiently and responsibly, to solve practical tasks, find and process information, design digital products and communicate content. Digital skills also include developing digital judgement by acquiring knowledge and good strategies for the use of the Internet.

Digital skills are a prerequisite for further learning and for active participation in working life and a society in constant change. The development in digital technology has changed many of the conditions for reading, writing and oral forms of expression. Consequently, using digital skills is a natural part of learning both in and across subjects, and their use provides possibilities for acquiring and applying new learning strategies while at the same time requiring new and increased powers of judgment.

Sub-categories

Search and process means being able to use different digital tools, media and resources as well as to search for, navigate in, sort out, categorize and interpret digital information appropriately and critically.

Produce means being able to use digital tools, media and resources to compose, reapply, convert and develop different digital elements into finished products, e.g. composite texts.

Communicate means using digital tools, resources and media to collaborate in the learning processes, and to present one’s own knowledge and competence to different target groups.

Digital judgement means being able to use digital tools, media and resources in a responsible manner, and being aware of rules for protecting privacy and ethical use of the Internet. How are digital skills developed? Developing digital skills means learning to use digital tools, media and resources and learn to make use of them to acquire subject-related knowledge and express one’s own competence. This implies developing increased independence and judgement in the choice and use of digital tools, media and resources relevant to the task.

How are digital skills developed?

Developing digital skills means learning to use digital tools, media and resources and learn to make use of them to acquire subject-related knowledge and express one’s own competence. This implies developing increased independence and judgement in the choice and use of digital tools, media and resources relevant to the task.”

Digital skills as basic skills					
Field of skills	Level 1	Level 2	Level 3	Level 4	Level 5
Search and process	Can read hypertexts and simple interactive information. Can use picture- and icon-based navigation.	Can make simple digital searches, and read and interpret information from digital sources. Can use simple digital resources and tools for information processing and learning.	Can choose and use search strategies and assess information from digital sources. Can use different digital tools and resources for information processing and learning.	Can filter, transform and collate information from digital sources. Can use relevant search tools and master search strategies in subject-related tasks.	Can find, organize and update digital information. Can use advanced search strategies and sources in subject-related work.
Produce	Can write simple texts on keyboard and produce simple composite texts. Knows simple digital use of sources and copyright rules.	Can produce digital composite texts following simple formal requirements. Can make use simple use of digital sources observing copyright rules, also in re-use, and further development.	Can make digital composite texts with linked content. Can understand and use digital formal requirements in one's own texts. Can refer to digital sources and apply copyright rules.	Can produce and edit complex digital texts. Can refer to and assess digital sources in relevant subject-related situations.	Can choose and use target group relevant digital tools and digital formal requirements. Can administer copyright rules to one's own digital products and master digital source referencing.
Communicate	Can use simple digital tools and media for presentation and communication.	Can use a selection of digital tools and media for presentation and communication.	Can make varied use of different digital tools and media to convey a message both in one-to-one and group communication.	Can use digital media and tools to convey a clear and detailed message for communication and documentation.	Can choose, assess and apply digital communication tools according to different subject-related needs.
Digital judgement	Can follow basic rules for digital interaction. Knows basic rules for protection of personal privacy on the Internet.	Can apply basic netiquette and knows about rules for protection of personal integrity on the Internet	Can apply netiquette and follow rules for protection of personal integrity on the Internet and in social media.	Can use the Internet and social media efficiently and appropriately.	Can reflect ethically on and assess the Internet and social media as a communications and information channel.

Table 4: Digital skills as basic skills, retrieved from Framework for Basic Skills (Norwegian Directorate for Education and Training, 2012, p. 13)

Articles

Articles included in this thesis:

Article 1: Øygardslia, K. (in press). ‘But this isn’t school’: Exploring tensions in the intersection between school and leisure activities in classroom game design. *Learning, Media and Technology*.

Article 2: Øygardslia, K. (2017). Pointing, praising, and pondering: Unpacking game design as a learning activity in social studies classes. *Manuscript submitted for publication*.

Article 3: Øygardslia, K., & Aarsand, P. (2017). ‘Move over, I will find Jerusalem’: Artifacts in game design in classrooms. *Manuscript submitted for publication*.

Published in conference proceedings (peer-reviewed), not included in the thesis:

Oygardslia, K. (2015b). Students as Game Designers: Learning by Creating Game Narratives in the Classroom. In H. Schoenau-Fog, E. L. Bruni, S. Louchart, & S. Baceviciute (Eds.), *Interactive Storytelling 8th International Conference on Interactive Digital Storytelling, ICIDS 2015* (pp. 341–344).

Oygardslia, K. (2015a). Computer games for promoting global awareness: Methods and modes. In R. Munkvold & L. Kolås (Eds.), *Proceedings of the European Conference on Games-based Learning* (pp. 703–710).

Submitted for review as a book chapter, not included in the thesis:

Øygardslia, K. (2016). Stories about history: Exploring central elements when students design game narratives. *Manuscript submitted for publication*.

Article 1

Øygardslia, K. (in press). 'But this isn't school': Exploring tensions in the intersection between school and leisure activities in classroom game design. *Learning, Media and Technology*.

‘But this isn’t school’: Exploring tensions in the intersection between school and leisure activities in classroom game design

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Abstract: While there are several positive outcomes from implementing game design in a formal learning context, there are also challenges that have to be considered in order to improve game-based learning. This is explored in the article, using the concepts of *activity frames* and *stancetaking*, focusing on the social organization of the game design activity. Building on video data from one 6th grade class and one 7th grade class designing computer games based on their social studies curriculum, this article shows that tensions arise when students fail to agree on what the activity they are doing is really about: The academic content and what students commonly perceive as school activities, or a game design activity informed by their leisure time. The main argument is that the students position themselves as *students*, *game designers* or *characters*, and that this may cause tensions in the students’ social interactions.

Keywords: classroom game design; game-based learning; activity frames; stancetaking

1. Introduction

In a 6th grade classroom in Norway students are sitting in groups designing computer games about the Middle Ages. Alvin and Mathias are writing the dialogue between the player character and one of the non-player characters when their teacher, Katherine, sits down at their work table and comments on the activity on the screen.

- | | | |
|---|-----------|---|
| 1 | Katherine | Capital D (.) capital D |
| 2 | Alvin | But it isn’t school now |
| 3 | Katherine | Yes this is school this is <u>absolutely</u> school |
| 4 | Alvin | Yes (.) I <u>know</u> that |

This episode shows the ambiguity of classroom game design – is it perceived as a school activity or not, and are school and leisure activities in opposition to each other? While several positive outcomes from including computer games in the educational system have been demonstrated (see for example Ke 2009), there are also challenges, as taking an activity from elementary school students’ leisure time and into a formal learning environment might challenge the established norms and implicit rules of what learning in a classroom should be like. According to Squire (2005), bringing computer games with commercial qualities into the classroom can create problems as many students fail to understand the purpose of the activity, even though other students may find it highly motivating. This complements Jenkins’ (2006) argument that the successes of young people’s interest-driven leisure activities do not necessarily occur when brought into the classroom.

The differences between formal learning activities and leisure activities might contribute to these challenges, as game-based learning takes place in the intersection of this dichotomy. On a

similar note, a study by Lantz-Andersson, Vigmo, and Bowen (2016) showed that students who used social media as a learning activity in the classroom found it challenging to understand how the task should be framed, as the activity draws on students' leisure activities but is conducted in a school context. Digital technologies challenge the traditional views of learning on which formal schooling has been based (Säljö 2010), as schools have often favoured print-based literacies over the visual and often computer-mediated worlds that young people are used to from their out-of-school spaces (Jewitt 2006; Squire 2006). Often, digital technologies are taken into the classroom without considering how educational practices are shaped by the traditional learning resources that are already established in the classroom, such as pencils, notebooks and blackboards (Sørensen 2009, 190).

Game-based learning is a field that has rapidly increased the last few years (Boyle et al. 2016), and in the present article, the term is used to refer to learning from both *playing* and *making* games for learning (Kafai 2006). When it comes to game-based learning, the students' own perceptions of computer games for learning are often not considered to a sufficient extent when deciding how computer games should be implemented into the classroom (Beavis, Muspratt, and Thompson 2015). This is a challenge, as understanding the students' experiences is necessary to use games for classroom learning in an effective way (Beavis, Muspratt, and Thompson 2015, 22). There may also be challenges for the teachers, as the dynamics between students and teachers are different from ordinary classroom teaching: While the leadership roles between students and teachers are usually fixed in a formal learning context (Jenkins 2006), this relationship differs in interest-driven communities – here, young people might become the experts, including those who are not necessarily seen as good students in a school setting (Jenkins, Ito, and boyd 2016).

The use of educational technology has often been praised (Selwyn 2016), but the perceived benefits and challenges of introducing games in a school context are not understood well enough (Bate, MacNish, and Males 2014). As noted by Selwyn (2016, 442), there is a need to focus on the experiences of the users of educational technology, such as students and teachers, to understand the often less talked about, challenging aspects of using educational technology in the classroom. The aim of the present article is to understand these challenges from the perspective of the students themselves. The focus is on the tensions that arise between the students participating in the game design activities in the classroom and explore the following: What characterizes these tensions, and how do these tensions unfold while the students are designing games based on their social studies curriculum?

2. Gaming activities: Leisure and learning

Playing computer games is an important part of young people's leisure time, both in Norway and worldwide (A. I. Wang 2011; Entertainment Software Association 2016), and might be a possible way of bridging young people's interests and academic learning (e.g., Ito et al. 2013). In Norway, 96% of boys and 76% of girls play digital games (Barne-, ungdoms- og familiedirektoratet, 2016). Indeed, children and young people today are not only consumers of digital media, some are also active *producers* of game-related media content. They are members of game-oriented communities, producing new media content, such as modding computer games, collaborating in guilds to solve challenges in online games, writing blog posts, creating podcasts and discussing gaming experiences (Jenkins et al. 2009). Young people's participation in fan-based online communities has not only provided positive educational outcomes, such as increased writing

skills from writing fan-fiction (Ito et al., 2013; Jenkins, 2006), but also civic engagement (see for example The Harry Potter Alliance: Ito et al., 2013; The Harry Potter Alliance, 2015). While not all young people are producers of media content, these digital, participatory communities are examples of interest-driven learning occurring outside of institutional contexts (Greenhow and Lewin 2016; Hillman and Säljö 2016).

