Playing with Sequential Learning and and Inquiry Processes by Bringing "World of Warcraft" to the Real World

Based on Reflective Practice-based Learning

Jensen, Camilla Gyldendahl

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AUTHOR CV

I graduated in Architecture and Design at Aalborg University in 2004, with a specialisation in the topic of "Integrated Building Design". This topic is about combining technology, aesthetics and function into coherent and holistic solutions through analytical, theoretical and practical perspectives. I have been employed at UCN, Technology, the education of Architectural Technology and Construction Management since January 2007, where I primarily teach in communication, innovation, methodology and integrated building design.

Topics such as innovation and integrated building design are difficult to learn through simple knowledge transfer and therefore require complex learning processes that interfere with students' past life experiences. In my first years as a teacher, I found that the students could not apply or understand the knowledge that was taught. The students did not develop the necessary skills on their own to be able to work with particularly integrated building design. Consequently, my work has always been focused on the development of specific and practical tools regarding framing and scaffolding the students' learning processes.

In recent years, my focus has therefore been the facilitation and scaffolding of learning processes in which particular Game-Based Learning has had my interest. Based on my education as an architect, I have, in this regard, paid particular attention to how Design Thinking can contribute to the development of new learning concepts that strengthen the students' reflective and analytical skills.

Camilla Gyldendahl Jensen, January 2020

ENGLISH SUMMARY

The process of globalisation has shown a growing need to rethink the jobs of the future, as the world is changing towards a transformation and refinement in the creation and sharing of knowledge. It also means that the concept of knowledge is changing, where knowledge is moved from something stationary to something that is continuously created and changed through analytical and reflective processes. Instead, global learning environments with a multimodal approach consisting of different kinds of resources create meaning through processes of reflection. The students' reflexive skills are, therefore, crucial regarding being able to apply their knowledge to innovative use.

According to the OECD (2019), the educational institution is a important factor in order to equipping students with the right competencies needed to succeed in the global future. In particular, the trends "increase of complexity" and "speed of change" show that it has never been more urgent that education continues to evolve in order to provide the necessary skills and competencies for a modern world. There seems to be a consensus among researchers about what an educational shift entails, and that it includes the implementation of keywords such as "connect", "share", "analyse", "assess", "apply", "personalise", "engage", "streamline", "include", "know", "computing" and "construct".

The trend is, therefore, that the educational institutions focus on developing new and more active forms of learning that can accommodate the students playing with knowledge and new ideas. It means that the students become partners in their learning process through participation in active knowledge creation. The OECD (2019) also states that "the future is rarely just a smooth continuation of past patterns" and therefore advocates a shift away from the traditional, lecture-based lessons that simply transmit knowledge about a topic, and toward new educational concepts such as authentic learning, project-based learning, challenge-based learning, competency-based learning, inquiry-based learning, etc.

However, it can be challenging to create a movement towards a new educational paradigm, as this challenge is multifaceted in a way that calls for learning models based on complex design criteria. Although many educational institutions have begun bridging the gap between academic knowledge and practice, there is still a need for investment in the development of high-quality teaching that supports the necessary in-depth learning.

The concept of Game-Based Learning, and especially "Massively Multiplayer Online Role-Playing Games" (MMORPGs), has gained focus in the educational sector as an inspiration for new types of active learning experiences. Games present elements that can inspire the creation of active learning experiences that challenge students to apply new knowledge, solve problems and explore different viewpoints. The new interest in using game principles in educational contexts entails a reassessment of working with new opportunities for creating reflective, explorative and practice-based learning through concepts like quests and levels, missions, crafting and farming, and personal trajectories of narratives. As a learning concept, games are thus interesting as they provide stories that naturally connect and create patterns of knowledge through social norms and values. Particularly in higher education, games can be a source of inspiration when it comes to developing and exploring new models for how academic activities can be enhanced through learning situations with an individual expression related to the qualifications of participants, content and context, as well as the learning outcomes. Research within Game-Based Learning can still be characterised as an emerging field; it is considered heterogeneous when it comes to research designs. The research field has experienced significant changes as new technological developments have influenced the concepts behind Game-Based Learning. One final dimension is that the prevalence of Game-Based Learning is far lower in higher education than in the other educational sectors. This means that there is a need for an increased focus on how Game-Based Learning can inspire and challenge the academic teaching environments where learning has entirely different characteristics, such as being much more problem-oriented, analytical and reflective.

This PhD project aims to investigate and experiment with “Reflective Practice-based Learning (RPL)”, which is a new learning approach at University College ’of Northern Denmark (UCN), through the use of Game-Based Learning. Since 2013, UCN has invested actively in developing new frameworks and concepts for future education through the implementation of Reflective Practice-based Learning as a new common learning approach. The goal is to ensure that students are ready for the future labour market by being able to acquire new knowledge, skills and competencies that can both qualify and develop practice. The core of UCN’s approach to learning is the interaction between theory and practice, where the students, through effective learning strategies, must be able to analyse, solve problems, develop, communicate, explore, investigate and practise through reflection processes.

A large proportion of the students in technology programmes at UCN have a previous vocational background as the basis for their entry into higher education. These students are experts in following instructions with a primary focus on finding the “right solution” and draw on these experiences when forming the framework of their learning. Now they need to be reflective, have an analytical approach to a project, be innovative and creative. They must be able to collaborate and share their knowledge across programmes, disciplines and nationalities while adopting a critical approach to what they are working with. At the same time, they still encounter an educational system that tends to consider learning and the acquisition of knowledge through a professional and straightforward progression of isolated activities.

Within the pragmatic paradigm, this PhD project developed knowledge through the use of Educational Design Research. It used a mixed-method approach to data collection and abductive reasoning to investigate how a perspective of Game-Based Learning inspires the development of a new teaching and pedagogical concept with the aim of strengthening practice professionalism through sequential learning and inquiry processes in a higher education learning environment. Through a theoretical understanding of World of Warcraft, the PhD project thus examines how a designed learning game affects the pedagogical concepts of motivation and autonomy, analysis and exploration, and reflective practice through the use of game principles.

The domain of Practice Theory will inspire the theoretical perspective through an understanding and interpretation of learning as “landscapes of practice” consisting of designed complex and personal learning trajectories. By considering learning as a complex landscape of personal learning trajectories, the PhD project will argue that it creates an opportunity to think in terms of design strategies that more effectively facilitate students through meaningful learning processes built around an explorative approach to traditional academic disciplines.

RESUME IN DANISH

Den øgede Globalisering har skabt et stigende behov for at nytænke fremtidens arbejdspladser. I en verden hvor evnen til at transformere viden er afgørende er tilegnelsen af generiske kompetencer essentielle. Det betyder også, at konceptet videnskabelse ændrer sig fra at være noget stationært til noget, der kontinuerligt skabes og forandres gennem analytiske og refleksive processer. Nye strømninger skaber en række samfundsmæssige og sociale tendenser, som bidrager til stadigt mere komplicerede kollaborative samarbejdsprocesser, hvorved viden som begreb forandres. Det betyder at globale læringsmiljøer, med en multimodal tilgang bestående af forskellige slags ressourcer bliver meningsskabende via refleksionsprocesser. De studerendes refleksive kompetencer er derfor afgørende i forhold til, at kunne bringe deres viden i innovativ anvendelse.

I følge OECD (2019) er uddannelsesinstitutionerne en afgørende faktor for at uddanne de studerende med de rigtige kompetencer, der er nødvendige for at få succes i den globale fremtid. Især tendenserne "en øget kompleksitet" og "Forandringernes hastighed" viser, at det aldrig har været mere presserende, at uddannelsesektoren fortsætter med at udvikle sig for at sikre at de studerende opnår nødvendige færdigheder og kompetencer til en moderne verden. Blandt forskere er der enighed om hvad dette uddannelsesmæssige skift indebærer, og at det inkluderer implementering af nøgleord som forbinde, dele, analysere, vurdere, anvende, tilpasse, engagere, strømline, omfatte, kende, programmere og konstruere.

Tendensen er derfor, at uddannelsesinstitutionerne har fokius på at udvikle nye og mere aktive læringsformer, der kan rumme at de studerende aktivt leger med viden og nye ideer. Det betyder, at de studerende bliver partnere i deres læringsproces gennem deltagelse i en aktiv videnskabelse. Ifølge OECD (2019) er "fremtiden sjældent en simpel fortsættelse af fortidens mønstre" og avokerer derfor for et skifte væk fra de traditionelle forelæsningsbaserede undervisningsformer der overfører viden om et emne, til nye uddannelsesmæssige begreber, som autentisk læring; Projektbaseret læring; Udfordringsbaseret læring; Kompetencebaseret læring; undersøgelsesbaseret læring. Det kan imidlertid være vanskeligt at skabe denne bevægelse hen imod et nyt uddannelsesparadigme, da udfordringen er mangefacetteret hvilket kræver læringsmodeller baseret på komplekse designkriterier. Selvom mange uddannelsesinstitutioner er begyndt at bygge bro mellem akademisk viden og praksis, er der stadig et behov for at investere i udvikling af kvalitetsundervisning, der understøtter den nødvendige dybdegående læring, der er afgørende for udviklingen af 21. century kompetencer.

Begrebet Game-Based Learning og især genren "Massively multiplayer online role-playing games" (MMORPG) har vundet indpas i uddannelsessektoren ved at inspirere til nye typer af aktive læringserfaringer, der udfordrer de studerende til at anvende deres viden på nye måder, løse problemer og udforske forskellige synspunkter. Anvendelsen af Game-Based Learning i uddannelsesmæssig sammenhænge indebærer en revurdering af måden hvorpå der kan skabes reflekterende, udforskende og praksisbaseret læring gennem nye koncepter som quest og levels, missioner, crafting og farming. Som læringskoncept er spil således interessante, da de udfordrer de studerende gennem narrativer, der naturligt forbinder og skaber videnmønstre gennem sociale normer og værdier. Specielt indenfor videregående uddannelser kan game-based learning være en kilde til inspiration, når det kommer til at udvikle og udforske nye modeller for, hvordan akademiske aktiviteter kan læres gennem undervisningssituationer med et individuelt udtryk der relaterer til de studerendes kvalifikationer kombineret med uddannelsens indhold og kontekst.

Forskning inden for Game-Based Learning kan stadig karakteriseres som et voksende forskningfelt, hvor en stor grad af heterogenitet skaber stor diversitet i projekternes forskningsdesign. Forskningsfeltet har oplevet betydelige forandringer efterhånden som udviklingen af nye teknologiske mulighed har påvirket koncepterne bag spilbaseret læring. En anden dimension er, at udbredelsen af game-based learning er væsentlig mindre på de videregående uddannelser sammenlignet med andre uddannelsessektorer. Det betyder, at der er behov for et øget fokus på, hvordan game based learning kan inspirere og udfordre de akademiske undervisningsmiljøer på de videregående uddannelser, hvor læring har helt forskellige egenskaber, såsom at være meget mere problemorienteret, analytisk og reflekterende.

Ph.d.-projektet sigter således mod at undersøge og eksperimentere med "Refleksiv Praksis Læring (RPL)", som er en ny læringsmetode på University College Nordjylland (UCN), ved hjælp af Game-Based Learning . UCN har siden 2013 investeret aktivt i at udvikle nye rammer og koncepter for fremtidig uddannelse gennem implementeringen af Refleksiv Praksis Læring som en ny fælles læringsmetode. Målet er at sikre, at de studerende bliver klar til det fremtidige arbejdsmarked ved at kunne tilegne sig ny viden, færdigheder og kompetencer, der både kan kvalificere og udvikle praksis. Kernen i UCNs tilgang til læring er samspillet mellem teori og praksis, hvor de studerende gennem effektive læringsstrategier skal være i stand til at analysere, løse problemer, udvikle, kommunikere, udforske, undersøge, f.eks. praksis gennem reflektionsprocesser.

En stor andel af de studerende på teknologiuddannelserne på UCN har en tidligere erhvervsmæssig baggrund som grundlag for deres optagelse på en videregående uddannelse. Disse studerende er eksperter i at følge instruktioner med et primært fokus på at finde den "rigtige løsning" og trækker på disse oplevelser, når de skaber rammen for deres læring. De skal nu til at være reflekterende, have en analytisk tilgang til et projekt, være innovative og kreative. De skal være i stand til at samarbejde og dele deres viden på tværs af programmer, discipliner, nationaliteter, mens de har en kritisk tilgang til, hvad de arbejder med. Samtidig støder de stadig på et uddannelsessystem, der har tendens til at opfatte og forstå læring og videnskabelse gennem en lineær progression af isolerede professionsrettede aktiviteter.

Med afsæt i det pragmatiske paradigme har dette PhD projekt til formål at udvikle ny viden gennem anvendelsen af educational design research. Der anvendes en mixed method tilgang til dataindsamling kombineret med en abdutiv analysetilgang i forhold til at kunne undersøge hvordan perspektiverne bag Game-Based Learning kan inspirere til udviklingen af nye undervisnings- og pædagogiske koncepter med det formål at styrke praksis relateret professionalisme gennem stilladserede lærings- og udforskningsprocesser i et videregående uddannelsesmiljø. Gennem en teoretisk forståelse af "World of Warcraft" undersøger PhD projektet således, hvordan et designet læringsspil påvirker og udfordrer pædagogiske begreber som Motivation og Autonomy, Analysis og Exploration, og Reflective Practice

Practice theory vil i den forbindelse udgøre det læringsteoretiske perspektiv gennem en forståelse og fortolkning af læring som "praksislandskaber", der fremstår som komplekse og designede personlige læringsbaner. Ved at betragte læring som et komplekst landskab af personlige læringsbaner, argumenterer PhD projektet for, at det skaber en mulighed for at arbejde med designstrategier, der mere effektivt faciliterer de studerende gennem meningsfulde læringsprocesser bygget op omkring en udforskende tilgang til traditionelle akademiske discipliner.

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A thank you must also be given to the Research Program for Educational Development and Professional Research at UCN. Thank you to Susanne Dau and Preben Olund Kirkegaard for your competent guidance throughout the process. I also want to thank the program of Reflective Practice-based Learning and the research group behind the development of a Reflective Practice-based learning (RPL) White Paper.

It has been a great pleasure to have been part of the research group Iild at Aalborg University. A big thank you to Morten Misfelt, who, especially at the beginning of my project, helped me make some difficult choices early on concerning a theoretical demarcation. I would also like to thank Elsebeth Korsgaard Sorensen for the many and long discussions about the academic elements and aspects of my project. Thank you very much for letting me follow my own curiosity. And a huge thank you to Thomas Ryberg for his guidance through the final phase of the project. It has been invaluable to have you look critically at the project towards the end where all the elements and aspects are being assembled into a whole.

I would also like to thank Rikke Toft Nørgård from CUDiM, at the University of Aarhus, as well as Monika Bærøe Nerland and Kenneth Silseth at IUO Oslo University, for giving me the opportunity for an exchange stay in a second research programme.

Finally, I would like to thank my fellow game researchers, Charlotte Lærke Weitze and Kristine Øygardslia, for the many inspiring discussions on Game-Based Learning.
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Jensen, C. G. (2016). Gamification of innovation processes by bringing World of Warcraft into the real world. In EDUlearn16 (pp. 59–68). IATED.

Jensen, C. G. & Dau, S. (2016). Playing with 'Fun Failure' in higher education: Experiences from Non-virtual Lessons, Publikation: Konferencebidrag.

Jensen, C. G. (2017). Collaboration and dialogue in Virtual reality. Journal of Problem Based Learning in Higher Education, 5(1).

Jensen, C. G. & Sørensen, E. (2017). Maintaining collaborative democratic and dialogue-based learning processes in virtual and game-based learning environments, ICERI2017 Proceedings. s. 1797–1805 9 s.

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Jensen, C. G. & Dau, S. (2019). A Framework for Game-Based Learning Design in Higher Education, 2019, The Proceedings of the 13th International Conference on Game-Based Learning ECGBL 2019.

Accepted papers

Jensen, C. G. (2020). Gamification of personal learning trajectories – Representations of the Academic, to be published by Routledge as part of the series "Values and Virtues in Higher Education Research", Editor Jean McNiff.

Jensen, C. G. & Dau, S. (2020). The use of the principle Crafting and Farming as inspiration for future game design in higher education, to be published by Routledge in the anthologies "Emerging practices, tools and technologies in innovative designs and learning", Editor Staffan Selander.

Jensen, C. G. & Dau, S. (2020). Affordance of Fun Failure in Non-Virtual Lessons anthology – Bidrag til Game Scope: The potential for gamification in digital and analogue places. Aalborg Universitetsforlag, InDiMedia Series.

Conferences

Speaker at the Conference ECGBL in 2019

Invited speaker at the conference Playful Learning in 2019

Participation in the conference Counterplay in 2019

Invited Speaker at the conference “Technology Understanding and Future Education” 2018

Speaker at the conference EdMedia 2018

Speaker at the conference “Innovation and entrepreneurship in the welfare and professional field” 2018

Invited speaker at the conference Experience Technologies and Gamification in the museum context, organised by the Danish Centre for Museum Research in collaboration with an elective at Communication and Digital Media in Gamification at AAU

Participation in the conference ICERI2017

Speaker at the conference Game Scope Conference in 2016

Participation in the conference EDULEARN16

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PROLOGUE

Back in February 2006, a guild called Oops fought their way through Black Wing Lair, where the black dragon Nefarian was waiting for them. The fight was intense and time-consuming; there was no room for mistakes. Everything was going according to plan. Nefarian kept challenging all members in the raid during the fight – mage, shaman, warrior, priest, one by one he called out punishment for them. However, they all knew what was coming! Nefarian still had one extra challenge left for them. When Nefarian's health point was down at 20 per cent, he would spawn an army of skeletons. *"Next call is random, remember we group around Graznak the mage, and stop on 22 per cent!"* the warrior who kept Nefarian grounded yelled. *"Please please, let us get the priest call!"* people started to scream. They were lucky; it was the priest call that was the next one. They started attacking again to take Nefarian to 20 per cent. *"Keep the warrior up!"* one of the raid members yelled, while the mage was getting ready to cast AOE magic on Nefarian's army. *"And it is Graznak for AOE,"* came the command from the mage team. While fighting the last health point down, the officer started yelling, *"Gradering around Graznak when we are ready, but stop attacking. We need to see the call first."* When everyone was waiting to see the next call, the priest team shared the plan for keeping the mage up: *"Okay, Mykene and Saavedra both have full mana, so they will heal Graznak."* The raid kept attacking Nefarian, and finally he got down to 20 per cent. *"Gradering around Graznak, closer closer closer!* everyone screamed while the mage kept casting AOE on the army Nefarian created. *"They are almost dead. They are ALL DEAD!"* But sadly Graznak did not survive the massive blast. With the skeletons down, the endgame for Nefarian began. People started to get excited, and the officers tried to calm people down: *"Yea, calm down, just keep going, calm down, relax."* But then something unexpected happened: when there was only 10 per cent left, the warrior lost his grip on Nefarian, and the dragon started running away. *"Fuck fuck!"* he yelled while chasing it. One of the other warriors was fast and grounded Nefarian again. The fight was still continuing. The next line of quotes is the conversation in the last minutes before Nefarian died.

We got mage and druid call left, so be ready for mage call that will be the bad ones
Druids call, let us get him down, we got druids on DPS now he is going to die fast
Come on, come on guys
Come on people
3% he is so going to die, 2%
Come on
1%
COME ON
He is in the bag
We got him. We got him
(Everyone is screaming Yeahhhhhhhhhh)
So fucking beautiful

Nefarian died that night in February, and Oops became the first guild on the server on the Horde side to defeat the black dragon. I remember that night because as a shaman, I was a member of the guild. That night was the fruit of months of hard work, and my time in Oops was the beginning of a fascination for the learning processes that take place in a computer game like World of Warcraft.

In many ways, my journey through the PhD has been reminiscent of the fight against Nefarian. Through my PhD, I have done lots of quests (PhD activities) and been on larger missions (PhD courses). On the way, I have gained new levels as new insights and knowledge have come to me. I have farmed ideas, thoughts, reflections, data, and all of it has through design processes been crafted into something new and bigger. I definitely had the feeling of "Game over" more than once, and I have been forced to change my strategy and make new plans. I have rewarded myself with achievement each time I reached one of my goals. And now it is here, my PhD, a finished presentation of my work.

CHAPTER 1. INTRODUCTION

The purpose of this PhD project is to investigate and experiment with Reflective Practice-based learning (RPL) through the use of Game-Based Learning. RPL is a new learning approach at University College ’of Northern Denmark (UCN) that aims to improve students’s practice professionalism The thesis investigates how motivation and autonomy, analysis and exploration, and reflective practice can strengthen a practice professionalism, and consequently Reflective Practice-based Learning, through the use of game principles from the computer game World of Warcraft. An understanding and interpretation of the domain of Practice Theory will inspire the theoretical perspective.

From a historical perspective, the PhD project began with observing a resistance coming from students when participating in a learning situation with a high degree of complexity through investigative and reflective learning trajectories. This phenomenon was especially prevalent when students at UCN, Technology participated in smaller innovation workshops (Gyldendahl-Jensen, 2018). These observations initiated the idea of working with Game-Based Learning as a strategy to create change within the students’ behaviour and way of thinking. Smaller pilot studies were developed and conducted on this basis (Gyldendahl-Jensen, 2016).

The early pilot studies also coincided with the introduction of UCN’s new shared learning approach, called “Reflective Practice-based Learning” (RPL). The development and incorporation of RPL is thus UCN’s response to some of the current trends and political agendas that seek to embrace the idea that students need to achieve 21st-century skills (OECD, 2019). The introduction of Reflective Practice-based Learning thus contributes to strengthening teaching methods that previously created situations in which there was a high degree of resistance from the students. Based on the results from the early pilot studies, UCN thus wanted to investigate whether Game-Based Learning can support Reflective Practice-based Learning on a larger scale and as a part of the students’ semester projects. In addition, a pre-study was needed to be able to say something more confirmative about how the students understand and interpret Reflective Practice-based Learning.

The above discussion is elaborated further in the upcomming sections as an introduction to the thesis. The opening will thus discuss the current trends within the field of education, and how these trends, in general, affect the decision-making within educational institutions. Chapter 1 also provides a brief introduction to the status of the implementation of RPL at UCN, including the challenges observed. The chapter ends with a problem statement and three sub-actions based on the initial argumentation. The overall introduction to the PhD can therefore be described as three different streams that merge together. These streams are summarised and formulated on the next page:

- The thesis starts with a very general and brief introduction to how to meet the need for education of the future, labelled by many as the concept of "21st-century skills", as an institutional response for introducing Reflective Practice-based Learning as an institutional shared learning approach.

- The next section of the introduction presents Reflective Practice-based Learning and the challenges it creates when students are exposed to an investigative and reflective learning approach.

- Subsequently, Game-Based Learning inspired by World of Warcraft is presented as a proposal for a learning concept that can help to create new teaching methods and tools rooted in a pedagogical understanding of Reflective Practice-based Learning.

1.1. MEETING THE NEED OF 21 ST CENTURY LEARNERS

Some argue that the process of globalisation has shown a growing need for rethinking the jobs of the future, as the world is changing towards a transformation and refinement of the creation and sharing of knowledge (Adams et al., 2017; OECD, 2019; Rodrigues & Bidarra, 2017). In a global context, the growth of economies creates new challenges which call for future visions of holistic solutions with high aesthetic value, sustainable responsibility and competitive prices. To meet these challenges, it is crucial to possess the competence to be able to develop creative solutions to complex problems (Kress & Selander, 2012; McConville et al., 2017; OECD, 2019; Rodrigues & Bidarra, 2017; Selander, 2008). It also means that the concept of knowledge is changing, where knowledge is moved from something stationary to something that is constantly created and changed through analytical and reflective processes (Adams et al., 2017; McConville et al., 2017; OECD, 2019; Rodrigues & Bidarra, 2017). As McConville et al. (2017) write, *"To possessing factual knowledge and skills to respond to standard situation engineers need to have the competence to analyze the whole complexity of the context of application and, if needed, come up with solutions that adapt to changing conditions"*(McConville et al., 2017, p. 595). Selander (2008) also pointed out that these new movements create some common and social trends that contribute to continual and more complex collaborative processes, whereby knowledge as a concept is changing. He speaks about global learning environments where a multimodal approach consisting of different kinds of resources creates meaning through processes of reflection. The students' reflective skills are, therefore, crucial in order to being able to apply their knowledge in practice (Kress & Selander, 2012; Selander, 2008). According to the OECD (2019), the educational institution is an important factor in regard to equipping students with the right competencies needed to succeed in a global future (Becker et al., 2018; OECD, 2019). The OECD (2019) points out that the trends "increase of complexity" and "speed of change" in particular entail the educational insititution continuing to evolve in order to provide the necessary skills and competencies for a modern world (OECD, 2019). There seem to be many institutional responses to, and interpretations of, what an educational shift entails, and they include the implementation of keywords such as “connect”, “share”, “analyse”, “assess”, “apply”, “personalise”, “engage”, “streamline”, “include”, “know”, “computing” and “construct” (Rodrigues & Bidarra, 2017). The trend is, therefore, that the educational institutions focus on developing new and more active forms of learning that can accommodate the students playing with knowledge and new ideas. This means that the students become partners in their learning process through participation in active knowledge creations (Adams et al., 2017; Becker et al., 2018). Adams et al. (2017) emphasise, through the following statements, that this trend is essential in relation to the paradigm shift facing the education sector: *“Rather than being regarded as mere participants and consumers of knowledge, the embedding of a maker culture in higher education has made them active contributors to the knowledge ecosystem. They learn by experiencing, doing and creating, demonstrating newly acquired skills in more concrete and creative ways*" (Adams et al., 2017, p. 6). The OECD (2019) also states that *“the future is rarely just a smooth continuation of past patterns”* and therefore advocates a shift away from the traditional, lecture-based lessons that simply transmit knowledge about a topic towards new educational concepts such as authentic learning, project-based learning, challenge-based learning, competency-based learning, inquiry-based learning, etc. (Adams et al., 2017; Becker et al., 2018; OECD, 2019; Paaskesen & Nørgård, 2017;). Paaskesen and Nørgård (2017) challenge this viewpoint further by arguing that it is not enough to work with “participation in projects” that are intended to produce creative and innovative products; on the contrary, the goal must be education based on open exploratory and experimental learning design with open learning contexts. This means open learning cycles that strike a balance between what they term “directing” and “emergent learning”, where the keywords include: “create”, “imagine”, “play”, “share” and “reflect” (Paaskesen & Nørgård, 2017). However, it can be difficult to create a movement towards a new educational paradigm, as this challenge is multifaceted in a way that calls for learning models based on complex design criteria (McConville et al., 2017). Also, the established educational community still to a large extent approaches learning through restrictive demands and normative rules and procedures, which hinder the students’ freedom to challenge the prescribed curriculum (McConville et al., 2017; Paaskesen & Nørgård, 2017). Nørgård et al. (2017) emphasise that this approach does not sufficiently support high-order thinking and doing. They write:

> *This emergence of the corporate university or the knowledge factory promotes teaching to the test, reproduction of information, criteria-based assessment and clear, quantifiable outcome. Rather than supporting the value accentuated as driving higher-order thinking and doing. Or the virtue at the base of moral practice of academics. Instead these values and virtue are stigmatised as risky, unproductive and too fuzzy. Learner engagement and satisfaction have become key performance indicators. (Nørgård et al., 2017, p. 272)*

The Committee for Quality and Relevance in Higher Education, set up by the Danish Research and Education Ministry, reached the same conclusion in 2014. Their report indicates that students must be supported in their application of professional knowledge creatively and innovatively with a view to the continued development of the profession's practice. The report states, among other things: *"The higher education programmes have a major responsibility for the students to develop general competencies that are complementary, transforming and possible"* (Kvalitetsudvalget, 2014, p. 26). One of the committee's main arguments is that it is the educational system's restrictive requirements and rules regarding the content that challenges the professional quality, including the students' freedom to challenge the presented syllabus: *"It is the opinion of the committee that a number of systemic mechanisms in recent years have put the quality of higher education under pressure"* (kvalitetsudvalget, 2014, p. 11). The report of the "Quality Committee" provides an opportunity to discuss how higher educational institutions in the future can develop teaching strategies for supporting students in transforming and exploring their professionalism both actively and independently through analytical disciplines and processes of reflection. Although many educational institutions have begun bridging the gap between academic knowledge and practice (Becker et al., 2018), there is still a need for investment in developing high-quality teaching that supports the necessary in-depth learning that is crucial for developing generic competencies, also referred to as "21st-century skills" (Adams et al., 2017; Rodrigues & Bidarra, 2017).