Links between *making* and *learning* have been suggested by researchers, many of whom draw on Papert's constructionist ideas (Papert 1980; Papert and Harel 1991). Constructionism states that learning is most effective when a learner is engaged in producing an external artefact, and when the activity is considered meaningful by the learner (Papert and Harel 1991). These ideas have been central in the *maker movement* (see e.g., Hatch 2014), which originates from out-of-school activities but also presents opportunities for learning through making in a formal learning environment. The maker movement is thus said to blur the divide between formal and informal learning, and has the potential to “democratize access to the discourses of power that accompany becoming producers of artifacts” (Halverson and Sheridan 2014, 500).

One way that the potential of learning through making can be reached is by *designing computer games*, which software such as *Scratch* (MIT Media Lab 2017) and *Kodu* (Microsoft Research 2017) have made accessible. While learning from *playing* games is more common, learning through *creating* games allows students construct “new relationships with knowledge” in the process (Kafai 2006, 38). This idea is consistent with Hillman and Säljö (2016), who noted that learning using digital resources may “challenge simple notions of learning as a reproduction of what exists, and they simultaneously pave the way for conceptions of learning that emphasize tool-mediated collaboration, innovation and a performative understanding of what it means to know” (p. 308). Furthermore, game design might be a key to learning what has been called 21st-century skills, such as systemic thinking, specialist language, and meta-level reflection on these literacy skills (Salen 2007), in addition to developing collaboration skills, being part of a community based on similar interests and developing lasting engagement (Peppler and Kafai 2007b, 375). Understanding how to create new media is necessary for young people to critically participate in the current media culture (Peppler and Kafai 2007a, 150). However, and as noted by Squire (2008), the educational outcomes of game-based learning are not inevitable. Denham and Guyotte (2017) noted the importance of cultivating critical game makers to promote learning from making games, which should be considered when game design is used for pedagogical purposes.

Classroom game design may also face challenges which often occur when new technology is brought into the classroom. Among these challenges are ensuring teacher agency, dealing with outside expectations about which type of learning activities should be in a classroom, and curriculum requirements (Kimber and Wyatt-Smith 2006). In Norway, digital media should be used in all subjects, and digital skills are considered a basic skill in the national curriculum (Norwegian Directorate for Education and Training 2012). The social studies curriculum even states that students should be able to search for information, explore websites, critically assess sources, and make their own multimedia products (Utdanningsdirektoratet 2013). While Norway is highly ranked in Europe regarding the extent of ICT use and infrastructure (Søby 2013; EU 2013), utilizing the full potential of digital technologies in the classroom has been challenging (Guðmundsdóttir et al. 2014; Søby 2013). Despite these challenges, reports have demonstrated an interest in learning from making digital media products in schools, such as from designing computer games (e.g., The Royal Society 2012; Kjällander, Åkerfeldt, and Petersen 2016).

This integration requires a deep understanding of the *challenges* of classroom game design, and additional research on how curriculum-based game design can be integrated in the classroom

has been called for (Robertson and Good 2005, 65). Therefore, this article aims to explore how tensions in classroom game design unfold through the detailed study of interaction.

3. Activity frames and stancetaking in collaborative game design

This article will employ the following core concepts to explore the tensions arising in the students' game-design activity: *Activity frames*, to understand how participants perceive the activity that is currently taking place, and *stancetaking*, to understand how the students orient towards each other and the activity within these frames. Combining these concepts is seen as a useful way to not only understand how the students make sense of the activity they are participating in, which might account for the tensions occurring in the game design process, but also to obtain a more detailed understanding of *how* these tensions are made relevant in the students' interactions in the game design process.

3.1 Activity frames

When analyzing social interaction, a core point is often to understand what the participants themselves perceive as important in the interactions (e.g., Melander and Sahlström 2010). *Frames*, defined by Goffman as 'principles of organization which govern events – at least social ones – and our subjective involvement in them' (Goffman 1974, 10–11), is a way of understanding how people make sense of what is going on within social interactions, and therefore which rules and norms govern the current activity. A key part of activity frames is *participation*, which here is seen as 'actions demonstrating forms of involvement performed by parties within evolving structures of talk' (C. Goodwin and Goodwin 2004, 222). Embodied interactions such as gaze, gesture and how participants orient their bodies are also considered, as well as the social, cultural and material structures in the environment in which the actions occur (C. Goodwin and Goodwin 2004, 241). How participants together are constructing, changing or sustaining arrangements of action and the context in which this takes place should be examined (C. Goodwin and Goodwin 2004, 239–40).

According to Fine (1982), frame analysis might be well suited for research on games due to the social conventions established by a game. The concepts utilized by Fine for researching gameplay will in this article be used to analyse the students' *game design* activities. *Engrossment*, which can be seen as involvement or being 'carried away into something' (Goffman 1974, 347), is a key characteristic of the game experience as people might become engrossed in the game world, voluntarily shifting between different frames (Fine 1982). Fine focuses on three levels of meaning in his analysis (Fine 1982, 186): Usually, people will be positioned in what is called the *primary framework*, which is what most people will call their common, everyday life, with a common sense understanding of events. When participating in a game, however, they will become *players* where their activities are shaped by the socially established rules of the gameplay. While engrossed in the game, they can even shift to the level of meaning where they act as the *characters* they are playing as (Fine 1982). Analytically, this is especially interesting as frames are seen as *dynamic* and shifting: Through a process of keying, a transformation that 'may alter only slightly the activity thus transformed, but it utterly changes what it is a participant would say was going on' (Goffman 1974, 45), people can switch from their primary framework to the frame of player or character. As Fine (1982) points out, this can lead to tensions and misunderstandings when people are not positioned within the same frame, as these frames suggest how an activity is interpreted. For example, if a person is asked about his or her age

during the gameplay, she might respond with her age in real life, instead of the age of the game character she is playing as (example from Fine, 1982). Frequent frame switching is also common in classrooms, where the students dynamically change between different activity frames (Aarsand 2008; Silseth and Arnseth 2016), and might change their positions as learners triggered by the different learning resources available to them (Silseth and Arnseth 2016).

3.2 Stancetaking

How participants position themselves within activities can be described by means of the term *stancetaking*, that is, how they take stances on a statement, a participant's action or an object. While the term *stance* has been used broadly and in different ways by researchers, Englebretson (2007, 6) has suggested general themes with respect to how stancetaking is perceived in discourse analysis, stating that a stance: 1) Can be physical (embodied interaction), personal (attitude or beliefs) or moral; 2) Can be observed and interpreted by other people; 3) Is conducted within interaction; 4) Is indexical, 'evoking aspects of the broader sociocultural framework or physical context in which it occurs' (6); 5) Has consequences for the involved parties (6-7).

To understand *how* this stancetaking occurs, this article will utilize the definition provided by Du Bois (2007): 'Stance is a public act by a social actor, achieved dialogically through overt communicative means, of simultaneously evaluating objects, positioning subjects (self and others), and aligning with other subjects, with respect to any salient dimension of the sociocultural field' (163). This can be explained through an analytical framework called the *stance triangle* (Du Bois 2007, 164), which presents the different components of taking a stance, a *stance act*, and how these components are connected. First, the stance act consists of two participants, called *first subject* and *second subject*, as well as a *shared stance object*, or what the participants orient towards. Second, the stance triangle shows the different actions required in taking a stance: Evaluation, positioning and alignment. A person will *evaluate* the shared stance object, orienting towards it and making up one's mind about the characteristics of that object. Based on this evaluation, the person might *position* oneself or others in relation to the stance object. A person can, for example, position oneself through an *affective stance act* like saying 'I'm glad', or an *epistemic stance act* which can be either verbal, like saying 'I understand', or non-verbal like nodding or shaking one's head (Du Bois 2007, 143–44). This is followed by a process of *alignment* between participants – do the participants agree or disagree, and to what extent? (Du Bois 2007, 143–44). The context of the stance act is significant and the analyst should be able to answer *who* the participants are and *what* they are speaking about, in addition to what stance the speaker is responding to (Du Bois 2007).

While stancetaking is often associated with spoken words, C. Goodwin (2007) suggests that stances can also be displayed through embodied interaction seen in how participants align towards each other. When participants cooperate, or fail to cooperate according to what is expected of them within the established participation framework, they might take stances that are publicly visible (C. Goodwin 2007). In this article, seeing stancetaking as displayed both through dialogue and embodied interaction is considered significant for understanding the tensions occurring in the students' game design activities.

4. Methodology

This article is informed by data that was collected from a school in the eastern part of Norway, where the students designed computer games based on four key history topics in the Norwegian

social studies curriculum: the Renaissance, the great explorers, the Middle Ages, and the Viking Age. The students had been working on these topics prior to the game design project, and the teachers emphasized that creating games about these subjects could help the students learn more about these topics.

Due to a lack of learning resources that fit the intended task and target audience of the project, a website with video tutorials, written step-by-step instructions, and challenges was developed by the author. These learning resources focused on teaching such game design concepts as character development, building the game world, storytelling, and playtesting, and provided practical instructions on how to design a game using the *RPG Maker VX Ace* tool (Enterbrain 2016). The teachers of the participating classes could review and comment on the learning resources before they were used in the classroom. While this research project followed a focused ethnography methodology (Knoblauch 2013), this stage of the research project was inspired by a design-based research approach, as learning resources were designed and implemented in the classroom for the sake of the project (e.g., Reimann 2011). These learning resources remained the same in all stages of the research project. However, experiences drawn from each stage of the data collection informed how the data was collected in the next stage (see e.g., F. Wang and Hannafin 2005). Changes were made to how the camera was placed, as well as changes in the role of the researcher from observer to participant observer, as the students would often ask for assistance with using the software.