1.2. REFLECTIVE PRACTICE BASED LEARNING

The educational institution the University College of Northern Denmark (UCN), which is the context of interest for this PhD (see a further description in Chapter 2), has since 2013 invested actively in developing new frameworks and concepts for future education through the implementation of Reflective Practice-based Learning as a new general learning approach (which will be further elaborated in Chapter 4). The goal is to ensure that students are ready for the future labour market by being able to acquire new knowledge, skills and competencies that can lead lead to qualifications and the development of these new-found capabilities in practice (Horn et al., 2019; www.ucn.dk).

The core of UCN's approach to learning is the interaction and tension between theory and practice, where the students, through active learning strategies, must be able to analyse, solve problems, develop, communicate, explore, investigate and practise through reflection processes. A large proportion of the students in technology programmes at UCN have a previous vocational background as the basis for their entry into higher education. These students are experts in following instructions with a primary focus on finding the "right solution" and draw on these experiences in a learning situation. With the implementation of Reflective Practice-based Learning, they now need to be reflective, have an analytical approach to a project, and be both innovative and creative. They must be able to collaborate and share their knowledge across programmes, disciplines and nationalities while having a critical approach to what they are working with (www.ucn.dk).

A pre-study (see Appendix A and Section 4.4) of this PhD, however, reveals that the students in technology programmes at UCN lack specific learning strategies for how to work in depth with the curriculum through academic disciplines – they are often brought into situations where they do not know what the next step is. Reflective Practice-based Learning points toward a process-oriented approach that contrasts with the learning approach the students are used to from earlier schooling systems. The consequence is a "passive-aggressive resistance" against the teaching and a lack of **autonomy**. It is, therefore, difficult for educators to **motivate** students to be interested in an **explorative** and **analytic** approach to the academic representation – disciplines they might not even see the value of – if the teaching is based on traditional dissemination of specific knowledge. Furthermore, the students do not develop a **reflective practice** that enables them to challenge and change the professional context. The pre-study thus indicates that the following three main topics are particularly challenged in regard to developing Reflective Practice-based Learning at UCN, Technology;

- **motivation** and **autonomy**
- **exploration** and **analysis**
- **reflective practice**

The need for new teaching methods and tools rooted in a pedagogical understanding of Reflective Practice-based Learning is, therefore, still relevant. Becker et al. (2018) talk about the need for research that examines *"how institutions can nurture cultures that promote experimentation. A significant element in advancing this movement is the call for higher education to accept failure as an essential part of the learning process"* (Becker et al., 2018, p. 8). This means finding a new solution to building bridges between theory and practice through reflection processes, multidisciplinary approaches and hands-on activities (Becker et al., 2018).

In the following section, Game-Based Learning is briefly introduced as a proposal for a new educational strategy that provides opportunities and potential solution paths for how to strengthen the students' motivation and autonomy, analysis and exploration, and reflective practice through sequential learning processes.

1.3. RETHINKING EDUCATION THROUGH GAME DESIGNS

The concept of Game-Based Learning, and especially *"Massively multiplayer online role-playing games"* (MMORPGs), have gained focus in the educational sector in relation to tapping into learning opportunities that meet the needs of 21st-century learners (Adachi & Willoughby, 2013; Leith et al., 2019; Melero & Hernández-Leo, 2014; Morris et al., 2013; Rodrigues & Bidarra, 2017; Sánchez, 2014; Sourmelis et al., 2017). Kulman et al. (2014) state in the following quote how games can be linked directly to the development of 21st-century skills: *"A comprehensive review of Game-Based Learning found that video games could impact positively on problem-solving skills, motivation and engagement, all of which support using these digital tools in teaching 21st-century skills"* (Kulman et al., 2014, p. 164). Games present elements that can inspire the creation of active learning experiences that challenge students to apply new knowledge, solve problems and explore different viewpoints (Kulman et al., 2014; McConville et al., 2017; Rodrigues & Bidarra, 2017). As Kulman et al. (2014) explain in their argumentation, *"21st-century skills are more deeply explored, many connections can be seen between the use of video games and the development of these important capacities. Many games require learning and innovation skills such as critical thinking and problem solving, communicating and collaboration, and creativity and innovation for the user to be successful"* (Kulman et al., 2014, p. 164). The new interest in using game principles in the educational context entails a reassessment of working with new opportunities for creating reflective, explorative and practice-based learning through concepts like quests and levels, missions and dungeons, crafting and farming, and personal trajectories of narratives. As a learning concept, games are thus exciting as they provide stories that naturally connect and create patterns of knowledge through social norms and values (Sánchez, 2014). Particularly in higher education, games can be a source of inspiration when it comes to developing and exploring new models for how academic activities can be enhanced through learning situations with an individual expression related to the qualifications of participants, content and context, as well as the learning outcomes (McConville et al., 2017).

Game-based learning as a technological issue or not

However, when working with the development of technological devices or digital software, social and cultural factors need to be addressed. This is to ensure that there is no unilateral focus on the more technical and digital aspects. It is a relevant concern when working with Game-Based Learning, as this research field through new technological opportunities has undergone a boom through digital computer games. In discussions dealing with technological understanding, Selwyn (2016) in particular is a critical voice, as he strongly warns about fascination with technology taking over the essential vision of a project. He writes, among other things: *"Our primary focus should not be on technological devices, tools and applications per se, but on the practices and activities that surround them, the meanings that people attach to them and the social relations and structures that these technologies are linked to"* (Selwyn, 2016, p. 2). Especially when research projects are based on technology developments aimed at changing or strengthening practices, there needs to be an increasingly critical stance on whether new technologies or technological solutions are contributing positively to the problem. As Selwyn writes,

> *Disruptive innovation should not be seen as a hard-and-fast solution per se, but instead as offering a different way of thinking about solutions. In this sense, this view of technological change invites us to rethink the very nature of education – its core activities and relationships, its core purpose and values. "Disruptive innovation" is not about using technology to do the same thing differently, but using technology to do fundamentally different things. (Selwyn, 2016, p. 32)*

This means that working with Game-Based Learning in this project is not about the technical aspects and possibilities, but is concerned instead with how Game-Based Learning becomes meaningful in practice. To cite Selwyn once more: "*In other words, educational technology is less about devices and applications, and more about what is 'done' with these devices and applications – that is, practices and meanings"* (Selwyn, 2016, p. 18). This PhD project, therefore, will only work with Game-Based Learning through physical and analogue artefacts, to avoid focusing on what is technologically possible when developing an educational game.

Chapters 5 and 6 will present a further elaboration of the concept of Game-Based Learning through a desk research.

1.4. PROBLEM STATEMENT AND PURPOSE

This PhD project aims to investigate and experiment with Reflective Practice-based Learning (RPL), which is an emerging learning approach at University College of Northern Denmark (UCN), through the use of Game-Based Learning. The PhD project, therefore, investigates how the students' motivation and autonomy, their ability to analyse and explore, and their reflective practice can strengthen a practice professionalism through the use of game principles from the computer game World of Warcraft. Through the use of Educational Design Research, the thesis thus develops guidelines and forms theory and methods that contribute to creating learning designs based on Reflective Practice-based Learning and Game-Based Learning.

The domain of Practice Theory will inspire the theoretical perspective through an understanding and interpretation of learning as "landscapes of practice" consisting of designed complex and personal learning trajectories. By considering learning as a complex landscape of personal learning trajectories, the PhD project will argue that it creates an opportunity to think in terms of design strategies that more effectively support students through meaningful learning processes built around an explorative approach to traditional academic disciplines. This means that the PhD project through its educational game design makes the assumption that the link between Practice Theory and game theory can create an experience of "progress" as it is known from

World of Warcraft and thus a learning process that supports the development of a future vision of generic competencies.

The research question for this PhD project is as follows:

How may a perspective of sequential learning and inquiry processes support motivation and autonomy, analysis and exploration, and reflective practice through the use of Game-Based Learning in a higher education learning environment?

This research question leads to three supporting areas of interest. As mentioned in the previous chapter, the pre-study (see Appendix A and Section 4.4) of this PhD indicates that the following three main topics are particularly challenged regarding the implementation of Reflective Practice-based Learning at UCN, Technology. The research question will, therefore, be addressed through the following actions:

A1 – Examining what impact the use of Game-Based Learning has on the students' motivation, including their development of autonomous behaviour.

A2 – Investigating how Game-Based Learning affects the students' development of an explorative approach, and thus analytical skills.

A3 – Examining how the use of Game-Based Learning influences the students' development of reflective practice and behaviour.

1.5. STRUCTURE OF THE PHD THESIS

This section describes the structure of the thesis. The thesis is written as a monograph. A monograph was chosen because it was considered necessary in order to capture the amount of data and thus the breadth and depth of the project. The thesis consists of 12 chapters and six appendices. The first chapter presents an introduction and describes the problem area and the purpose of the dissertation. Chapter 2 provides a detailed description of the University College of Northern Denmark (UCN) as the case of interest. Chapter 3 outlines the dissertation's philosophy toward science and its methodological background. The chapter ends with a description of the research design. The following structure of the dissertation follows the four phases of Educational Design Research;

Phase 1 – Problem and theory identification

Phase 2 – Designing the prototype

Phase 3 – Analysis through interventions

Phase 4 – Findings and conclusions

Phase 1 – Problem and theory identification
Chapter 4 investigates the theoretical learning approach of the thesis. The chapter also includes a summary of the pre-study. Chapter 5 elaborates on the concepts of Game-Based Learning, while Chapter 6 examines the theoretical aspect of World of Warcraft. Chapter 7 describes the design principle derived from the three desk researches.

Phase 2 – Designing the prototype
Chapter 7 presents a detailed description of how the prototype is built upon the presented theoretical assumptions.

Phase 3 – Analysis through interventions
Chapter 9 presents the research strategy and elaborates on the analytical approaches and theory construction of the thesis. Chapter 10 examines and identifies the teachers' development of pedagogical competences and new knowledge when developing new iterations of the learning designs based on Game-Based Learning. Chapter 11 follows with the main analysis of the dissertation, examining the problem statement concerning each of the three actions.

Phase 4 – Findings and conclusions
Chapter 12 summarises all discussions and conclusions, outlines the research contributions and suggests perspectives for future research.

Appendix
The purpose of the appendix is to provide the reader with access to the data supporting the conclusions in this thesis. The appendix contains:

Appendix A – A detailed presentation of the pre-study

Appendix B – Interview guidelines

Appendix C – Quantitative survey questions

Appendix D – List of the quest structure

Appendix E – List of achievements

Appendix F – Rules of the game

CHAPTER 2. PRESENTATION OF CASE

This chapter initially presents University College of Northern Denmark (UCN) as the context of interest for this PhD, where the education of Architectural Technology and Construction Management (ACTM), is the primary case. University College of Northern Denmark (UCN) is one of seven university colleges and two engineering colleges in Denmark that have existed since 2007. UCN includes 23 academy and bachelor programmes in business, pedagogy, health and technology. UCN works with higher education, research, development and innovation within the four main areas. Also, UCN offers courses and continuing education for in-service practitioners, again within all four main areas.

The PhD project is focused on the educations that exists in the technology programme: Architectural Technology and Construction Management (ACTM), Energy and Environment, Design and Production, and Information Technology. The specific case of this project will be the education of ATCM, where the fourth semester in particular is the primary focus. The three other areas of education in the technology programmes are included in the pre-study of the project (see Appendix A).

2.1. THE EDUCATION OF ATCM

ATCM is a bachelor degree rated for three years and six months of student work with the purpose of teaching the students about managing and handling technical and administrative work within the design and execution of building and construction projects. An education within Architectural Technology and Construction Management provides the students with an in-depth and interdisciplinary knowledge of all the phases characterising the process of constructing a building. The interdisciplinary approach allows the students from ATCM to act as a vital link between thought and action, which is crucial as the construction industry consists of many different actors with very different inputs and competencies. Thus, a student from ATCM becomes the person who collects and ties together all the threads from all the phases – a consistent figure, who has responsibility and an overview from start to finish. The interdisciplinary profile enables the students from ATCM to handle many different types of jobs in many different industries (BEK nr 715, 2009; www.konstruktørforeningen.dk; www.ucn.dk)

The core professionalism of ACTM is difficult to define, as it stretches across other professions, such as engineers, architects, craftsmen, etc. This means that the professionalism of ATCM can be defined as the ability to combine, process and develop a large number of elements from other professional disciplines and subsequently communicate it all through drawings and sketches. It also includes involving relevant authorities in the dialogue on construction details and the design of the building. The students from ATCM is thus the key person in terms of obtaining knowledge from the architects and engineers translated into a practical understanding. Thus, the field of knowledge of ACTM is volatile and changeable as regards society's trends and innovative solutions for the future (BEK nr 715, 2009; www.konstruktørforeningen.dk; www.ucn.dk).

Within the construction industry, increased globalisation and technological development have in recent years affected the domain of ACTM. Generic competencies have become essential, as the future vision of construction calls for holistic solutions with high aesthetic value, sustainable responsibility and competitive prices. These new trends are already a reality in the education of Architectural Technology and Construction Management through the growth of new topics, such as *BIM design, digital processes, industrialised construction, sustainable construction, energy design and integrated building design.* Common to these new topics is a high degree of complexity combined with a lack of professional demarcation. These changes have increased the complexity of students' semester projects tremendously, which creates a pedagogical challenge in terms of making teaching much more process-oriented (BEK nr 715, 2009; www.konstruktørforeningen.dk; www.ucn.dk).

2.2. DESCRIPTION OF FORTH SEMESTER

The PhD project is based on the fourth semester in the education of ATCM at UCN, Technology. This semester has been selected as the primary case as it contains a great deal of complexity that requires an analytical, reflexive and explorative approach. Also, the teaching is based entirely on a group project, and the teachers have stated that it is difficult to capture the students' interest in the more academic and process-oriented disciplines within a project-based curriculum. In this semester, the students aim to demonstrate and understand an interprofessional collaboration within the construction industry while dealing with the planning of an apartment and a commercial building. This means that, at the end of the semester, the students should be able to demonstrate the ability to analyse, discuss and integrate economic, technical and production topics in a multidisciplinary context. Thus, through group work, the students must develop a building that takes into account relevant social, environmental, economic and technological aspects. Four semesters are divided into several phases, with this PhD project being based on the first phase, which focuses on the early development of a building concept. In this phase, the students will work through an integrated design process to create a building with a connection between aesthetics, technique and function. Each student's project aims to create an understanding of the theories, methods and models that together contribute to developing relevant solutions for an integrated architecture/design project. Through the development of an architectural building concept project, students will thus, using an architectural and engineering approach, describe and create a relationship between form, space and construction, in a problem-based context. For the students, this means that for the first time in their education they must become acquainted with academic topics such as urban design terminology, architecture theory, design and representation. Also, through the project phase, they will work with several design tools they have no previous experience with. The semester project thus requires the student to work in a problem-oriented way with both academic and professional topics through reflection processes and an analytical approach. They are also required to be able to communicate their conceptual vision for the project through various media.

2.2.1. SELECTION CRITERIA

A broad diversity characterises the students at ATCM in terms of age and previous educational background. Figure1 shows the distribution of the students' age as well as their previous academic background. In particular, the proportion of students with craftsman backgrounds constitutes over 50% of the total. As described in the introductory section of this PhD project, these students, in particular, pose several challenges regarding the educational organisation of the semester's teaching processes. These challenges are described in more detail in section 4.1 and Appendix A. In the first iteration, five project groups are randomly selected out of the 11 possible, whereas all students in the fourth semester participated in the second and third iteration. For all iterations, characteristics of age and background distribution have been represented. Also, seven teachers participated in both the development of the project's game design and in the running of the teaching process. Of these, four of them have been through-going persons in all three iterations. The teachers have all previously worked with fourth semesters and therefore have an in-depth knowledge of the academic content as well as the educational challenges. None of the teachers has previously worked with games as a tool for teaching. Likewise, none of them has a natural interest in playing computer games and hence no experience with the terminologies that characterise the gaming world.

Below 25	Between 25 and 30	Over 30
56.2 %	27.4 %	16.4 %

Craftsman	Upper secondary	Other
51.4 %	33.8%	14.9 %

Figure 1 - Schematic overview of the distribution of age and academic background

CHAPTER 3. RESEARCH METHOD

The foundation of this PhD thesis is based on a pragmatic epistemology where Educational Design Research through a mixed-method approach is the recurring methodological approach. The pragmatic philosophy is emphasised at the very beginning and thus presented before the elaboration of methodology as the pragmatic philosophy permeates the way I as a researcher work and think. The mission of epistemology is very much about creating a foundation for what the concept of knowledge and knowledge creation entails within a specific scientific paradigm. How knowledge can be recognised has in particular concerned the philosophical traditions since ancient times. If the choice of the epistemological approach is not clear, there is a risk of facing an analytical process taking divergent directions with a lack of transparency and coherence. The pragmatic philosophy is thus the recurring way of anchoring the choices I have made along the way in terms of both methodological and analytical dispositions. According to Tashakkori and Teddlie (2010), modern epistemology can be understood through the question of *"how the human mind can acquire knowledge of a world outside of itself"*. Epistemology is thus concerned with dealing with issues relating to what it means to say that we know something. And maybe even more basically, "How do we know we know?" (Rescher, 2003; Tashakkori & Teddlie, 2010). Thus, I argue that a clear epistemological framework that is consistent with the researcher's basic conception of how knowledge is created is crucial to achieving a pervasive thread in the work of knowledge. Without it, it is hard to make a convincing argument regarding the connection of methodology and methods as well as the analytical assumptions.

From a methodological point of view, pragmatism is closely linked to methods that have an experimental and intervening nature. The choice of EDR as the overall methodology within a pragmatic framework is closely connected with my profile as an educator and designer.

The project is built around a research approach that seeks both to understand and change practice where the use of Educational Design Research based on a pragmatic epistemology frames the research process. The study of strengthening a practice professionalism through the use of game principles requires the development of, and experimenting with, new teaching designs. With these ideas in mind, the aim of using Educational Design Research is to: 1) identify the deadlocks and areas of problems, and 2) make new perspectives and potentials visible through the use of a Design Thinking strategy (Amiel & Reeves, 2008; Cobb et al., 2003; Nieveen et al., 2006).

Pragmatism can in this sense be seen as an epistemology that generally rejects the idea of correspondence theories of truth or theories that claim that a true belief or statement is one that represents the world as it is (Elkjaer & Simpson, 2011; Godfrey-Smith et al., 2015). The pragmatic philosophy does not enter its study field with only one theory or one concept; on the contrary, it is the content and context of the phenomenon being studied that determine the choice of theories and concepts to understand something (Garland, 2014). This argumentation corresponds well with doing educational research as the theory of education has a particular history with an idea of plurality, difference and contingency. Educational research must, therefore, be able to accommodate the complexity that occurs when humans react to contingencies and consequently reconstructions of social conditions (Brinkmann & Tanggaard, 2010; Lehmann-Rommel, 2000). According to Tashakkori and Teddlie (2010), the dualism between mind and matter in particular sets the agenda for modern epistemology by seeking an answer to how the mind can get in touch with a world of contingency (Tashakkori & Teddlie, 2010). Garland (2014) argues that the selection of the epistemological and ontological basis within education research should thus be a pluralistic framework. By that, Garland means that educational research cannot be reduced to just one fundamental epistemology and ontology. In Habermas's work around social worlds and their relationships, Garland opens up the integration of various positions as an alternative to a one-sided focus within a given paradigm (Garland, 2014). Dewey's contribution to pragmatism is also controversial in considering the issue of objectivism or subjectivism as either/or. Different knowledge is merely the result of different ways of examining the world, and thus the consequences of different actions. Pragmatism speaks instead of science as something that deals with a combination of different approaches, methods, results, connections, actions, consequences, etc. By removing the hierarchical division of knowledge, working with a mixed-method approach is then possible (Garland, 2014; Tashakkori & Teddlie, 2010).

In this context, the epistemology of pragmatism serves as a consensual method of doing research that seeks to transcend these many dualisms as a result of contingency (Elkjaer & Simpson, 2011; Kjær, 2010). This approach is thus helpful for overcoming some of the discussions that continue to stifle both educational research and the use of mixed methods in social and behavioural research (Brinkmann & Tanggaard, 2010; Elkjaer & Simpson, 2011; Frega, 2011; Godfrey-Smith et al., 2015; Kjær, 2010; Lehmann-Rommel, 2000; Tashakkori & Teddlie, 2010).

In the following paragraphs, pragmatic philosophy and its significance for the scientific work are elaborated. Next, the significance of a pragmatic epistemological approach concerning the use of Educational Design Research as a research method is described. Then pragmatism is linked to the vision of using Design Thinking as a strategy for developing an experimental educational design based on design principles from the concept of Game-Based Learning.

3.1. PRAGMATISM

Pragmatism emerged in the late nineteenth century where particularly Charles Peirce, William James, John Dewey and George Mead are regarded as authors of classical pragmatism (Brinkmann & Tanggaard, 2010; Elkjaer & Simpson, 2011; Godfrey-Smith et al., 2015). The influence of pragmatism declined after the death of Dewey in 1952, but since then pragmatism has regained a renewed interest through the work, among others, of Richard Rorty and Hilary Putnam (Elkjaer & Simpson, 2011; Godfrey-Smith et al., 2015; Kjær, 2010).

Pragmatism emerged as a reaction to the contemporary understanding of science, where dualistic conceptions prevented the possibility of establishing contact between different research domains (Godfrey-Smith et al., 2015). Especially the introduction of industrialisation and mass production created new contradictions and increased complexity, which put the existing scientific ideals under pressure (Elkjaer & Simpson, 2011). Also, pragmatism believed that the traditional philosophies had a too passive and atomistic mindset rather than an active and holistic approach to the subject of research (Godfrey-Smith et al., 2015). Pragmatism thus offered a new perspective of understanding how knowledge is created, arguing that the only way to acquire knowledge is through the combination of action and reflection (Tashakkori & Teddlie, 2010).

Pragmatism can, therefore, be seen as knowledge based on a dissatisfaction with traditional or existing philosophies that perceive truth as a passive reflection of an unchanging world, a world that appears finished and complete. In pragmatism, there is no objective basis for creating evidence and knowledge must be perceived as preliminary, and therefore, in principle, it is fallible (Godfrey-smith et al., 2015; Kjær, 2010). Pragmatism therefore searches for, and plays actively with, situations where apparent contradictions exceed or affect each other: for example, the difference between the material and immaterial, subject and object, mind and nature, organism and environment, rationality and creativity etc. (Godfrey-smith et al., 2015; Kjær, 2010; Lehmann-Rommel, 2000). Pragmatism, therefore, finds its justification in situations characterised by process awareness, unpredictability, differences, diversity and contingency (Lehmann-Rommel, 2000). Also, pragmatism tends to include humanistic perspectives such as morals and values (Godfrey-Smith et al., 2015).

The choice of pragmatism as the epistemological basis, therefore, sets the agenda for the scientific process, which will thus be about finding clues that disturb the immediate understanding of the context as an engine for further development (Frega, 2011; Godfrey-Smith et al., 2015; Kjær, 2010; Tashakkori & Teddlie, 2010). Kjær (2010) describes it as follows:

> *Such is often expressed as deficiencies or problematic conditions in the representation and vision of the world, and they only become apparent when we look deeper into the immediate to rethink it in a new direction. The tracks must point to an existing and current presentation of the pedagogical issue, and also take into account the possibilities. (Kjær, 2010, p. 23).*

Although pragmatism connects practice to the centre of the scientific process, this should not be understood as an exclusion of the theoretical discussion. An experience where elements are put together through a systematic and logical process is, therefore, also not sufficient to give new knowledge or answer the question of truth. On the contrary, it is in the clash between practice and theoretical reflection that the transcending contradictions exist. Frega (2011) expresses it as building a bridge between thinking and action and between theory and practice (Frega, 2011; Godfrey-Smith et al., 2015; Tashakkori & Teddlie, 2010).

Even though the four founders of pragmatism all committed themselves to finding practical ways to work with the importance of human behaviour in a dynamic and social complexity, the link between theoretical work and practical objectives is only described in detail by Dewey (Elkjaer & Simpson, 2011). This argument is thus why this PhD project is based on Dewey's understanding of pragmatism (Dewey, 1933, 1938a; Dewey & Nagel, 1991). Among the core principles of Dewey's understanding of pragmatic knowledge creation are the concepts of intervention, experimentation and transaction. These concepts, therefore, play a central role in this PhD thesis and will be further elaborated in the following paragraphs. He argued that it is through a link between action and theory that knowledge arises as a result (Brinkmann & Tanggaard, 2010; Godfrey-Smith et al., 2015; Tashakkori & Teddlie, 2010). Dewey talks about instrumental attributes as a way to study relationships and the connection of events through interventions. The purpose is to expand the capacity for problem solving and transformation of the environment in an open manner that is not limited by immediate practical preconceptions (Dewey, 1933, 1938a; Dewey & Nagel, 1991). Dewey's ideas about problem solving as a way of learning have been a significant influence on educational research (Dewey, 1933, 1938b; Dewey & Nagel, 1991; Frega, 2011; Godfrey-Smith et al., 2015). In this respect, the concept of knowledge is necessarily associated with action and therefore absolutely crucial to Dewey's theory regarding reflective links between action and consequence that articulate and thus manifest cognition (Frega, 2011; Tashakkori & Teddlie, 2010). Tashakkori and Teddlie (2010) describe in the following statements the importance of seeing knowledge as an activity in itself:

> *The combination of reflection and actions leads to knowledge. From this, it follows that knowing, the acquisition of knowledge, is not something that takes place somewhere deep down inside the human mind. Knowing is itself an activity, it is literally something that we do. (Tashakkori & Teddlie, 2010, p. 109)*

This statement means that knowledge must always be understood as being temporary and contextually determined and closely related to the action – *"a moving whole of interacting parts" (Tashakkori & Teddlie, 2010). Another important aspect of the pragmatic epistemology is the consequence of the experimental element where, for example, the phrase "the transformation of disturbed and unsettled situations into those* *more controlled and more significant"* (Tashakkori & Teddlie, 2010, p. 107) points to the fact that knowledge is generated in particular when creating a form of doubt, disturbance or uncertainty that is solved by connecting theory and practice through reflection (Elkjaer & Simpson, 2011). These compounds can be concretised through interventions consisting of experimental learning design. It must not be a blind trial and error process, but closer to what Dewey calls "intelligent action", which should be seen as a systematic inspection and active manipulation of the situation through reflection processes and abductive reasoning (see Section 9.3) (Dewey, 1933, 1938a; Dewey & Nagel, 1991). In this context, Educational Design Research sets the framework for the iterative processes through specific procedures that aim to link theory and practice (Brinkmann & Tanggaard, 2010; Elkjaer & Simpson, 2011; Tashakkori & Teddlie, 2010). Educational Design Research is also built around many iterative processes that harmonise with the concept of inquiry, which is one of the key elements in pragmatism (Elkjaer & Simpson, 2011). Especially the movement from a non-cognitive background (actions, activities, practices, etc.) to a cognitive foreground (issues, concepts and categories, notions/imaginations) can be understood as iterative and expanding circles and thus an expression of inquiry (Elkjaer & Simpson, 2011; Lehmann-Rommel, 2000; Tashakkori & Teddlie, 2010).