Utilizing the developed learning resources, one 6th grade class and one 7th grade class with students aged 11 and 12 were observed during three stages of data collection. First, an observation session was conducted during an ordinary class lecture, where the topic of the students' computer game design was introduced. In this stage, data was collected through observation notes; important focal points for the observation included the students' group dynamics, the use of resources such as textbooks and craft equipment, and the layout of the classroom, as this informed the design of subsequent stages of the study. In the second stage of data collection, each class spent two days working in pairs or groups of three to design computer games that were related to the curricular topic which was introduced to them in the first stage. In the third stage, which occurred two months after the two-day game design period, the students designed a game on a curricular topic again, but this time during a one-day game design session, as the students already knew how to use the tool and basic game design concepts. Although the games made by the students were not formally assessed by the teachers, the teachers commented on the students' games during the game design process. The students were also instructed to comment on each other's games during the playtesting stage.

Video data was collected using three video cameras during the second and third stages of this research project. Two of the cameras were stationary, recording the interaction and computer screen of a three-member target group, and one camera was hand-held and used to capture classroom interactions from other student groups. The total recorded video data from the three cameras was around 75 hours, with approximately 30 hours of screen data which was viewed and analysed alongside the interactional data from the target group. The video data was then processed in different stages. First, a content log was created, which included narrative summaries of sequences that occurred (e.g., Derry et al., 2010), as well as rough transcriptions and keywords from interactions that seemed significant in the data material. When organizing the data, *sensitizing concepts* (Bowen 2006) were utilized. Sensitizing concepts guide the researcher while drawing attention to specific features of social interaction, and were based on the observation notes and the theoretical and analytical framework of the research project. The analysis of the excerpts focused on the social organization of the game design activity and how it

was produced and sustained by the participants (e.g., Francis and Hester 2004; Melander and Sahlström 2010).

The excerpts in the present article reveal different aspects of a recurring pattern in the data material: situations where tensions and ambiguities between school and leisure activities arose when students designed games. These tensions were apparent from the beginning of data collection and were seen in all stages of the game design process, from the initial creation of the game story to the playtest. These tensions were not always present, as the students could create a joint focus of attention on the task through discussions and negotiation. When organizing the data, however, it was clear that episodes characterized by tensions were common and recurring among both the 6th grade and 7th grade students.

The episode referenced at the beginning of this article was observed on the second day of the game design process, while the episodes presented in the analyses occurred on the final day of designing games. The episodes were selected based on recurring patterns of the students taking on different positions in the activity, and they show different but common aspects of these tensions. The excerpts were transcribed using a modified version of Jeffersonian transcript notations (Appendix 1) and then translated into English. The drawings are based on screenshots from the video data, and are included to indicate how non-verbal interactions such as pointing, gazing, and using resources occurred.

5. Tensions in classroom game design

The students who participated in this research project used digital media both at home and in school, and sometimes these activities would influence each other. At home, they played games like *Minecraft*, *FIFA* or *Grand Theft Auto*, usually every day or a couple of times a week. They talked about the games at school, sometimes using this talk to form social bonds based on common game preferences. They used computers at home to do their homework, or sometimes the computers at school to do activities not related to their schoolwork. Sometimes the students created stories using the computer in their spare time, and would often use the internet to get information about new things or talk to their peers. One of the students had tried to make his own computer game prior to the research project.

During the six days of the game design that informed this article, tensions arose between students who oriented towards the activity mainly from one of two positions: As informed by their leisure activities, often participating in the activity with a playful attitude and drawing inspiration from popular culture and gaming practices, or seeing the activity as mainly being informed by what they considered to be the norms and values of the classroom, often focusing on what they had learned about the topic previously in class, using the textbook as a starting point, or emphasizing that the game they were making should be historically correct.

5.1 Guarding the boundaries of school activities

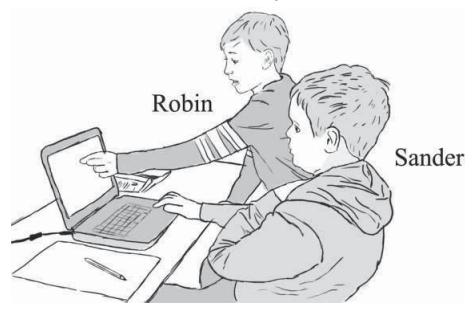
A recurring event in the data material was disagreement over what was considered acceptable to include in the computer games, indicating what the students considered as valid or invalid knowledge in a school context. When one group of students discovered how to add zombies to the game, the class was quickly divided into those who applauded the students' discovery, and those who did not think zombies belonged in the game at all. Sometimes, it was more ambiguous when it came to what could be included in the game or not – while the students did not think that sea monsters actually *existed* during the Middle Ages, perhaps they could be included as people

believed in sea monsters during this time period? Attempting to add pubs to the game world was a recurring topic with different outcomes for the students in this class: While Scott argued in favour of making pubs using textbook knowledge, stating that ‘we have to make beer, because beer was really important in the Middle Ages [...] If they didn’t make beer, they could be put in jail’, Marcus was quickly stopped by Samantha when attempting to do the same thing: ‘We don’t have time to be fooling around!’. Simon added a pub to their group’s game, but it did not last very long: ‘It’s not a pub anymore (.) Marion wouldn’t let me. Now, it’s a house’. The following excerpt reveals how the students position themselves within different activity frames based on what they consider to be valid knowledge and actions within a school context.

The 7th grade class has been working for one day designing computer games related to a curricular topic: The Renaissance. Now, they are getting close to the end of the school day. Sander has been practising his game design skills at home after he was first introduced to the game design software in class two months earlier, and now he is showing his classmate Robin the game that he has created together with Sally and Mia. Sally is standing in the background, watching the boys.

Excerpt 1. Participants: Robin, Sander and Sally

1 Robin



Hey (.) see how tiny it is ((*leaning forward and pointing at the screen*)) really tiny (.) and inside (.) just walk inside (.) and just PHOW ((*throwing his arms to the side and upwards*))

2 Sander ((*pressing the keyboard arrows and moving the game character into a house on the screen*)) (h)yes but

3 Robin the enormous there on the outside=

4 Sander =I’ll show you something else (.) watch ((*moving the character on the screen*)) (.) here (.) and then I’ll go (.) here↑

5 Robin Wow=

6 Sander =And then you see that there↑ and then you see inside here↑ ((*moving the character through the house on the screen*)) (.) and then you see the bedroom is there (.) oh

7 Robin What are you doing?

8 Sander ((*continuing to move the character around in the house*)) (xxx) The kitchen (.)

9 Robin Crazy

10 Sander Everything is inside that [bui-

11 Robin [That house is enormous

12 Sander Oh

13 Robin You know it’s the old days they didn’t have such big houses in the old days

14 Sander Ye::es
 15 Robin No(h)o:o
 16 Sally ((*leaning towards the boys*)) Hear that? ((*smiling*)) (.) they didn't have big
 houses in the [old days
 17 Sander [Nah-nah-nah-nah-nah
 18 Robin (Hear that↑) nah-nah-nah-nah-nah

Sander now continues to show the game to Robin, showing him the inside of a church that he has made, which includes an organ that Robin asks him to play. He also shows a large, empty room which Robin refers to as 'space', before he moves the character back to the main game world. He starts singing in a dark voice when navigating the game character.

25 Robin You're only fooling around
 26 Sander But that's fun (1.0) e::eh (3.0) wow↑
 27 Robin Eh Sander if you think that looks nice
 28 Sander Yes
 29 Robin Go to bed
 30 Sander ((*laughing*)) (.) It didn't look that bad?

This excerpt shows how the students take different stances in relation to what they consider to be important aspects of the activity. It is clear that the students have different perceptions of exactly what kind of activity they are participating in, and therefore how Sander's designed game world should be evaluated.

Robin states that the inside of the room that Sander has made is way too big compared to what it looks like on the outside (lines 1 and 3), accompanying his utterance by throwing his arms to his side and upwards when saying 'just walk inside (.) and just PHOW' (line 1), where adding a gesture might emphasize the point he is trying to make (C. Goodwin 2000). Sander then shows Robin what he has created in the game world, showing him the inside of the house, including the bedroom and the kitchen (lines 4 to 8). Thereby, he orients towards the activity as *game design*, where producing the game world is in the foreground. But Robin keeps talking about how enormous the house is (line 11), and comments about the house that Sander has designed in light of the fact that they did not have large houses in 'the old days', the Renaissance. He evaluates the game world Sander has created using school knowledge and historical facts as a point of reference, and positions himself as someone who orients more towards the activity as informed by what is more commonly perceived as classroom activities.

Sally then responds to Robin's utterance by stepping into the conversation, physically placing herself closer to the other participants. She aligns with Robin when she says 'Hear that? They didn't have big houses in the old days' (line 16). Robin and Sally are taking *epistemic stances*, seen clearly in Robin's utterance '*You know* it's the old days, they didn't have such big houses in the old days' and Sally's '*Hear that?* (.) they didn't have big houses in the old days'. Here, they are not only expressing their attitude to knowledge (Kärkkäinen 2006), displaying their own knowledge about buildings in the Renaissance, but also implying that this is something that Robin should know ('*You know* it's the old days') and now should take into account ('*Hear that?*'). While the exact function of 'you know' might differ in various contexts (Fox Tree and Schrock 2002), it is commonly used when the speaker wants the addressee to come to the same conclusion as the speaker – it 'invites the addressee to recognize both the relevance and the implications of the utterance marked with *you know*' (Jucker and Smith 1998, 194). In this case,

it is clear that Sally and Robin expect Sander to know that they did not have large houses in the Renaissance, and he should take this into account when designing the games.

A stance can indicate the attitudes and values of the stancetaker, which is often described as a *moral stance* (Englebretson 2007, 10), and here this is used to describe what the students value and see as the correct way to behave in the activity they are participating in. Moreover, it could be argued that Sally and Robin emphasize that what they are doing is a *school activity*, and not an activity where they can design whatever they want without considering the subject's learning objectives. They expect Sander to see it in the same way (lines 13-16). This is further seen towards the end of the excerpt, where Robin confronts Sander with the fact that he is 'only fooling around' (line 25). Here, Sander's game world is evaluated not only in terms of how correctly it has been made according to what they have learned about the Renaissance, but also in relation to the value of the activity itself.

When Sander responds to Robin's 'only fooling around' comment with 'But that's fun', the ambiguous nature of game design, being in the intersection between school and leisure activities, is even clearer. The differences are emphasized in the next part of the excerpt with Robin saying: 'Eh Sander if you think that looks nice [...] Go to bed' (line 27 and 29), with 'go to bed' being a term with a meaning similar to 'give it a rest'. Sander laughs, then disaligns with Robin and states that he himself does not think it looks that bad (line 30).

The core argument of this analysis is the following: When taking game design into the classroom, tensions might arise between what can be seen as the main goal of the activity from a school perspective, which is to *learn something* about the topic they are working on, and the *way that this is conducted*, through designing games, an activity using a medium that many young people know from their leisure activities. In this example, this tension changes the dynamics of the participation, creating two main positions, each with a different focus on what the activity is about: *Students* like Robin and Sally, emphasizing that the games should be correct representations of the curricular topics they are portraying, and *game designers* like Sander, where the main focus is on creating and designing. It is no longer a given what is to be considered valid knowledge in the game design activity the students are participating in – knowledge typically associated with young people's out-of-school practices, or what is considered to be commonly valued knowledge in a school context. By disaligning with Sander, Robin and Sally are guarding the borders of what learning activities in the classroom should be like.

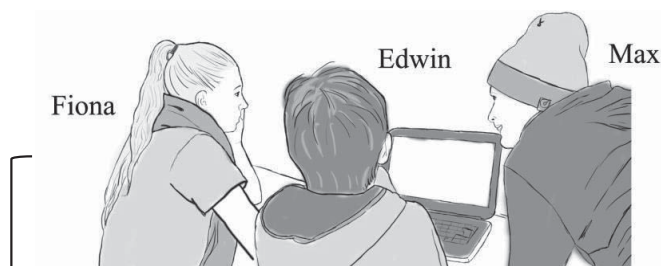
5.2 Frame switching

The previous excerpt showed how tensions arise in the game design activity because the participants position themselves as either students or game designers, where tensions arise as students guard the boundaries of what a school activity should be like. It emphasized the dichotomy of the informal learning practices of the students' leisure activities and the established learning traditions in a school context. But the students would also position both themselves and each other as *characters* in the game they were making. When one of the student groups added a Renaissance quiz to their game, the name of one of the students in the group, Simon, was added as an alternative to the question 'Who shaped the dome of the St. Peter Basilica?' together with Michelangelo and da Vinci. When Fiona, Max and Edwin had been working for a while on their game, Max stated that 'everything was about Fiona', referring to Fiona as one of the main characters in the game they had made. The following excerpt shows one example of *positioning as characters* as the students become engrossed in the game design experience. The 7th graders

Edwin, Fiona and Max are developing the story and dialogue for their game about the Renaissance. Fiona has the textbook in front of her, while Edwin is in front of the keyboard. Max is looking at the screen with Edwin.

Excerpt 2. Participants: Fiona, Max and Edwin

- 1 Fiona ((looking up from the textbook)) well (.) for example that (.) he is talking to people↑(.) (xxx) I agree with you (.) and goes to the Pope (.) and then we make a castle or something like that (.) then he goes down and then talks to the Pope or something like that (.) and if you don't agree you'll be put in jail (.) and then (.) if you touch some guy or another you'll die ((shifting her gaze towards Max))
- 2 Max Yes (.) and then we'll have to do this now rather than just talking
- 3 Fiona ((looking away from Max)) Yes↑
- 4 Max Yes I want mine to talk to mine
- 5 Edwin ((moving around on the chair)) This will be very very difficult
- 6 Max ↓Difficult (.) it will just be to do it
- 7 Edwin (xxx)
- 8 Max Yes I know what mine will be saying (.) mine will not (.) I know what mine will be saying
- 9 Edwin (.) Hm?
- 10 Max If I can write
- 11 Edwin What [will he
- 12 Fiona [Yeah what?
- 13 Max Well for example (1.0) sort of it will not be him who helps maybe (.) it is Fiona who will (2.0) give items ((looking at Edwin))
- 14 Fiona ((looking at the screen)) (I want to go and) say like (.) just I agree with you
- 15 Max



- ((sitting up on the chair, leaning towards the screen)) Not me (.) I'll say don't touch me I'll give you a scar↑ ((looking at Fiona, who shifts her gaze to Max)) it is my character I have to be allowed to write what I want↑
- 16 Fiona °Yes° (xxx) ((shifts her gaze back to the screen))
- 17 Max Should we start writing rather than just sitting here↑

The first point to note is how Fiona is initiating an attempt to make a game story which is informed by the school context, how people who defy the Pope are put in jail (line 1). Similar to Robin and Sally in the previous excerpt, she is orienting towards the activity by emphasizing the

norms and values of the school context. This can be seen in how the dialogue sequence is established: Her attention before suggesting a game story has been on the school textbook, a common resource within a traditional school setting. Fiona is positioning herself as a *student*, inviting the other participants to align themselves with her and establish a common goal. However, Max and Edwin evaluate her suggestion and challenge her attempt: While Max responds by saying ‘yes’, a stance marker indicating alignment (Du Bois 2007, 144), he is clearly eager to start designing instead of ‘just talking’ (line 2). He is also determined that *his own* game characters should talk to each other: ‘I want mine to talk to mine’ (line 4). Edwin states that what they might be planning to do is ‘very very difficult’ (line 5).

Participation is actively constructed and cannot be controlled by just one person – the other participants have to visibly show that they have a common orientation (C. Goodwin 2000, 1500). In this case, Fiona’s attempt at establishing a content-oriented goal for the activity that they are doing is clearly challenged, and is seen in both the verbal and embodied responses of Max and Edwin. Edwin’s utterance ‘this will be very very difficult’ is accompanied by him shifting from side to side in his chair. Max disagrees on this, stating they will just have to *do* it and that he would like to do it himself instead of watching (lines 8 and 10). In line 8 when he says ‘I know what mine will be saying,’ he takes an *epistemic stance* as he clearly states that he knows what to do and is committed to doing it (Kärkkäinen 2006), with ‘I know’ as a common epistemic stance marker (Kärkkäinen 2003, 36–37). Max is later physically sitting up on the chair and leaning towards the screen when he says ‘I’ll say don’t touch me I’ll give you a scar↑’, and looking at Fiona while saying ‘It’s my character I have to be allowed to write what I want↑’ (line 15).

A joint construction of action is not only created through talk and gesture, but also through postural orientation (C. Goodwin 2000). Fiona, who initiated the sequence, often only briefly looks at Max before shifting her gaze away from him, even when responding to him (lines 3 and 16) – the students are mainly looking at the computer screen (lines 14, 16). Fiona’s response in line 12, when addressing Max’s utterance ‘If I can write’ (line 10) with ‘Yeah what↑’ with an increase in volume and change in pitch, might indicate opposition (e.g., M. H. Goodwin, Cekaite, and Goodwin 2012). She is taking an *affective stance*, which can be defined as a ‘a mood, attitude, feeling, and disposition, as well as degrees of emotional intensity vis-à-vis some focus of concern’ (Ochs 1996, 410). Affective stances like Fiona’s anger towards Max can be seen when a participant in an interaction fails to properly cooperate in the activity (C. Goodwin 2007, 71). Here, Fiona’s affective stance shows another aspect of the tensions occurring when failing to agree not only on what the activity is about, but on how to participate.

In this excerpt, the students are again positioned within different activity frames, with Fiona emphasizing the curricular aspects of the activity, and Max focusing on the characters in the computer game and writing the game dialogue. But another aspect of how the tensions between school and leisure are made visible is also seen: How identifying with the game characters leads some students to forget, or choose to treat as irrelevant, that one of the main points of the task from a school perspective is to learn something about the Renaissance. Thus, tension is created between the students who balance learning about the Renaissance with the design process, and those who do not.

When Max states that *mine will talk to mine* in line 4, he is talking as a *game designer*, and emphasizes a sense of ownership to the character that he has designed. However, in line 15, this changes as he states: ‘I’ll say don’t touch me I’ll give you a scar↑’. Max has switched activity frames, talking on behalf of the game character he has created, referring to it as ‘I’. Shortly after, he switches back after looking at Fiona, again positioning himself as a game designer when saying ‘it is my character I have to be allowed to write what I want↑’ – again referencing that he

has *made* the character instead of referring to *himself* as the character. The action of changing his gaze from the screen and towards Fiona seems to be an indicator of the sudden shift of frame.

This excerpt shows how characteristics of computer games, namely *engrossment* and identifying with game characters, might explain some of the tensions occurring in the game design activity in the classroom. Fine (1982) showed that misunderstandings might occur when people playing role-playing games are positioned within different activity frames, and therefore perceive what is going on in the current situation in a different way – for example, failing to understand if a question is targeted at a person in her primary framework or at the character she is playing as. Moreover, players can become attached to the characters they create, identifying with the game characters to the extent that they ‘become so engrossed in the game that they may shelve their natural identity and temporarily adopt the one of their character’ (Fine 1982, 11). While this refers to creating one’s own characters within fantasy tabletop role-playing games, it also seems to take place while designing computer game characters. What Max perceives as important in the activity is influenced by his identification with the game character, making learning about the Renaissance a less important activity than making the game characters and dialogue. This contributes to creating tensions when other participants see the activity as mainly a school activity.

6. Summary and discussion

The excerpts presented have shown different aspects of tensions that arise when game design is taken into a formal learning environment, and how these tensions unfold.

The first point that should be noted is that these tensions might be due to disalignment between the students as they position themselves within different activity frames, emphasizing different aspects of the activity they are participating in. The examples reveal a common pattern in the data material, where the students identify as either students or game designers, which in turn shapes what they interpret as important in the activity. The *game designer* would often emphasize the story, game characters and creating the game world, sometimes to the extent where the school content was forgotten or made irrelevant. When the participants were positioned within an activity frame where they identified as *students*, they would balance the game design process with a focus on school knowledge, often using such artefacts as textbooks, Google or Wikipedia to support their claims. The tensions occurring were not only seen when the students had different perceptions of what was valid knowledge in the school context, but also in their moral stances based on how one was *supposed to behave*, and the emotions and uncertainty they showed when other participants failed to cooperate in the way that was expected.