The third perspective that is essential is the role of the researcher. Dewey consistently refused to be a passive spectator. Instead, it is essential to consider the researcher's observing role as a contributor to what Dewey calls "a transaction based on a link between action and theory". Tashakkori and Teddlie (2010) describe it as follows: *"This is less a question of how theory plays a role in observation than the more basic claim that observation is itself a transaction and not a 'Kodak picture'"* (Tashakkori & Teddlie, 2010, p. 112). According to Garrison, pragmatism thus implies that humans should be regarded as participating in an unfinished universe rather than spectators of a finished universe (Brinkmann & Tanggaard, 2010; Elkjaer & Simpson, 2011; Lehmann-Rommel, 2000). Lehmann-Rommel (2000) thus describes it as follows:

> *According to Dewey, every situation is a qualitative whole and cannot, as quality, become completely ever explicit. Thinking as participants, people cannot obtain total certainty through thinking, and involvement in action and suffering is prior to inquiry. But the great chance, as Dewey stresses, is to take part in this game intelligently and creatively. (Lehmann-Rommel, 2000, p. 191)*

In Educational Design Research, the researcher collaborates with the participants regarding practice about both identifying issues and developing new design proposals for improving practice (Wang & Hannafin, 2005). In Educational Design Research, the researcher is thus active and takes part in the iterative development process where the link between theory and practice is the subject of what is being investigated (Edelson, 2006; Nieveen et al., 2006). Research in own practice, therefore, allows not only the reality to be understood and observed but also movement to be created and changed from an insider perspective. The methodological discussion as a result of this deals with the balance of having a third-person/objectivist/spectator perspective, to examine and understand the students' actions and participation in the educational practice, and then a first-person/subjectivist/insider perspective as an insider who researches from a subjective and participatory position. As Eikeland (2012) writes, *"praxis knowing radically challenges the division of labour between knower-researchers and the know-researched"* (Eikeland, 2012, p. 9). An intersubjectivity perspective (second person) is therefore chosen as a way to conceptualise the research methodology based on a pragmatic epistemologist understanding where personal preconception of practice characterises the role of a scientist while the topic of gamification is unfolded through an experimental approach (Cochrane et al., 2013; Eikeland, 2012; Kemmis, 2012).

Pragmatic epistemology has since its beginning been criticised for lacking sufficient coherence to be considered a distinctive doctrine or school of thought (Elkjaer & Simpson, 2011). Dewey insists, however, that knowledge and rationality cannot be understood unless their transformative roles in controlling situations actually work and that this can be documented through the selection of data (Dewey, 1933, 1938a; Dewey & Nagel, 1991; Frega, 2011). The claim of validity is, therefore, argued from the necessity of a controlled process of inquiry where the concept of judgment aims to ensure that truth claims retain the truth criteria from the specific context. Frega (2011) writes, among other things: *"In this sense we cannot call any utterance a judgment if it does not show this epistemic relation with a research activity aimed at finding a proper solution to a given problem"* (Frega, 2011, p. 593). Because Dewey rejects all claims about science being based on objectivism, the critics of pragmatism instead point towards a situation of complete subjectivism (Dewey, 1933, 1938a, 1938b, 1980; Dewey & Nagel, 1991; Frega, 2011). However, Dewey acknowledges this premise and argues that it is not a problem as long as *"the world we construct is constructed for our own individual purpose, for our own attempts to address the problem we face"* (Tashakkori & Teddlie, 2010, p. 111).

The next chapter describes how Educational Design Research is used in this PhD thesis as the overall methodological approach within a pragmatic paradigm.

3.2. EDUCATIONAL DESIGN RESEARCH AS METHODOLOGY

Educational Design Research addresses studies of integrated and meaningful phenomena in specific contexts. This approach will thus provide a holistic insight into how Game-Based Learning is changing the conditions in a learning environment to promote elements such as exploration and reflection. A literature review by Anderson and Shattuck (2012) describes Educational Design Research as being categorised by (1) being situated in a real educational context, (2) focusing on the design and testing of a significant intervention, (3) using mixed methods, (4) involving multiple iterations,

(5) involving a collaborative partnership between researchers and practitioners, (6) the evolution of design principles, and (7) its practical impact on practice (Anderson & Shattuck, 2012). Since Brown (1992) introduced design experiments as a research methodology, the terms of the approach have been discussed and combined in various ways, as emphasised by McKenney and Reeves (2013) through the following statement: *"The use of the term design-based research is just one part of the whole literature field. Many experts have pointed to the abundance of terms that have been used to describe this nascent field"* (McKenney & Reeves, 2013, p. 98). For example, terms such as "design research", "development research", "design-oriented research", "design-based research", "design science research", etc. are used to describe the approach (Akkerman & Bronkhorst, 2013; Anderson & Shattuck, 2012). This PhD project will, therefore, use the term Educational Design Research, which was introduced in 2006 by four leading researchers within its field, namely Akker, Gravemeijer, McKenney and Nieveen. This definition is chosen as it both expresses the understanding of methodologies from an educational perspective and at the same time couples Design Thinking directly to the research process.

However, a critical reading of the literature shows that the following three aspects of Educational Design Research are only touched on sporadically: Design Thinking, insider research and mixed methods. For instance, the term "design" is spoken of in general terms, but no directions or methods are given for how these designs occur. Nor is there any explanation for how the theoretical perspectives, which in many ways are the basis of what is being investigated, are translated into concrete designs.

Likewise, the researcher's collaboration with the participants of the project is of great importance for creating transparency when it comes to the data collection and subsequent analytical interpretations. These issues are extremely well known and thoroughly described in the field of action research. But contrary to action research, Educational Design Research does not address in depth the issues that may arise from the researcher taking an insider perspective in the research process. The role of the researcher is thus only mentioned briefly and as a general point of interest. A third point deals with the link between Educational Design Research and mixed methods. The literature describes how Educational Design Research projects often have a complexity and size that call for a mixed-method approach to adequately illuminate the topic of research through a multifaceted data collection. However, there is no immediate description in the literature of how to create the link between EDR and mixed methods.

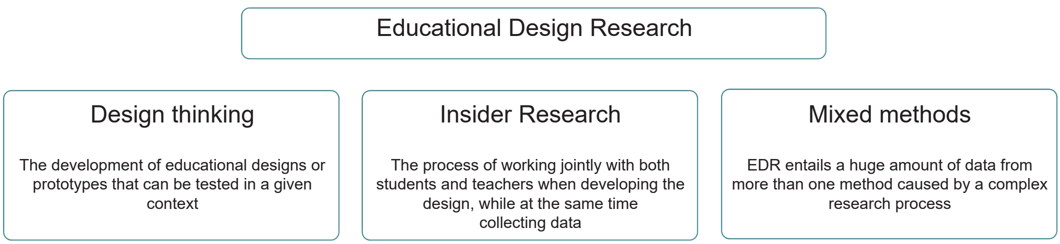


Figure 2 – Shows the three perspectives of EDR that together constitute the research design.

This PhD thesis will thus, in addition to presenting Educational Design Research as the methodology of choice, contribute with perspectives on how Design Thinking, insider research and mixed methods can be combined with EDR. Chapter 3 will therefore focus on the following four main areas:

- General description of EDR – Initially introduces a general discussion on the PhD project's primary methodological approach, Educational Design Research, from a pragmatic epistemological perspective.

- Design Thinking – This is followed by a critical discussion about the method behind Design Thinking embedded in the methodology of Educational Design Research. The section will also describe the chosen path for how this PhD project works with the design concepts.

- Insider research – The next focus will be the challenges regarding the issues relating to the choice of a third-person/objectivist/spectator position versus a first-person/subjectivist/insider position – here, the concept of knowledge creation. These perspectives end with a discussion on the dilemmas a first-person/subjectivist/insider position entails concerning validity and robustness.

- Mixed methods – The last part of the chapter deals with the link between Educational Design Research and a mixed-method approach. Here, the focus is on how a general discussion on mixed methods and partly how the use of different methods can contribute positively in order to capture and understand the complexity that an Educational Design Research project entails. Thus, a link is also made between the project's epistemological foundation and the mixed methods.

3.3. EDUCATIONAL DESIGN RESEARCH

As the domain of education has a particular history with a plurality, differences and contingency, educational research must be able to accommodate the complexity within the research design (Brinkmann & Tanggaard, 2010; Lehmann-Rommel, 2000). As described in the previous section, the epistemology of pragmatism serves in this context as a consensual method of using philosophy that seeks to transcend these many dualisms as a result of contingency (Elkjaer & Simpson, 2011; Kjær, 2010). This means that the research process must be able to accommodate situations characterised by process awareness, unpredictability, differences, diversity and contingency (Lehmann-Rommel, 2000). The choice of pragmatism as the epistemological basis, therefore, sets the agenda for the scientific process, which will thus be about finding clues that disturb the immediate understanding of the context as an engine for further development (Frega, 2011; Godfrey-Smith et al., 2015; Kjær, 2010; Tashakkori & Teddlie, 2010).

With the pragmatic understanding of knowledge as temporary and contextually determined like *"a moving whole of interacting parts",* Educational Design Research offers a design method capable of connecting theory and practice through inquiry (Tashakkori & Teddlie, 2010). Educational Design Research is traditionally defined as being *"a methodology designed by and for educators that seek to increase the impact, transfer and translation of education research into improved practice"* (Anderson & Shattuck, 2012, p. 16). This means that Educational Design Research contains three epistemological cultural and traditional understandings: conducting research, creating a usable design and establishing a sustainable change in the field. Also, the method is not explicitly focused on a desire to create context-free generalisations (Akkerman & Bronkhorst, 2013; Barab & Squire, 2004; diSessa & Cobb, 2004; Kelly, 2006).

As McKenney and Reeves (2013) state, it is not so much the method as the goals that set Educational Design Research apart from other genres of research (Kelly, 2006; McKenney & Reeves, 2013). It is, therefore, a methodology that links several theoretical perspectives and research paradigms to bridge the gap between educational research and practice through the following three design levels: (1) educational research, (2) educational design, and (3) educational change. Initially, the three positions enrich each other as the educational theories and concepts serve as operational tools in the development of educational design (Akkerman & Bronkhorst, 2013). These designs subsequently become tools for establishing an educational change, a change that will ultimately be the object of analysis. In practice, however, this is not a linear development but rather a process characterised by being contradictory, chaotic and iterative (Akkerman & Bronkhorst, 2013; Barab & Squire, 2004; diSessa & Cobb, 2004; Kelly, 2006).

Development and testing of experimental designs or prototypes through a systematic approach, therefore, have a central focus. McKenney and Reeves (2013) point out that it is particularly about addressing both scientific and practical issues. Thus, an Educational Design Research project must be based on a robust theoretical insight to ensure that designs are developed based on existing theory and other research and thereby minimise the risk of speculative projects that are not reliable, legitimate or effective. The focus of the analysis in the process is, therefore, the relationship between the intended, the implemented and the realised design where the generated data must be able to determine the difference between the three previously described design levels (Akkerman & Bronkhorst, 2013; Barab & Squire, 2004; diSessa & Cobb, 2004; Nieveen et al., 2006).

This means that the PhD project in its analytical phase uses the abductive analysis process based on elements from both induction and deduction (Timmermans & Tavory, 2012). The abductive method looks at theories and data as developing entities and thus, according to Haig (2008), becomes a method for theories in the making (Haig, 2008). Through a coding process, the abductive analysis seeks to engage in imaginative thinking about intriguing findings. Through iterative loops in data processing, the goal is to create creative inferencing and double-check previous assumptions (Timmermans & Tavory, 2012). In doing so, the abductive analysis process works from the premise of moving back and forth between data and theory iteratively (Timmermans & Tavory, 2012). The abductive analysis process and its significance for this PhD project are explained later in Section 9.4.

An essential element here is to understand that Educational Design Research does not aim to "prove" that the applied design principles that form the basis of a given design are "true". On the contrary, it will often be those situations where the designed intervention does not end up in a perfect implementation that new practical and theoretical understandings become clear (Akkerman & Bronkhorst, 2013; Anderson & Shattuck, 2012; Barab & Squire, 2004; diSessa & Cobb, 2004; Kelly, 2006; McKenney & Reeves, 2013; Nieveen et al., 2006). As mentioned earlier, pragmatism points out that the creation of knowledge takes place in particular by observing the consequences of an intervention. It is thus when a form of doubt, disturbance or uncertainty is created that is subsequently solved by connecting theory and practice through reflection that new knowledge arises (Brinkmann & Tanggaard, 2010; Elkjaer & Simpson, 2011; Tashakkori & Teddlie, 2010). When this criterion is highlighted it is because the researchers are obligated to demonstrate a sensitivity to the observed consequences of a given design in order to avoid the design principles being elevated as decontextualised principles or grand theories that work with equal effect in all contexts. Anderson and Shattuck (2012) argue as follows:

> *Dewey warns that although general ideals and principles are of value in the direction and enlargement of conduct, they are also dangerous: they tend to be set up as fixed things in themselves, apart from reference to any particular case. (Anderson & Shattuck, 2012, p. 17)*

Engeström (2011) also criticises the practical utility of research in education when it is based on what he calls "classic well-controlled experiments". Among other things, he disputes the idea that educational research can be based on the researcher knowing "what they want to implement, how they want to change the educational practice" where the desired outcome is already defined in advance (Engeström, 2011). In the following quote, Engeström (2011) highlights the importance of the link between interventions and Design Thinking in order to create new scientific knowledge and insights:

> *The main difference between "gold standard" interventions and design experiments seems to be that the former expects the design of the intervention to be completed at the outset while the latter, recognising the complexity of educational settings, expects the design to proceed through multiple iterations of "refinement". (Engeström, 2011, p. 4)*

As the field of education is characterised by changing and often unpredictable ways, research must necessarily be able to address this in its research design. He therefore points out that research through design holds interesting perspectives as the culture of inquiry and exploration infuses Design Thinking (Engeström, 2011; Nelson & Stolterman, 2014).