However, these activity frames were *dynamic* and shifting. It seems that being *students* can be seen as the primary framework of the participants, as this governed how they commonly would perceive the activities taking place in a school context. However, the activity could quickly shift so that the participants were positioned as *game designers*. They could even become so engrossed in the game they had created that they shifted to a level of meaning where they positioned themselves as *game characters*, as Max did in the second analysed excerpt. Here, the student’s strong identification with game characters contributed to him seeing content learning as a less important factor, which can cause tensions with the students who manage to balance content learning and game design.

Ito et al. (2013) argue that connecting academic learning to what the students themselves find interesting might be beneficial to them. As seen in the data material, however, connecting

academic content to game design, linking a school task to a method resembling young people's leisure activities, sometimes creates tensions that should not be ignored. This does not mean that the method should not be used – the students were often able to balance academic learning and game design, and expressed a high level of interest in using game design in the classroom – but it is important to understand these challenges. Previously, reasons have been found that can explain why challenges arise when taking elements from young people's leisure practices into the classroom, including testing requirements and scepticism on the part of parents (Ito et al. 2013), differences in how learning is perceived from traditional teaching methods (Säljö 2010) and uncertainty from the students that the skills from their home practices will be approved by their teachers (Jenkins, Ito, and boyd 2016). A significant aspect shown in this article, however, is that the challenges explored here do not stem from structural demands, parents or teachers, but from *the students themselves* failing to align on what the task they are doing is really about.

According to a study by Chee, Mehrotra, and Ong (2015), a teacher reported that about a third of her students could be identified as 'traditional learners', who had 'become habituated to reading the textbook with the aim of memorizing content for subject tests' (524), and therefore resisted the game-based learning approach. Along the same lines, de Freitas (2006, 351) found that some tutors in her study noted that not all students were eager to use game-based learning approaches, and that some students found it challenging to return to more text-based learning methods after learning through games. This supports what have been shown in this article's analyses: There are challenges to combining activities associated with young people's leisure with what can be considered the norms and values of the classroom.

It is not uncommon that tensions arise when a practice from one domain is brought into another. When an activity that is not usually seen in school is brought into the classroom, the students need to combine and negotiate elements from different domains, which might be a challenge (see e.g., Engeström, Engeström, and Kärkkäinen 1995). The students in this study had different experiences with games from their leisure, as well as different expectations for what classroom learning should be like. Thus, this challenge became apparent, but this also presents opportunities for learning. For example, participants can reflect on and negotiate the meaning of the practices they engage with, and confrontations can be essential to creating new hybrid practices (Akkerman and Bakker 2011). However, for these practice to continue in a fruitful manner where unproductive tensions are overcome, good communication might be a key tool (Akkerman and Bakker 2011). In this study, the tensions were produced by the students, and could also be reduced by the students themselves.

While this article focuses on how tensions unfold, the data corpus also showed several instances where the students could draw on both their leisure and the frame of the classroom in a productive manner. Their interactions were then characterized by creating an activity frame where the academic content learning was in the foreground and their gaming knowledge was used as an inspiration and a resource. They facilitated a joint orientation of the task by clearly expressing their intentions, positioning their bodies such that all the participants could perceive the important aspects of the activity, and gazing and pointing to ensure that all participants were oriented towards the same resources. This finding is congruent with studies by Mercer, Wegerif, and colleagues (Mercer, Wegerif, and Dawes 1999; Mercer 2004), suggesting that classroom collaboration might work better if certain ground rules for collaboration are in place. Their findings suggest that promoting talk where participants engage critically and constructively with each other's ideas, making sure that all opinions are considered before jointly making decisions, and ensuring that "*knowledge is made publicly accountable and reasoning is visible in the talk*" (Mercer, Wegerif, and Dawes 1999, 97 italics in original) might strengthen the students'

collaboration. Thus, incorporating a set of ground rules that are facilitated by a teacher might reduce unproductive tensions and promote an activity frame where the students can draw on their leisure within the frame of a formal learning environment.

6.1 Concluding remarks

This article has explored, through the lens of activity frames and stancetaking, the tensions that might occur when bringing the design of computer games into a formal learning context. By taking a participant perspective, it has shown how tensions are created by students in the game design activity as they take on different positions. While it may not be apparent from the outside, the students are participating in complex processes where they constantly negotiate what should be considered the important aspects of the activity they are participating in, positioning themselves within and dynamically shifting between different activity frames. Understanding these processes based on students' interactions may be a step towards reducing the challenges of transferring an activity from young people's leisure into a formal learning environment. The students can then participate in an interest-driven activity where they draw on their out-of-school, game-related practices as a resource, while considering the curricular aims of the game design activity.

Three factors might have an impact on the results presented in this article. First, the role of the teacher is often important for keeping the students on track with an activity. This role is described in the introduction, where with the comment, 'Yes this is school this is absolutely school', the teacher makes Alvin switch from being positioned within an activity frame informed by a leisure context, to being oriented to the activity as a school activity. This finding is consistent with earlier research on game-based learning, which states that the teacher has a role in facilitating the students' activities (Peppler and Kafai 2007a, 152), and is crucial to making game-based learning in the classroom effective (Chee, Mehrotra, and Ong 2015, 517).

Second, the affordances of the software could influence which factors the students considered important in the game design activity. The software, *RPG Maker VX Ace*, was designed with the goal of creating games within the role-playing games genre. This genre is characterized by a strong emphasis on storytelling, a high number of game characters, and a large game world to explore. While the choice of a platform that allows for easy creation of game worlds and characters was intentional, it might have had implications for how the students oriented towards the activity, such as emphasizing narrative and character design.

Finally, the nature of design-based research should be noted. A challenge of design-based research methods is that the results of an intervention are highly context-dependent, and might change based on variables such as the participants' interests, needs, abilities, and interactions (Collins, Joseph, and Bielaczyc 2004, 17). However, as discussed in the literature review, challenges associated with introducing new technologies into the classroom are not uncommon. This article contributes to understanding these challenges by showing how tensions between students unfold.

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9. Appendix 1: Transcription key

Adapted from Jefferson (2004)

- (.) Full stop inside brackets: Micropause of no significant length
- (0.2) Number inside brackets: Timed pause
- [Square bracket: Overlapping speech
- ((interaction)): Description of non-verbal activity
- (xxx): Talk that was too unclear to transcribe
- ↑ Upward arrow: Rise in intonation
- ↓ Downward arrow: Drop in intonation
- ? Question mark: Inquiring intonation
- :: Colons: Elongated speech
- (h) Bracketed h: Laugh within the talk
- Underlined: Emphasized talk
- = Equal sign: Continuation of talk
- °word°: Quiet speech

Article 2

Øygardslia, K. (2017). Pointing, praising, and pondering: Unpacking game design as a learning activity in social studies classes. *Manuscript submitted for publication.*

Is not included due to copyright

Article 3

Øygardslia, K., & Aarsand, P. (2017). 'Move over, I will find Jerusalem': Artifacts in game design in classrooms. *Manuscript submitted for publication.*

'Move over, I will find Jerusalem': Artifacts in game design in classrooms

Kristine Øygardslia and Pål Aarsand

Abstract

When game design is conducted in classrooms as a learning activity, the students usually have digital, as well as more traditional, artifacts available. This article looks at how students organize the use of different artifacts when creating computer games about historical topics. The data informing this article consist of video data collected from one sixth-grade class and one seventh-grade class. A sociocultural perspective is used to show how the students use a combination of different artifacts as resources in knowledge building. The students jointly construct knowledge that they then integrate into computer games using artifacts such as textbooks, world maps, Google, and timelines. It is argued that within the ecology of artifacts, the textbook still has a strong epistemic authority, which also has implications for how the students proceed with their game design activity.

Introduction

When new technologies -- such as radio, TV, and computers -- are introduced into school classrooms, discussions often have followed about how such new technologies drastically will change the way we see, understand and organize education and learning (e.g., Tapscott, 1998; McLuhan, 1964). This also has been the case for computer games (Gee, 2007; Prensky, 2001). However, computer games not only can be utilized for educational purposes through *play*, but also by letting young people *design* their own computer games (e.g., Kafai & Burke, 2015, 2016).

In studies on digital technologies in the classroom, attention mainly has been focused on how to use the technology and later on for what purpose it could be used (Erstad, 2006). While the introduction and usage of digital learning tools in the classroom have been well-documented, research remains lacking on how these “new” tools are used alongside more traditional artifacts during collaborative learning activities (Cobb, McClain, de Silva Lamberg, & Dean, 2003). New technologies are “usually implemented without any consideration of how the already-established learning materials -- notebooks, blackboards, pencils, and erasers -- contribute to forming the current educational practice” (Sørensen, 2009,

p. 190). The present article unpacks the activity of game design in an elementary school classroom to investigate how students work on a task in which they must use information and communication technology (ICT), but within a subject – in this case, social studies – in which traditional learning resources still are prominent. In this article, the following research question will be explored: What artifacts do students use and how do they use them while designing history-themed computer games in the classroom?

From using to designing games

Computer games increasingly are being used for learning topics such as social studies and history. Games can be used to model complex situations in the real world (Gee, 2007), such as the Middle East conflict in *PeaceMaker* (ImpactGames, 2007), climate change in *Fate of the World* (Red Redemption, 2011), and the reasons for poverty in *Ayiti: The Cost of Life* (Global Kids & GameLab, 2006) and *3rd World Farmer* (3rd World Farmer Team, 2005). The game *This War of Mine* (11 bit studios, 2014), in which the players assume the roles of civilians in a war, has elicited critical and public acclaim and is sold on multiple platforms (Darvasi, 2016).

Games also can be used as *representations of the past*, giving players opportunities to interact with historical settings (Schrier, 2014). This has been used successfully to teach history, e.g., bringing the civilization-building history game *Civilization III* into a high school classroom, in which students “developed familiarity with game concepts and deeper understandings of relationships among history, geography, economics, and politics” (Squire & Barab, 2004, p. 505). Games about historical topics allow players to immerse themselves in the past and speculate about what could have happened under different circumstances (Simons, 2007; Uricchio, 2005). Unlike books, games also have the advantage of being *interactive*. Instead of merely *reading about* a historical topic or time period, you can *experience it* through the game, and possibly alter the outcomes of historical events. However, historical content in games should be balanced with fun and engaging gameplay (Schrier, 2014), which might be a challenge for game designers.