3.3.1. PRESENTATION OF A FOUR-PHASE RESEARCH MODEL

Amiel and Reeves's (2008) work describes a phase model for Educational Design Research. This phase model has since been further developed and refined through the ELYK project by Christensen et al. (2012). ELYK's phase model thus targets specific research projects in professional and educational research with a specific focus on prototyping based on design principles (Amiel & Reeves, 2008; Christensen et al., 2012). The basis for the model is the use of domain-specific theories that say something about the local problem or challenge linked with more of the general grand theories within the topic of the project. These connections are made through the development of design principles as described in Section 3.4 (Christensen et al., 2012).

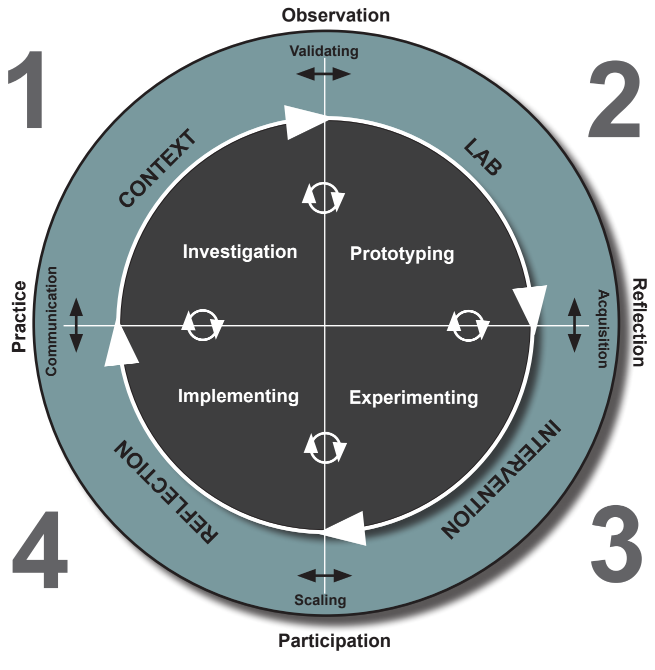


Figure 3 – The four- phase model of Educational Design Research.

The model is a four-phase research model (see Figure 3) consisting of the following phases. Phase (1) addresses problem identification in which domain-specific theories are analytically defined. Also, there is the definition of more general theoretical assumptions that form the framework for the project. This process takes place in a collaboration between researchers and practitioners. Phase (2) is about the development of concrete designs or prototypes based on the defined design principles. Phase (3) consists of a series of iterative processes where the developed designs are tested in practice. Phase (4) is a reflection phase where the design principles are revisited to strengthen the developed design for future implementation in other contexts (Christensen et al., 2012).

The research design for this PhD project is, therefore, divided into four general phases: 1) investigating the problem, 2) developing the prototype, 3) experimenting through three iterative phases, and 4) reflecting and concluding regarding future implementing of the final educational design or model. In addition to the four phases, several small-scale pilot trials have been carried out concerning the initial definition of the PhD project. These are not covered by the material outlined in this PhD report, but those interested can refer to articles in the list of publications. The following sections describe the content of the phase model more specifically in terms of the PhD project's activities and intentions, including a peripheral description of the link to the project's data collection.

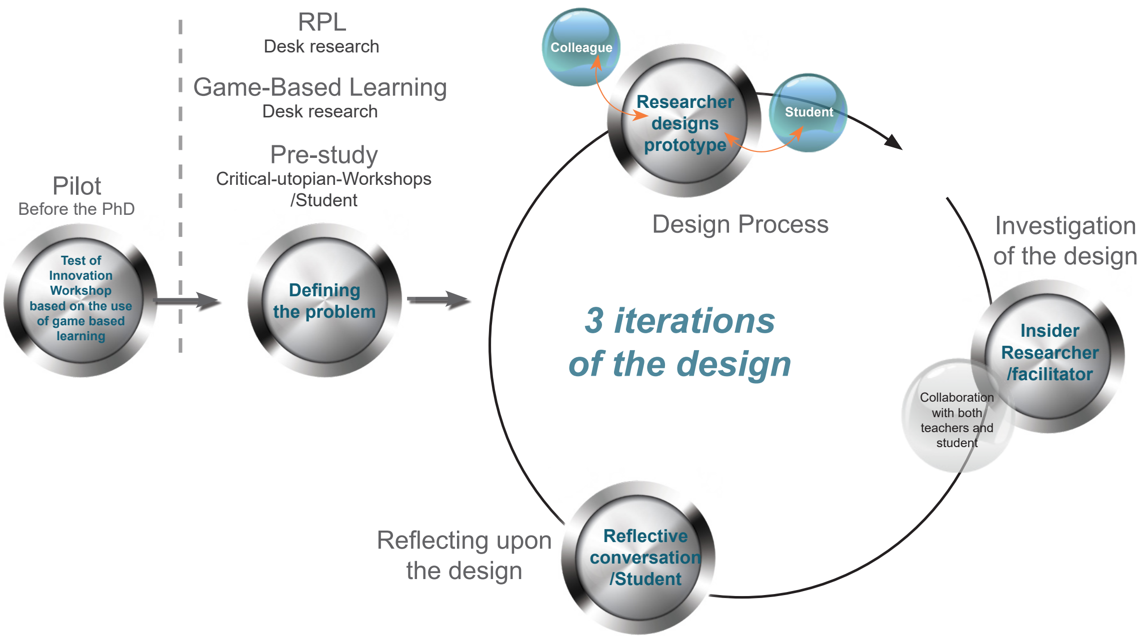


Figure 4 – The model for how EDR is interpreted in this PhD thesis.

Phase 1 – Problem and theory identification (Chapters 4, 5, 6 and 7)

The first step of the research process will be about defining the problem. In phase 1, the key activity is observing the existing pedagogical context with a focus on "describing", "explaining" and "understanding" the issues that characterise the existing practice for the participants. Here, methods from qualitative research are used, but with the particular perspective that the data collected should not only be the subject of traditional analysis. The collected data must be able to inform the creation of design principles in the next phase of the model. Furthermore, theory work and desk research conducted in this phase must likewise help to formulate the design principles that underlie the development of new educational designs and prototypes in phase 2.

Phase 2 – Designing the prototype (Chapter 8)
The formulation of the design principles leads to phase 2, called "prototyping". This phase represents the focus of developing an educational design, based on theoretical insights from Game-Based Learning perspectives balanced with practice-related knowledge while documenting the process. Based on the design principles from phase 1, design schemes are developed that can be transformed into many different concrete didactic designs. The practical research design must ensure that the experiments in phase 3 follow, as far as possible, the design principles that underlie the developed prototypes.

Phase 3 – Interventions (Chapters 9, 10 and 11)
The experimental phase is used for examining and testing the prototypes while listening to students and teachers to get feedback and suggestions for improving the prototype. The research perspective at this stage is thus based on the experiments being followed and documented through several iterative processes. The investigating phase will thus examine, test and experience the developed educational design while collecting data.

Phase 4 – Findings and conclusion (Chapter 12)
The last phase of the model is about all the considerations that are important so that a project can go from being a research project to actual new practices. In the original ELYK model these considerations are based on generalisation. When this concept is used in a pragmatic understanding it is reformulated to deal with reflections on the specific conditions or specific context characteristics that have affected the experiment. Also, considerations as to whether the context is general, making it plausible that the experiment could conceivably work elsewhere. These considerations subsequently allow the results of the experiments to be visualised as new models or theories that can be widely used in the education sector.

3.3.2. TEACHERS AND STUDENTS AS CO-CREATORS

Based on the ELYK model for conducting Educational Design Research, there is great potential in establishing a partnership between the researcher and the teachers. With the aim of joint collaboration, the initial problem identification and desk research become the tools for developing a new educational design through systematic conversion processes (Akkerman & Bronkhorst, 2013; Anderson & Shattuck, 2012).

Educational Design Research thus shares some similarities with action research and gets some inspiration here. Common to both approaches are: 1) a collaboration between researchers and participants, 2) that the research is anchored in practice, 3) that they work systematically with theory, 4) that the goal is to improve theory and practice (Majgaard et al., 2011; Nieveen et al., 2006). Educational Design Research is collaborative through establishing cooperation with the participants from the field of practice regarding problem identification, and formulation of the characteristics of potential solutions through an experimental and iterative process (Amiel & Reeves, 2008; Cobb et al., 2003).

In action research, the improvements are typically initiated by the participants' studies where the researcher plays a facilitating role. In Educational Design Research, on the other hand, researchers and participants from practice work jointly on identifying problems, producing and improving proposed practice innovations (Wang & Hannafin, 2005). In Educational Design Research, it is entirely legitimate that the researcher occupies an "expert" role through active participation in the development process by contributing with innovative proposals to a given design (Edelson, 2006; Nieveen et al., 2006). However, despite the differences in roles, a study by Cole et al. (2005) concludes that the two methodologies, action research and Educational Design Research, share the same epistemological and thus defining characteristics as are known from pragmatism. They therefore concluded their article by recommending the integration of the two. They are not alone in suggesting this, as a study by Misfeldt and Nielsen (2011) also points to the benefits of combining action research and Educational Design Research (Akkerman & Bronkhorst, 2013; Anderson & Shattuck, 2012; Majgaard et al., 2011; Nieveen et al., 2006; Purao & Rossi, 2005). However, there are some issues regarding the separation of roles between researcher and teacher when the design is tested in practice. In action research projects, participants are, as already mentioned, much more integrated into the development phase, where the researcher's task is mainly reduced to facilitating processes. If the teachers lack motivation for creating changes, it can be problematic regarding creating the right attention to the balance between cautious changes or facing a greater risk taking when selecting the design principles. Being able to create a disturbed and unsettled situation as a driver for the acquisition of knowledge is an essential factor when it comes to conducting a pragmatic research process (Elkjaer & Simpson, 2011; Lehmann-Rommel, 2000; Tashakkori & Teddlie, 2010). Existing research on resistance towards change describes how human nature seeks a sense of stability (Lewin, 1947; Madsen, 2009, 2013; Schein, 1995). This natural response means that processes of change often produce resistance, which makes it challenging to engage in a developing process – innovative solutions must often be found through impossibilities. As Decker Walker points out, risk taking in design is what creates the most significant changes (Walker, 2006). This is not the case in Educational Design Research, where the teacher typically plays a limited role in the design process (Akkerman & Bronkhorst, 2013). Since the researcher plays an active and dominant role in the development of the learning design that forms the framework for the research design, it iscrucial that the researcher acquires knowledge about the complexity of the educational context and culture in order to effectively create and measure the effectiveness of an intervention (Akkerman & Bronkhorst, 2013).

The choice for this PhD project will thus be the use of a first-person perspective represented by the researcher in the design process as part of a co-creation team while the prototype is being developed through the conversion of theory into design principles (Edelson, 2006; Nieveen et al., 2006). The teachers who teach at Architectural Technology and Construction Management are thus in this PhD project consulted through workshops between each iteration (see Chapter 10). The teachers and I as a researcher are thus collaborating about balancing the theoretical aspects of gaming theory with the practical learning condition of the fourth semester.

When the design is subsequently tested in practice, the researcher then plays a spectator role through a third-person position by objectively observing the teachers' and the students' response to, and the use of, the design (Walker, 2006; Wang & Hannafin, 2005). The inclusion of the teachers in the design process is in accordance with the pragmatic core principles. Elkjaer and Simpson (2011) describe the significance of why a shared dimension in the process is central to pragmatism: *"Dewey argued that all experience has an objective dimension but that 'sharing experience' must be more than a metaphor because shared objective situations are always interlaced with subjective experiences"* (Elkjaer & Simpson, 2011, p. 65). As a result of this, the intersubjective development processes are catalysts for the continuous development of practice and the ownership of the participants (Elkjaer & Simpson, 2011). It is through interaction, co-creation, coordination, communication, etc. that humans create an intersubjective world, and thereby it becomes possible to see the situations where subjectivity becomes a problem (Tashakkori and Teddlie, 2010).

This argumentation leads to the question of whether it may be possible to benefit from the students as co-creators in the design process. Through participation in workshops, students can bring interesting perspectives to the prototype design principles about the problems they face in their education. However, the concept of Game-Based Learning has embedded some elements that hinder this approach in practice. One of the fundamental principles behind Game-Based Learning is the surprise element and experiences associated with moving toward something unknown. It is, therefore, impossible in practice to have an in-depth gaming experience by playing a game you are developing yourself. The excitement of not knowing what the next step is or how obstacles should be overcome will be lost. Another argument would be the conflict or contradiction between the status of the researcher and the student when it comes to an understanding of what the problem is, and where to find the solution. The understanding of learning in this PhD is very much linked to the concept of playing with impossibilities, and the pre-study revealed that the students to some extent did not acknowledge problem-based learning as a valid way of approaching teaching activities.

The concept of "change" thus becomes essential. How does one understand the idea of change and what influence will it have on the project regarding questions such as: Does the changes have to make things better? What is the risk? Moreover, who decides what is good? Good for whom? One goal could be to find a way or learn a way to educate the students in a shared understanding of what a good learning process looks like, instead of insisting that it is the student or the teacher who should change their belief. The idea of change must be carefully linked with the desire to create new knowledge rather than solve a problem. In this PhD thesis, the ongoing process of identifying new design principles that can inform new design schemes acts as a way to ensure that the focus is not only on problem solving. Thus, the focus of PhD projects shifts towards the development of new knowledge rather than solving a specific problem, as well as trying to establish a sensitivity towards situations where observations or dialogues with both students and teachers point to a detected change in their behaviour. The analysis of the empirical data in Chapter 9 shows that even though the teachers were able to observe changes in the students' behaviour and they acknowledged that it was the game causing it, it was not seen entirely as a positive effect. The teachers questioned whether it is the "right" or perhaps even the most ethical way to make a change if it is based on the behaviourist traits of Game-Based Learning. Examples of these types of concerns have, therefore, been highlighted in the PhD project's analytical chapters and the subsequent reflection and conclusion of the project's results and contribution. If the goal is to build new knowledge, then the process of change mediates the creation of new insights – for example, through an experimental approach. The concept of change is not about whom it benefits or that it has to make something better, but rather it is the understanding of what different perspectives a given prototype can cause. Problematic change may also be the source of new knowledge and perhaps the key to spotting something that is untapped and has some potential. Edgar H. Schein, who was inspired by Lewin's theories, talks about processes of change as a "cognitive restructuring" (Schein, 1995). Resistance phenomena occur not only as back pressure for changes but just as much through the mediation of social factors such as empathy, feelings and attitudes towards other people (Lawrence, 1969). The basic idea behind Lewin's theory is that the current habits and perceptions are first redefined, then a movement is organised towards something new (Gyldendahl-Jensen, 2013; Lewin, 1947; Madsen, 2009; Schein, 1995;).

3.4. THE LACK OF DESIGN PROCEDURES IN THE LITERATURE

One of the essential elements of Educational Design Research is thus research through design experiments. As mentioned in Section 3.2, which presents a review of the relevant literature on Educational Design Research, the term "design" is spoken of in general terms, but no directions or methods are given for how these designs occur. Nor is there any explanation for how the theoretical perspectives, which in many ways are the basis of what is being investigated, are translated into concrete designs. One of the few examples related to the design process in Educational Design Research is the book *Conducting Educational Design Research* by Susan McKenney and Thomas C. Reeves (McKenney & Reeves, 2018). In the section "Design and construction" they try to give several suggestions on design methods. However, there is still a tendency for the discussion to be reduced to discussing the "necessity of design", with very little about how to conduct it. Even when McKenney and Reeves (2018) become more specific about what activities a researcher can initiate, it is limited to simple brainstorming techniques and idea generation methods. A criticism to correct here must be that these methods in themselves do not create designs that link to theoretical assumptions. The following quote illustrates how the design problem is being boiled down to concepts such as exploring, idea generation and mapping solutions. It skips central parts like synthesis as an abductive sense-making process that merges and manipulates different elements into a cohesive structure through sketching. Instead, there is a focus on solutions that must be assumed to be the end product of a design process.

> *The work is guided by theory, as well as local expertise and inspiring examples. During design, potential solutions are explored by generating ideas, considering each, and checking the feasibility of ones that seem the most promising. Once a limited number of options have been identified, potential solutions are gradually mapped from a skeleton design to detailed specification. Once (partially) mapped, the solution is constructed, usually through a process of prototyping. (McKenney & Reeves, 2018, p. 129)*

They talk in the book about building a skeleton design but never explain what it is, or how to create one - besides generation of ideas. According to McKenney and Reeves (2018), a skeleton design consists of both design requirements and design propositions. Design requirements specify the criteria of the intervention and are closely tied to the long-range goal. Design propositions, on the other hand, guide how to achieve the long-range goal. They write, among other things: *"Based on theoretical understanding, empirical findings and local expertise, design propositions may further specify what a design should look like"* (McKenney & Reeves, 2018, p. 129). The challenge is the same; there is no methodological insight into how these design requirements are derived or how they are used to inform the design. When idea generation is coupled with a detailed list of requirements and wishes, there is a risk that the design process does not create new insights but rather creates merely a list of what is already known (McKenney & Reeves, 2018).

The underlying problem is that McKenney and Reeves (2018) do not, through their methodological description of EDR, secure the very basic "bricks" for creating a design process, which means their method is going to point to a solution-oriented modus where specific requirements are almost self-explanatory to the solution, rather than playing with "bricks" that create many potential paths.

In their book, McKenney and Reeves (2018) make several references to Nelson and Stolterman, who are the authors behind the book *The design Way* (Nelson & Stolterman, 2014; Stolterman, 2008). What is interesting, however, is that McKenney and Reeves (2018) fail to include Nelson and Stolterman's theories on design schemes and sketching techniques, which are mentioned in design research as a prerequisite for creating designs (Kolko, 2009; Krogh et al., 2015; Nelson & Stolterman, 2014; Stolterman, 2008). Also, references to Edward de Bono are seen (Bono, 1990), who is known for his theories on lateral thinking, which are basically about how "impossible connections" can be reconciled through new ideas. However, instead of focusing on lateral thinking, they address the design perspective from Bono's (2017) theory of the "six thinking hats", which would count more as an evaluation tool or method for creating status in a given project (De Bono, 1990; De Bono, 2017).

Based on these criticisms, the embedded design process of Educational Design Research in this PhD project will be unfolded through existing theories and models within the research field and domain of Design Thinking. The following section describes Design Thinking as the primary method for developing an educational game design.

3.4.1. DESIGN THINKING

Based on the formulated critique of how design perspectives are described and directed in the literature on Educational Design Research, the following sections aim to contribute to an understanding of how the design challenge is handled in this PhD project. Based on the book The Design Way, formulated by Nelson and Stolterman (2014), which describes the design process through the systematic development of design schemas, the PhD project design approach is unfolded in the following sections (Nelson & Stolterman, 2014). Thus, when the vision is to conduct research through the testing of experimental designs or prototypes through a systematic approach, a fundamental dimension of Educational Design Research must be to understand the concept of "design" (Akkerman & Bronkhorst, 2013; Barab & Squire, 2004; diSessa & Cobb, 2004; Nieveen et al., 2006). Nelson and Stolterman (2014) discuss how methods that frame Design Thinking pave the way for meeting the requirements for future education:

> *To be able to successfully deal with change in the twenty-first century it is now critical that we pick up those frayed design threads, and weave them back into new patterns, integrating their wisdom into a more holistic fabric of life. (Nelson & Stolterman, 2014, p. 21)*

What is essential here is initially to describe the challenges a design process poses, where the necessity for the researcher to occupy a "designerly" position in practice can be challenging, and require specific skills and design insights. Next, the project's understanding of the concept of design, including the "design character", is the basis for the development process itself. It leads to a presentation of the method used, where the "design way" defined by Nelson and Stolterman (2014), in particular, has been the primary basis (Nelson & Stolterman, 2014; Stolterman, 2008). This specification is followed by a description of the importance of the design approach used in practice, along with the concrete methods and tools used in the design process.

Finally, the final design is presented, which forms the framework for the study process and the project's data collection. As previously mentioned, this description will include a discussion of how the individual design principles and design schemes, derived in the previous sections, have been coupled through an abductive synthesis process.

3.4.2. BECOMING "DESIGNERLY" IS THE CHALLENGE

The design concept has, in many ways, become mainstream and is used interchangeably when talking about development and change processes. However, Stolterman (2008) points out that the concept of design is *"grounded in and guided by a sufficient understanding and acceptance of the nature of design practice"* (Stolterman, 2008, p. 56). He argues that a design practice has its characteristics and related disciplines that point to a particular "designerly" behaviour consisting of being able to (1) frame the situation, (2) listen and pay attention to what to embrace and dismiss, (3) explore, extract and recognise, and (4) chose useful information from potential sources (Stolterman, 2008). Thus, in the following quote, Stolterman (2008) describes the difference between whether or not a designerly behaviour is ingrained in a design process:

> *It is obvious that good designers can handle design complexity, and they can do it in ways that lead to innovative and surprising results that people appreciate and value as wonderful examples of good design. Even in the most demanding situation, one with a design complexity that most people would agree is overwhelming, some designers are still able to deliver a design that seems both to "conquer" complexity and to be surprisingly functional and appealing. (Stolterman, 2008, p. 60)*

This means that every development process cannot merely be described as a design process and that it often requires training and experience to become a competent designer (Nelson & Stolterman, 2014; Stolterman, 2008). This argument is also supported by Krogh et al. (2015) in their description of the design process as drifting, where the designer must understand to navigate and learn through sequences of action (Krogh et al., 2015). Kolko (2009) talks about design as a process of synthesis where the designer must be able to *"forge connections between seemingly unrelated issues through a process of selective pruning and visual organisation"* (Kolko, 2009, p. 18). Thus, there is a consensus that the design process requires a specific methodological approach and behaviour that can accommodate a large complex of endless opportunities (Kolko, 2009; Krogh et al., 2015; Nelson & Stolterman, 2014; Stolterman, 2008). Therefore, being able to work in a designerly manner is very much about acquiring a significant degree of discipline and a rigorous process where the use of tools and methods supports intentional and situated design practice (Stolterman, 2008). Based on my education as a civil engineer in architecture and design, this way of working is not unknown. In fact, the designerly approach is in many ways the core of how I work naturally. The challenge is probably in many ways more me being able to create transparency around a complex design process with endless opportunities, as my designerly behaviour is both intuitive and unconscious. It is, therefore, a conscious focus of the PhD thesis, which is further elaborated in phase 2, Chapter 8.

3.4.3. DESIGN CHARACTER

Design is about the creation of meaningful experience by dealing with situations of high complexity and a "messy" reality (Salen & Zimmerman, 2004; Stolterman, 2008). The concept of design has also been referred to as a "third way" to integrate thinking and actions (Nelson & Stolterman, 2014). Thus, the design tradition is an alternative way to create change, which, according to Nelson and Stolterman (2014), shocks the general understanding that change requires "comprehensive analysis and rational decision-making, leading to a clear choice for action" (Nelson & Stolterman, 2014, p. 21). Krogh et al. (2015) try to create an overview of the extent to which design differs from the more classical scientific disciplines. In this connection, they point out that the crucial difference is the design research nature of "drifting". It makes "research through design" vulnerable to criticism, as the argumentation is that research must not be done with a touch of randomness, uncontrolled, illogical and inconsistent (Krogh et al., 2015). When a design process, and thus parts of an educational research design process, is characterised by unpredictability or a "drifting nature", this is undoubtedly a relevant criticism, especially in regard to a desire for transparency. However, they address the criticism by pointing out that a professional design practice contains several procedures, methods and tools aimed at framing and managing the chaotic trajectory of the design process (Krogh et al., 2015). Stolterman (2008), one of the authors of the book The Design Way: Intentional Change in an Unpredictable World, also supports this argument and writes, among other things:

> *The point is that even though the design process is not structured in the way other rational processes are, it does not mean that we have to see the process as a "black art". Instead, design has its own internal structure, procedures, activities and components that are well recognised by skilled designers. (Stolterman, 2008, p. 60)*

This means that research through design should not only focus on a description of the prototype as an end product but also show an interest in describing the procedural choices and arguments that are important for the development of the specific prototype or design (Krogh et al., 2015; Stolterman, 2008).

According to Stolterman (2008), design practice is characterised by the way the "designer" handles the complexity of the problem. He talks about becoming "designerly" as a way of acting and thinking (Stolterman, 2008). Thus, the literature indicates that changes, as a consequence of design, are primarily intentional, and the result of the robust tradition of Design Thinking (Engeström, 2011; Krogh et al., 2015; Nelson & Stolterman, 2014; Stolterman, 2008). Nelson and Stolterman (2014) point out that this is a unique design culture or design character that conceptually sets the boundaries and framework for the design process based on the context. The design approach acts as a catalyst for the intentional actions of the design process by creating space and freedom to explore and play with the contextual challenges of the context. It can thus be argued that the nature of design culture, its methods and approach helps us to understand design as pragmatic inquiry (Nelson & Stolterman, 2014). They write, among other things: *"Design is comprised of reflective and critical thinking, productive action and responsible follow-through"* (Nelson & Stolterman, 2014, p. 5). This means that what might seem like arbitrary design decisions, choices, ideas or thoughts is instead the result of a series of intentional actions aimed at stimulating the recognition of new possible combinations and knowledge pathways. Design Thinking is, therefore, performed through a systematic process, to create the basis for abstract ideas and thoughts to be united and made concrete. Nelson and Stolterman (2014) argue that *"design – as an alternative to this limit on rationality – uses a process of composing and connecting, which pulls a variety of elements into relationships with one another that are then formed into functional assemblies"* (Nelson & Stolterman, 2014, p. 21). In practice, this translates into abstract ideas and turns ideas into a variety of design principles. A design principle can be understood as a theoretical key concept or as a specific key values. The derived design principles can be put together in a myriad of ways in which new theories and models emerge.

Therefore, when referring to a systematic process, it is not a linear process but rather the opposite. Despite this, a design process is often illustrated by incremental linear models. Even models that work with cyclic iterations do not adequately challenge the primary linear picture (Engeström, 2011). However, a literature review by Engeström (2011) shows that in design research there is a tendency to do so: "*A linear view ignores what we know of interventions as contested terrains, full of resistance, reinterpretation and surprises from the actors below"* (Engeström, 2011, p. 3). Instead, it is about systematically and deliberately using a particular type of method that links inquiry and action, thereby pushing designers closer to a new realisation. Nelson and Stolterman (2014) describe it as follows: *"It is a way to approach the reality of the human condition by intentionally embracing the richness of possibilities, the complexity of choices and the overwhelming challenges of getting it right"* (Nelson & Stolterman, 2014, p. 2).