Software advancements have made it more accessible for game players to *create* games using technologies such as *Scratch* (MIT Media Lab, 2017), *Kodu* (Microsoft Research, 2017), and *RPG Maker* (Enterbrain, 2011), thereby creating the possibility for young people to learn not only from *playing* games made by others about history, but also by *creating* games while engaging with curricular content, constructing knowledge, and integrating it into the games (e.g., Kafai, 2006). While introducing game design as a learning activity in classrooms often has focused on learning programming (Hayes & Games, 2008;

Kafai & Burke, 2015), instead utilizing a software that allows for easy creation of game worlds, characters, and narrative content, shifts the focus to other aspects of game design. It has been argued that game design involves “a rich array of knowledge and skills,” including problem solving, art, writing, and storytelling (Salen, 2007, p. 305), and that game designers must think actively about the *content* they are implementing into games (Kafai & Burke, 2016). These are aspects that have been discussed as relevant to primary and secondary education in Western countries (e.g., Gee, 2007; Kafai & Burke, 2015, 2016; Peppler & Kafai, 2007; Selander, 2008)

Creating games has been seen as a method for students to learn “21st century skills” (Birmingham et al., 2013; Kafai & Burke, 2015; Salen, 2007), or as a way for young people to become critical players of games and active producers and participants in today’s media culture (Kafai & Burke, 2015, 2016; Peppler & Kafai, 2007). However, in studies in which game design has been used to teach subjects such as math and English, the design aspects have taken precedence over learning academic content (Ke, 2014; Oldaker, 2010). This highlights the fact that introducing game design into classrooms includes expectations for what students should gain from the experience, becoming part of an already established learning ecology. With the demand for more research on game design as a learning activity (Ke, 2014; Oldaker, 2010; Robertson & Good, 2005), the present study aims to address this by exploring *how* students’ learning activities unfold when designing games in the classroom, focusing on their use of artifacts in the game design process.

Artifacts in knowledge building

Artifacts are central parts of almost all social practices and have been described as objects made for (re)production of social and cultural practices. If we look to the classroom, artifacts range from pencils and blackboards to textbooks and computers. Artifacts are developed to do something particular; they have a particular purpose. For instance, a pencil makes it possible to write and erase what you write, and a whiteboard may be used to create a joint attention when instructing a group of students, while a map helps us navigate in unknown areas. Certain artifacts are expected to be present and even a precondition in certain social practices like schools, in the sense that without them, these would have been completely different (e.g., Latour, 1995). Humans develop and store knowledge in artifacts that takes part in, works and change the practices (Säljö, 2006; Wenger, 1998). Thus, artifacts are objectified knowledge and experiences (Ingold, 2000) that have a meaning potential within a collaborative effort

(Linell, 2009). By making information fixed, e.g., through writing, information can be passed on from person to person, and from one generation to another (Säljö, 2006).

Artifacts can be divided into different types, depending on the function they have within a certain practice (Wartofsky, 1979). Primary artifacts are tools that clearly indicate how they can and should be used, e.g., chairs and pencils, and can be seen as an extension of humans' abilities to act. Secondary artifacts cover representations, such as maps and diagrams, which can be perceived and which preserve and transmit acquired skills and modes of action. These artifacts can provide models and explanations that show us how to use primary artifacts, e.g., a manual for a mobile phone, or an inscription on a machine that tells us how to operate it. Secondary artifacts are often used to store knowledge on how to use primary artifacts. Tertiary artifacts concern imagined or possible worlds that may exist in the form of scientific theories as well as in play (McDonald et al., 2005). These artifacts are not related to primary artifacts, but are used to resonate, discuss, play with, explain, diagnose, and theorize aspects of our surroundings. It could be argued that designing a computer game means building a third-level artifact.

Wartofsky's differentiation of artifacts, based on how they are used, shows us how tools are used for many purposes in many practices, and how they are material and immaterial in nature. Thus, he also underlines the central role that artifacts have in social practices. In addition, he shows us how artifacts may be complex objects that combine material and semiotic aspects. In society today, learning is often characterized by a deep engagement with artifacts (Ludvigsen, Stahl, Law, & Cress 2015). In the present study, the notion of *artifact* is used to direct our attention to *how* the study participants use tools in the knowledge-building process while designing games.

Conducting the study

The data informing this article was collected from one sixth-grade class and one seventh-grade class in a rural school in the Eastern part of Norway. Before the data collection started, a webpage was created that included videos and tutorials to teach the students how to design their own computer games using *RPG Maker VX Ace* (Enterbrain, 2011) software. This software was chosen because it requires little programming or game design experience to create games, focusing on storytelling, character development, and game design. However, the software also contains some restrictions, including that the games must be in the genre of *role-playing games*. Also, as the activity was conducted in a social studies class, teachers and students in one way or another are expected to operate within the curriculum. This also meant

that designing *computer games* is not the main purpose of the exercise (Grover & Pea, 2013). It was both a way of learning about social studies topics, as emphasized by the teachers, and a chance for students to connect academic learning with their own interests (e.g., Ito et al., 2013). In short, the designed computer games were artifacts that were partly developed as the “answer” to the task assigned by the teacher.

The data collection proceeded as follows: Students first were observed in an ordinary classroom setting, when the topic they would create games about was introduced. The focus was on group dynamics, social interaction, and dialogue. In the second phase of data collection, the students were divided by their teacher into dyads and triads, which would design their own computer games for two consecutive days, based on the social studies topics unveiled in the previous phase. The students used the developed webpage to learn both the game design tool, as well as game design principles. In the third phase two months later, the students, already knowing how to use the software, would spend one day designing games in class about a different topic from their social studies curriculum.

Data were collected using three video cameras: two stationary cameras and one hand-held camera. The stationary cameras were used to record video of a three-person focus group at all times, with one camera placed in the front of the group to capture the social interaction of the student group, while another camera was used to record the students’ computer screen. The hand-held camera was used to capture classroom interactions as they occurred in the rest of the class during the project period.

The video data were first organized in a content log that included short narrative summaries of events that occurred (Derry et al., 2010), as well as rough transcriptions of dialogue and categories that emerged as being significant – in this case, how the students’ use of artifacts emerged as a category. As recurring patterns of how students used artifacts were seen in the data, events were selected that demonstrated different aspects of students’ artifact use. From these, selected events were transcribed in detail using Jeffersonian transcript notations (see *Appendix*). Images were included to provide information on non-verbal interactions that were relevant to the analyses, drawn from screenshots of the video data. Data were analyzed using analytical concepts from conversation analysis (e.g., C. Goodwin & Heritage, 1990), focusing on the social organization of the activities.

In the analysis, excerpts are presented at different stages in the game design process: when creating the game story and game world, and when designing game characters. These excerpts were selected because they illustrated a recurring pattern in the data regarding how the students used a variety of artifacts to accomplish game design tasks.

Designing games about history in the classroom

Designing computer games in the classroom involves several artifacts. What may strike many teachers (and students) as new in this process is the use of special designer software.

Introducing new technologies changes classroom dynamics, adding to traditional practices established over centuries with artifacts such as pencils, textbooks, and blackboards (Arnseth, 2011). Within the classroom's epistemic ecology, students are expected to learn or know how to handle relevant artifacts when solving school tasks.

In the present study, the classroom is seen as a community of practice consisting of various artifacts in which attention is placed on how maps, books, and images become central when designing a computer game. We focus on how students collaborated and used different artifacts to create computer games, as well as show how they engage with different artifacts in this endeavor. The following episodes demonstrate several aspects of how artifacts are used and function in the students' game design process.


Creating the game story: the Crusader's journey

The following excerpt shows how a physical world map hanging on the wall becomes an important artifact for students when creating a virtual representation in the game world.

The seventh grade students Peter, Casper, and Samuel are designing a computer game on the topic the *Middle Ages*. The boys decided to make a game about the Crusades. They just watched the first game design instruction video and were prompted by the software to name their *game map*, which is the term used to describe an area in which the player can move within a given time, such as a city, ocean, or house. Casper controls the keyboard, while Peter and Samuel sit on each side. A large, raised relief map of Europe hangs on the wall just beside them. When the excerpt starts, the students discuss where the Crusaders came from, as this marks the start of the journey and the name of the game map. Casper argues for naming the map "Rome."

Excerpt 1. Participants: Peter, Casper, and Samuel.

- | | | |
|---|-------------------|--|
| 1 | Peter | But we could take ((<i>climbs the chair</i>)) look here ((<i>points at the map</i>)) if we find Rome (.) don't really know where it is(h) (.) <u>Rome</u> (.) there is <u>Rome</u> |
| 2 | Casper | Is <u>that Rome</u> ? |
| 3 | Peter | Yes there is <u>Rome</u> ((<i>climbs down from the chair, still pointing at the map</i>)) yes Rome lies there ((<i>pointing</i>)) then he goes [around here (.) up here (.) down there (.) over there ((<i>tracing the movement with his finger pressed on the map</i>)) |
| 4 | Samuel/
Casper | [[<i>(Turns away from Peter and looks in another direction)</i>]] |
| 5 | Peter | And over to ((<i>laughing</i>)) I don't know where that is (.) I don't know where Jerusa (.) Jerusalem is |

- 6 Casper ((Turns toward Peter again, gets up, and looks at the map)) Jerusalem?
7 Peter Yes
8 Casper Are you stupid or what? Jerusalem is down here ((pointing)) move over (.) I will find Jerusalem for you
9 Peter ((Points)) It is (.) here
10 Casper °Here's Jerusalem°
11 Peter ((Points with Casper down at the map, then a bit further up on the map)) Yes (1.0) then he goes from (.) [here
12 Casper [He has to go here (.) you know ((pointing around the same place as Peter))
13 Peter ((Traces the map with Casper while talking)) Then he goes here (.) up here (.) and down here (.) and there (.) and then he goes [between
- 
- 14 Casper [Then it was Yugoslavia (.) wasn't it?
15 Peter ((Points at the map while talking)) And then he goes over here (.) and he drives over the Black Sea down here
16 Casper ((Holds his hand on top of Peter's while pointing)) But we must say that he must cross a river (.) and here's a river
17 Peter He must cross a river?
18 Casper Yes (.) and there are crocodiles in it
19 Peter Yes.
20 Casper Then he will take a sword and kill them ((goes away from the map, looks at Samuel, and nods while Peter keeps pointing at the map)).

Peter climbs on the chair and gazes at the map on the wall while searching for and finding Rome: “don’t really know where it is(h) (.) Rome (.) there is Rome” (line 1). Casper does not seem familiar with the location of Rome on the map, but Peter assures him that it is correct. Still keeping his finger on the map, Peter gets down from the chair and starts tracing a path from Rome to the east. Thus, he begins shaping the game story about the player character’s journey as a Crusader. But Peter encounters a challenge – laughingly stating that he did not know exactly where to find Jerusalem (line 5). According to Casper, this is something he obviously should know: “Are you stupid or what? Jerusalem is down here ((pointing)). Move over (.) I will find Jerusalem for you” (line 8). Taking an *epistemic stance*, meaning that he is “marking the degree of commitment to what one is saying, or marking attitudes toward knowledge” (Kärkkäinen, 2006, p. 75), Casper says he knows this and intends to demonstrate it. The boys then point at the map together and trace the main character’s journey on the map

of Europe (line 11-16) as they comment on places they pass on the map: “Then it was Yugoslavia (. . .) wasn’t it?” (line 14), or places that have consequences regarding how they designed the game: “And then he goes over here, and he drives over *the Black Sea* down here” (line 15). Here, it can be seen how a new element is introduced to the Crusader’s journey: Casper says the protagonist must cross a river where there are crocodiles, which Peter aligns with (lines 16-19) – and then “he will take a sword and kill them” (line 20), as Casper states. Casper moves away from the map, looks at Samuel, and nods.

In this excerpt, a physical map hanging on the wall in the classroom becomes an important artifact when developing the game plot and designing the game map in the software. It works as a joint focus of attention and as a visualization of the possible game world. Peter even climbs atop the chair to make it easier to interact with the map, positioning his body in a way that makes it easier to experience and understand the important features of the joint activity of constructing the game story and finding relevant places on the map (e.g., C. Goodwin, 2007). Through looking at and touching the map, they traced the game character’s journey with their hands, inspecting the names of the countries, cities, and seas. The embodied experience of investigating and touching the possible route made them talk about how to travel across the landscape (land and bodies of water). Through this inspection, the students identify places that may hold importance for the game story: The Crusader must cross a river, pointed out on the map by Casper (line 16), and this river has crocodiles that he will have to fight and kill to clear it. Here, the function of the artifact as used by the students changes – Casper invites Peter to take part in a joint storytelling activity that he aligns with, with the map as an artifact establishing their joint focus of attention. While Samuel observes during most of the sequence, Casper meets his gaze and nods after stating that the protagonist will kill the crocodiles (line 20), inviting him to align with the other students’ constructed story world (Sidnell, 2011).

Conflict is at the core of every game story (Skolnick, 2014). Here, the students not only seem to draw on their own gaming experiences, but also adjust them to the demands for historical facts that are present within a school context. In short, the students used the map to both situate the Crusaders geographically and identify locations for upcoming game tasks on their travels between Rome and Jerusalem.

Building the game world: churches in Florence

When designing a computer game related to the social studies curriculum, students often consulted books or webpages to make their games historically accurate. In Excerpt 2, the

students were engaged in a discussion of what kinds of buildings there should be in a Renaissance city -- in this case, Florence. They identified two churches named Santa Maria. The question is: Which church should be the model for the one they are going to use in the game? To solve this problem, the students used both their textbook and digital artifacts.

When we enter the excerpt, the three seventh-graders are facing the screen. Samantha is in the middle with June and Marcus at her sides. The software they use for the game creation, *RPG Maker VX Ace*, is on the screen. June has an open social studies textbook in front of her.

Excerpt 2. Participants: Marcus, Samantha, and June:

- 1 Samantha >and we can make that church< ((points at a picture in the book, then turns toward Marcus))
- 2 Marcus And white houses
- 3 Samantha But I think we should have a little bit larger area (.) ((opening a browser and navigating to Google)) we'll search for ((writing "florence renaissance" in the search field and opens the results for image search)) Florence (xxx) let's see
- 4 June ((Turning pages in the textbook while Marcus and Samantha study the screen)) (.) ((moving closer to the others and looking at the screen with them))
- 5 Marcus We can try to make that church ((pointing with his finger at the screen))
- 6 Samantha Yeah but you see there are two churches you see with that name (.) it is that (red one) ((pointing)) and the other one is (the one that has the) ((pointing)) if it is not the same though (.) °don't know° (.) I could have been there!



- 7 Marcus But that isn't Florence is it?
- 8 Samantha ((Turning toward Marcus, smiling)) I have been there twice (.) I have been inside there once but I have been (.) (three two there)
- 9 Marcus That looks like ((June and Samantha lean in closer to the screen, study it for four seconds))
- 10 Samantha M::hm (.) it might be that it was there but that they tore it down (.) then it is
- 11 Marcus What is the name of the church that is there?
- 12 Samantha ((Looks down into the textbook)) Santa Maria (.) something and the other one is also called Santa Maria (.) something else (.) but it is something more (.) a difference (.) on both of them

When searching for images, the students encounter a picture they find amusing, giggle a bit, then continue searching for the church.

- 17 Marcus But we can try to make that church ((*leaning across the table and pointing at a picture in the book*)) or that church



- 18 June ((*Turning pages in the textbook*))
19 Samantha ((*Turning pages in the textbook*)) (xxx) and there is that one ((*pointing at an image, turning pages back to an earlier page*)) I think there are two different churches
20 Marcus Yes (.) but (.) I would rather make that one (.) ((*starts writing in the search box*)) what was the name
21 Samantha Santa [Maria
22 Marcus [<Santa Maria>
23 Samantha But there can be more churches with that name though (.) so you have to take (.) Florence (.) yes there both are showing (3.0) but look ((*pointing at the screen*)) that church is sort of in the middle of many houses
24 Marcus In the middle of the town in a way
25 Samantha Yes
26 Marcus We should have made that one ((*pointing*)) then
27 Samantha Yes

When the students discuss what the town should look like, Samantha suggests that they make a church that looks like the one in the book (line 1). Marcus, who wants to add white houses, continues with this idea. The textbook functions as a starting point for the students' discussion. The picture in the book does not seem to fulfill what Samantha has in mind, and she does a Google search for pictures of Florence and the Renaissance (line 3). June, who has been looking in the textbook, now switches her focus to the screen, which works as a joint focus of attention toward which all three students are pointing and gazing, while orienting their bodies toward each other or leaning forward (lines 1-27).

Marcus then suggests that they create a church that turns up from the image search. Samantha makes it clear that this is not that easy and tells him that there are two churches with a similar name, but that they do not look the same (line 6). She says she is not sure about which church is the right one. The students want the game world to correspond with how it

may have looked like during the Renaissance. Thus, books, as well as Google, are used as resources in the reproduction of historical facts. The discussion of how it looked like is running throughout this excerpt, and in this discussion, the students use different artifacts -- the textbook and Google -- as resources. We can see how Marcus isn't sure that the images they found on Google are from Florence, doubting the epistemic authority (e.g., Heritage & Raymond, 2005) of the source (line 7). Samantha smiles as she tells them that she has been in Florence twice, thereby positioning herself as someone who knows. However, she does not seem to recognize any of the churches and suggests that it might be possible that the church has been torn down (line 6-10). During this sequence, they are all studying the pictures on the screen. Marcus asks what the name of the church is, and Samantha, using the textbook, finds that they are both called "Santa Maria" something (lines 10 and 12). After continuing the image search, Marcus points at one of the churches and suggests that they should use that church in the game (line 17). Samantha looks at the textbook, points at an image, and tells him, "I think there are two different churches" (line 19). Marcus agrees, but tells her that he would rather create the church that he showed her, then starts to search for images of this church (line 20). Samantha points out that there might be more churches with that name, and that he should, therefore, add "Florence" to his search keywords (line 23). They find that both churches are showing up, but that one of the churches is located in "the middle of many houses," or a town. They decide to choose this church as a model for the game (lines 25 to 27), and which later is implemented into their game (*Figure 1*).

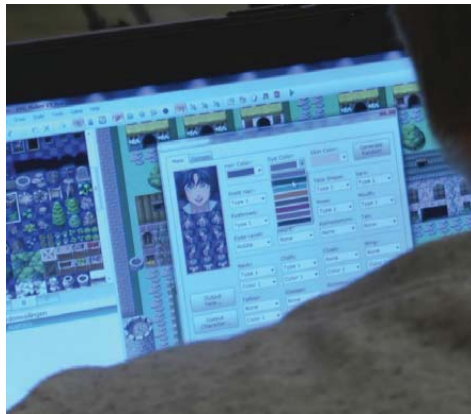


Figure 1: The Santa Maria Church in the students' game world. The church added to the game world is seen in the lower-right corner of the screenshot in line 6.

Professional game creators will often spend time researching the setting in which the game takes place, such as Renaissance Italy, utilizing resources such as books and online resources (Heussner, Finley, Hepler, & Lemay, 2015). Similarly, in this excerpt, students shift between using the textbook and a Google Images search. Their textbook is the students' point of departure, and the information they find on Google is compared with what they can find in the textbook. Knowledge is graded and influenced by the social norms of the setting in which it occurs (Stivers, Mondada, & Steensig, 2011), and here, the textbook has the epistemic authority.

Creating game characters: Designing Magellan

When designing characters for their game, the students often would start by designing the character controlled by the player, often using their textbook as a reference to ensure that the game characters look accurate. The following excerpt shows how three seventh-grade students created their player character, the explorer Magellan, and how artifacts were used to make him look as similar as possible to a picture in the textbook. They are using a character-creation editor that is part of the game design software (*Figure 2*), in which they can choose between options such as gender, hair and eye color, facial shape, and other features.



Figures 2 and 3: To the left, Marcus uses the character generator. To the right, a picture of Magellan as it appears in the students' textbook (Aarre, Flatby, & Lunnan, 2008).

Samantha is sitting in the middle with the computer in front of her, with Marcus and June on each side. An open textbook sits beside June. When this excerpt starts, the students have just finished watching a video tutorial about creating game characters. Marcus is in control of the mouse and keyboard.

Excerpt 3. Participants: June, Samantha and Marcus.

- 1 Marcus OK it was there (2.0) and there (1.0) this is a boy
 2 Samantha Eh wait a bit (.) can I ((*bends down toward the book that June has in front of her and sets it upright, looks at a picture in the book (figure 3) with June and Marcus*)) (we can look in the book a bit now)
 3 Marcus ((*Looks back on the screen*)) At least he has a black ↑beard then
 4 June ((*Bends down toward the book*)) Yes
 5 Marcus But what is his eye color (.) do you see that?
 6 Samantha ((*Looks in the book with June and Marcus, puts the book down and looks back on the screen*)) We'll take brown
 7 Marcus Brown?
 8 Samantha Blue looks a bit
 9 Marcus A::h >is that brown?<
 10 June Ye:ah=
 11 Marcus =Okay (.) what skin color? ((*gazes toward the book, then back to the screen*))
 12 Samantha ((*Looks down into the book with June, then on the screen*)) Not (.) so very pale
 13 Marcus That one? °is° (.) he is not that one (.) he is not that one (.)
 14 Samantha He is the (.) first
 15 June Yes
 16 Marcus Key th:en (2.0) e:hm

The students continue creating the game character, deciding on his hair, facial shape, and what his mouth should look like.

- 82 Marcus OK he didn't have any of that (.) tail (.) ↑he had a tail ↑ ((*talks with raised pitch*))
 83 Samantha No he didn't (.) ((*frowns*)) wings ↑

Marcus has opened the character generator and says the character they should make is a boy (line 1). They are prompted to choose the gender of the character before choosing facial features, clothing, and other aspects of the character's look. Samantha points out that they should look in the book (line 2), setting it upright so that she, June, and Marcus can see it, establishing a joint focus of attention in which they all can study the picture. According to Goodwin (C. Goodwin, 2007, p. 61), to conduct relevant actions, it is necessary that all participants position themselves so that they can clearly perceive each other and the structures in the environment that have importance for the activity in question. The textbook and the portrait of Magellan become a joint starting point for the activity to determine what their main character should look like. When putting together the main character, they compare it with the image in the book (lines 3-15). Marcus states that the character should at least have a black beard, which June agrees to after looking at the image of Magellan in the book (line 4). Marcus then asks about eye color, to which Samantha, June, and Marcus all look in the book

and agree they should be brown (lines 5-10). Marcus then asks about skin color, to which Samantha responds “Not (.) so very pale” while studying the image in the book (lines 11-12). Marcus then goes through different options, asking if it is “this one,” then stating “not that one” and “not that one.” Samantha suggests that it is the first one, June agrees, and Marcus finally chooses it (lines 13-16). This sequence shows how the students ascribe epistemic authority to the textbook, a classroom artifact associated with what students are supposed to know (Selander, 2008, p. 13), using the picture in the book as a model of how Magellan should look like in their game. Designing the main character is a joint accomplishment. Marcus is in control of the mouse and keyboard, physically creating the character on the screen, but before he makes the choices, he seeks confirmations and alignments from June and Samantha, who have better access to the textbook. While the keyboard and mouse are undisputed and taken for granted while creating the game, the picture in the textbook becomes an object of negotiation that both stimulates and restricts how they act -- not in terms of how to use it, but in terms of how to read and translate it to the screen.

After creating the eyebrows and finding a beard for their character, they move on to the next category in the character generator. This includes features often related to high fantasy, such as elven ears and tails, which means that the textbook is no longer considered a relevant artifact in designing the game character. Marcus states that he “didn’t have any of that,” but when he finds that it is possible to add a tail, he says “↑he had a tail↑” with a high-pitched voice (line 82), indicating a shift to a frame (M. H. Goodwin, 1996) in which the activity is perceived as more playful. Samantha, however, states that Magellan didn’t have a tail, frowns, and says “wings” with a disapproving voice, clearly disaligning with Marcus.

While the computer is the primary artifact that the students are using to create their games, secondary artifacts provide guidance on how the primary artifacts should be used, functioning as models for how to think and act (Säljö, 2006). The game design software provides possibilities and limitations on what the students can design, while the textbooks are used as a historical reference point for what the game character should look like to be “correct.” The characters they create spring from a process of analysis and discussion of the pictures in the textbook, deciding on what the character historically should look like and discovering what the game design software allows them to do.

Creating well-thought-out game characters is often emphasized by game designers – not only will the player experience the game world through this character, but the design also may convey meaning about the character, such as his or her backstory (e.g., Heussner et al., 2015). In this context, the difference is that this must be informed by what the historical

person behind the character they are making was like. While the software used by the students allowed them to create characters with wings and a tail, the students' source for how the game should be made is their textbook, an artifact that stores knowledge of what Magellan looked like, which they, in turn, embed into their character.

Summary and discussion

This article explores what artifacts students use when designing computer games in the classroom, as well as *how* they use them. From the analyses, the following main findings should be highlighted:

First, traditional artifacts were used as resources for students' game design activities in all phases of the process. When creating one game story, a map was used to geographically locate the places the game's protagonist would visit on his journey from Rome to Jerusalem. When designing another game world, students combined textbooks and Google Images searches to decide what Renaissance Florence should look like. And when the students created the main character for another game, Magellan, an image in the textbook was used to make the game character look as much like Magellan as possible.

Second, the artifacts used appear to differ with regard to epistemic authority (Heritage & Raymond, 2005). While it has been speculated that digital artifacts introduced into classrooms might challenge the relevance of textbooks (Skantz Åberg, Lantz-Andersson, & Pramling, 2014; Åkerfeldt, 2014), the episodes presented and the data corpus of this project show that the textbook is used both as a starting point for the activity, and to verify knowledge claims made by other students. The students in this research project often emphasized making their computer games historically accurate, which is likely to be because the project is a school activity conducted in a classroom environment. Secondary artifacts, such as textbooks and world maps, preserve beliefs and ideas about how we should act (Hauge, 2006; McDonald, Le, Higgins, & Podmore, 2005). The textbook is an example of an artifact that represents what students should know (Selander, 2008, p. 13), and this is seen in the presented excerpts.

Third, the interplay between artifacts on different levels is central to the students' knowledge building, and the function of the artifact might quickly change in the students' activities. For example, while the function of a map of Europe is to transmit geographical knowledge – a secondary artifact in Wartofsky's terms – the students used it as a focus of attention to jointly create a game story, making it more like tertiary artifacts, in which imagined worlds and play are central (McDonald et al., 2005; Wartofsky, 1979).

Artifacts in game design in the classroom

Game designers engage with knowledge areas such as art, problem solving, and storytelling (Salen, 2007). They need to balance historical accuracy with fun gameplay (Schrier, 2014), research game settings (Heussner et al., 2015), and integrate content with game mechanics (Kafai & Burke, 2016). The students in this project proceeded similarly, using an artifact – game design software – that has been used to create critically acclaimed games for entertainment (e.g., Freebird Games, 2011; Vagabond Dog, 2014). However, as the activity took place in classrooms, the stories they created, the worlds they built, and the characters they made were influenced by the larger classroom ecology, which included existing artifacts and social norms and values concerning what classroom learning should be about.

It was at this nexus where students' knowledge building took place. While creating the stories, game worlds, and characters, they jointly established where different cities were located on a map, what Florence in the Renaissance looked like, and what the explorer Magellan looked like – at least according to the textbook. In the interplay between the new software and the established artifacts, the students created a new artifact – a game, i.e., a tertiary artifact – designed by students drawing upon what was available in the classroom environment and from their understanding of games, building their knowledge of historical facts into the games.

As noted by Kafai & Burke (2016), “learning in game making is situated in designing a public and shareable artifact” (Kindle location 919), and much of the appeal from learning through creating is that young people can make games that their friends can play, incorporating well-known game elements (Good & Robertson, 2006). Tensions sometimes surfaced between what the game design software allowed the students to create and what the students perceived as acceptable to include. Adding elven ears to characters was a matter of negotiation, and historically correct content could be undermined by epic quests, as when crocodiles – not a species native to the Black Sea – were slain by a Crusader during his journey to Jerusalem.

Thus, introducing software used by game designers into a classroom context allows students both to draw on the playful, narratively focused aspects of games and build knowledge associated with classroom learning into games. In both cases, however, it is clear that when game design enters a classroom, it does not render already established artifacts obsolete. On the contrary – these artifacts are a vital part of the game design process and should be available and taken into consideration when introducing game design as a learning activity. The students creating a game story about the Crusades had a map right beside them,

and they only needed to climb up on the chair to be able to physically trace the movement of their game's main character. Furthermore, when Marcus, Samantha, and June needed more information about the images they saw in the textbook, they had a large pool of knowledge available at their fingertips. Game design in classrooms is not only done on a computer. The activity happens through interplay between the newly introduced software and the established artifacts available.

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Appendix: Transcript notations

Adapted from Jefferson (2004)

(.)	Full stop inside brackets: Micropause of no significant length
(0.2)	Number inside brackets: Timed pause
[]	Square brackets: Overlapping speech
((<i>smile</i>))	Italics inside brackets: Description of non-verbal activity
(xxx)	Bracketed xxx: Talk that was too unclear to transcribe
(word)	Text within brackets: Unclear talk/doubtful transcription
?	Question mark: Inquiring intonation
↑	Upward arrow: Rise in intonation
↓	Downward arrow: Drop in intonation
> <	Talking with increased speed
:::	Colons: Elongated speech
(h)	Bracketed h: Laugh within the talk
<u>talk</u>	Underlined: Emphasized talk
=	Equal sign: Continuation of talk
°word°	Degree sign: Quiet speech
<i>word</i>	Italics, no brackets: Words uttered in English in original

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