3.4.4. DESIGN ACTING

As previously mentioned, the PhD project is based on The Design Way formulated by Nelsom and Stolterman (2014), where a continuous development of design schemas is the focal point (Nelson & Stolterman, 2014). These are structured and organised mental schemas that support design inquiry and action. To create these design schemas, the researcher needs to act in a certain way. Design schemas are thus a manifestation of actively acting in a specific way to combine different design principles. These combinations of design principles thus create new design schemas aimed at understanding different real-world experiences based on different aspects and possibilities (Nelson & Stolterman, 2014; Stolterman, 2008). In their book, Nelson and Stolterman (2014) define seven characteristics that describe design schemas – for example, patterns of thinking and clusters of ideas that guide the design inquiry, or strategies for how an ongoing knowledge acquisition is made in the design process (Nelson & Stolterman, 2014). Each of these characteristics requires different ways of acting as a designer and researcher. There are thus seven different perspectives on how to act methodically and in an organised and structured way in the design process. Each design loop contributes to design schemas that contain specific perspectives and angles that enrich and extend the understanding of the design challenge (Nelson & Stolterman, 2014).

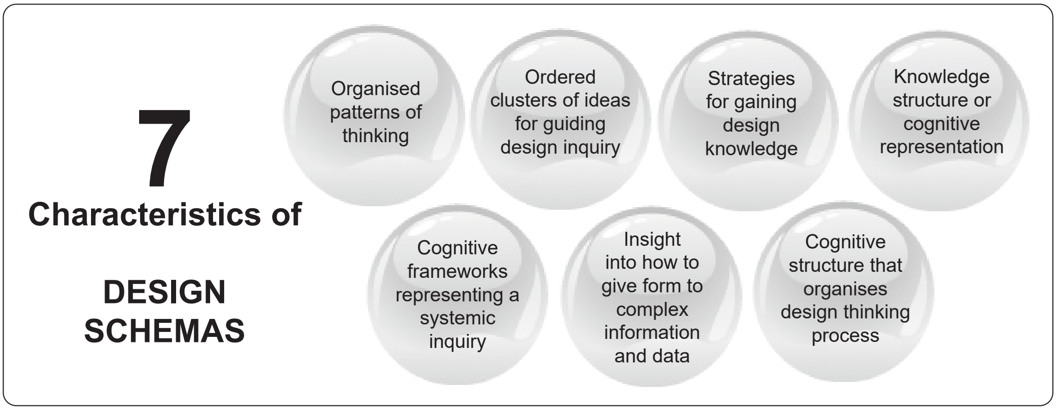


Figure 5 – Illustrates seven characteristics distinctive of design schemas.

A pervasive challenge is handling the amount of information and data that often inform the design process, which makes the use of design schemas a way to externalise and memorise that process (Kolko, 2009). By always translating and designing design principles based on different perspectives, it is possible to find relationships and patterns that can be combined in design schemas. In this way, design schemas become graphical abstractions that allow the thoughts and reflections that the first design principles create to be discussed, defined and embraced (Kolko, 2009). Kolko (2009) describes it as a way to organise the complexity of finding clarity in chaos (Kolko, 2009). Specifically, based on Stolterman and Nelson's (2014) seven characteristics of the design process, various types of design schemas are designed to: (1) translate and put images into ongoing thoughts and reflections, (2) create small graphic models that combine design principles into new ones, (3) create an overview of the ongoing knowledge acquisition by visualising abstract theories, (4) develop graphical models that describe the ongoing recognition process in a structured way, (5) visualise the exploration process driving the project forward, by linking design schemas to begin unique new designs, (6) help shape a standard set of complex data, and finally (7) collect, structure and organise the project's many design schemas with the aim of creating an overview. The different perspectives that design schemas express cause the designers to follow and examine different trajectories that ultimately influence the final design. The decisions that draw these design trajectories can, according to Nelson and Stolterman (2014), be regarded as a centre between intuition and logic or imagination (Nelson & Stolterman, 2014).

The graphic representations that make up the design schemas enable in practice a process of *"composing and connecting, which pulls a variety of elements into relationships with one another that are then formed into functional assemblies"* to be created (Nelson & Stolterman, 2014, p. 21). The process of converting design principles into design schemas transforms the abstractness of relevant scientific knowledge into prototypes that can be tested in practice (see Figure 6). Kolko (2009) termed this process a form of synthesis like an abductive sense-making process that "organises, manipulates, prunes and filters gathered data into a cohesive structure for information building" (Kolko, 2009).

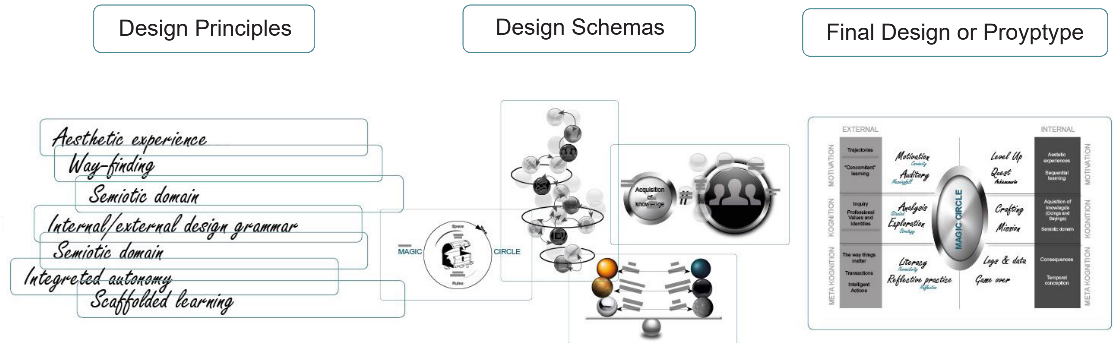


Figure 6 – The process of converting design principles into design schemas and prototypes.

However, he points out in this connection that despite the crucial importance of the synthesis process in order to develop a design, the design process still appears to appear as something magical (Kolko, 2009). In practice, it can be challenging to say precisely which steps in the development, or what design schemas, lead to new specific insights. This means that there will always be iterative processes that weave in and out with each other (Kolko, 2009). However, the described systematic approach supports the belief that essential connections can be drawn between immediate unrelated elements, and thus it is key to link research to design (Kolko, 2009; Krogh et al., 2015; Nelson & Stolterman, 2014; Stolterman, 2008).

In this PhD project there has been an iterative design process in which several design schemas have been developed based on the initially defined design principles, in line with Educational Design Research as the presented methodology. The work on design schemas is regarded as a form of data collection that has contributed to the production of knowledge (1) by challenging the analytical starting point and (2) through the development of the specific design that has formed the framework for data collection. The individual design schemas are continuously qualified and reviewed through conference presentations and the publication of research articles. A more detailed explanation of how the developed design schemas have formed the basis for the development of the final design of the PhD project can be found in Chapter 7.

The development of design schemas uses methods such as sketching, drawing and making artefacts to capture periods of reflection, as well as the thoughts that arise continuously through the investigation process (Kolko, 2009; Krogh et al., 2015). Kolko (2009) describes in the following quote how the design process makes use of mapping techniques that aim to create meaningful sense making:

> *Because of the complexity of comprehending so much data at once, the designer will frequently turn to a large sheet of paper and a blank wall in order to "map it all out". Several hours later, the sheet of paper will be covered with what to a newcomer appears to be a mess – yet the designer has made substantial progress, and the mess actually represents the deep and meaningful sense making that drives innovation. The designer will have identified themes, and will better understand the problem he or she is trying to solve; the designer will have discovered "the whole". (Kolko, 2009, p. 16)*

The description by Kolko (2009) captures the general approach of this PhD project to the design work, where the design principles of the project have been part of a graphic and primarily digital sketching process. "Sketching" can be viewed as one of the classic and perhaps most fundamental activities of a design process (Krogh et al., 2015). Krogh et al. (2015) describe the method outline as follows: *"Sketches can be temporal materialisations of ideas subject to rapid changes, incremental as well as radical changes; sketches can also be materialisations of ideas of parts of a whole" (Krogh et al., 2015, p. 5)*. Thus, sketching and graphic production have supported the reduction of the theoretical and practical complexity of the project.

3.5. INSIDER POSITION

A central dilemma in Educational Design Research is the notion of being respectively an insider or outsider in the practices under investigation (Herr & Anderson, 2015). Several researchers argue for the importance of reconsidering insiderness and outsiderness within education research as it enables the researcher to comprehend the complexity that characterises the practice (Milligan, 2014). This argument is supported by a pragmatic perspective, as Dewey rejected, for example, what he called the "spectator theory of knowledge". He challenged the whole idea that "real" knowledge arises when the researcher only acts passively and observantly. Instead, it is when the researcher takes an active role that supports the opportunity to transform a situation in a beneficial way that new knowledge and insight arises (Godfrey-Smith et al., 2015). Brinkmann and Tanggaard (2010) suggest in the following quotation that the experimental element of pragmatism is challenged when the researcher assumes a spectator role:

> *Experiences are not simply passive happenings, but aspects of human beings, doings and engagements with the world and each other. It means that there are no experiential elements that are simply given in the mind of a spectator. Dewey wants to replace the image of something being given to the eye with the image of something being taken. (Brinkmann & Tanggaard, 2010, p. 246)*

This means that thinking should be seen as an active process that occurs through interaction with reality, where actions, emotions and subjectivity contribute to a constructive direction in the creation of knowledge. Having an insider position means having the important domain knowledge and thus insight into the culture and traditions to be able to actively participate as a research "change agent" (Lehmann-Rommel, 2000).

Within the domain of Educational Design Research, there is thus an ongoing argumentation about the researcher having different positions in practice depending on the situation, the people interacting and the sociocultural norms. A researcher's identity can thus change along the way depending on the context of the situation (Milligan, 2014) Skjervheim describes how the researcher does not have to try to achieve objectivity as the creation of a neutral position as it will cause a new social construct, a new reality. A conventional approach would mean that it is not a constant moving and changing reality that is being studied, but a frozen reality (Nielsen & Nielsen, 2006). The idea of a continually changing reality is also highlighted by Tashakkori and Teddlie (2010) in their interpretation of Dewey's work through the following quote: *"Dewey characterises the universe as a moving whole of interacting parts. And because the parts interact, knowledge about actions and consequences and particular histories and trajectories is possible, not through observation but by connecting with these connections"* (Tashakkori & Teddlie, 2010, p. 113). The truth about reality is thus reduced when the researcher creates a structure with the only purpose of supporting the research process. One consequence of Skjervheim's philosophy is that reality must always be understood as being unfinished; everything can change in different directions (Nielsen & Nielsen, 2006).

Most insider-outsider research talks about how the researcher considers themself in a research process, while it would be more interesting to look at how the balance between the different positions can lead to active choices regarding the creation of new knowledge. This argument is supported by Lizzi Milligan (2014) in her article "Insider-outsider-inbetweener" where she also argues for an active and changing position of the researcher. The notion of power and the positioning between researcher and participants will have an impact on the way knowledge is constructed and what can be recognised. Therefore it is advantageous to work with different positions in the research design to make active choices according to the way different positionings can contribute to various insights (Brinkmann & Tanggaard, 2010; Godfrey-Smith et al., 2015; Lehmann-Rommel, 2000; Milligan, 2014).

An insider thus has a unique position to study specific practical issues in depth because of an individual and in-depth knowledge about practice. Also, an insider researcher often has easy access to participants and information, which may lead to a further expansion of the knowledge base. This provides a distinct advantage in complex and practice-based situations where many factors play together, and thus it is problematic to explore them in a detailed and thorough way. An insider researcher can often go into greater depth when it comes to complex issues regarding an understanding of the tensions that arise between the particular and the general. Paradoxes and ambivalence plague some issues, and an insider is often able to unravel them and has the expertise and experience that provide an advanced level of knowledge (Brinkmann & Tanggaard, 2010; Costley et al., 2010; Godfrey-Smith et al., 2015; Lehmann-Rommel, 2000).

3.5.1. CRITICISM OF INSIDER RESEARCH

Educational Design Research, as mentioned above, is often concerned with issues relating to the relationship between having an insider and outsider position, and here it is crucial to provide clarity regarding what it means for the study's validity, credibility and ethics (Herr & Anderson, 2015). The important point is to be aware of the criticism many research traditions will contribute towards research based on an insider's perspective. There is a concern about subjective research entailing a lack of impartiality. Also, there is a long historical tradition based on an expectation of an objective view of the data (Costley et al., 2010). The criticism has some validity, and it is, therefore, essential to work humbly and openly with these concerns and thereby address the factors that can give rise to criticism. For example, data collection must be given particular attention, especially when it comes to questions about an insider bias and the consequent validity of results (Costley et al., 2010).

A typical error for this type of research is the risk that the researcher's personal or professional identity is treated as an outsider observation rather than an insider position (Herr & Anderson, 2015). A lack of understanding or appreciation of an insider positioning can result in some repercussions that can prove problematic regarding research results.

The benefits of insider research are that it contributes to the development of professions and action-oriented knowledge, which can be challenging to achieve in traditional objective studies (Herr & Anderson, 2015). There is often an unexamined and tacit knowledge that is full of biases, prejudices and unchallenged assumptions. One way to deal with these imbalances is through recognising the researcher's presence in the studio and working on methods that are based on self-reflection (Herr & Anderson, 2015). There are thus some methods and techniques that an insider researcher can use to protect themself from criticism about bias. These could, for example, be a particular focus on the feedback participants contribute with an initial evaluation of the data, or triangulation in the choice of method terms. This potential criticism is countered in this PhD by collecting data through reflective conversations where the researcher is not present. This makes it possible to generate data where students have the opportunity to talk together without the researcher's intervention. The transcription of these reflective conversations is subsequently included as background for the focus group interviews. Likewise, the many design workshops provide an opportunity for both students and teachers to have more extended dialogues with the researcher, where any disagreements or different perceptions of theoretical perspectives can be discussed in depth. The dialogues from these workshops are transcribed and thus inform the analysis of the PhD thesis. Also, the use of a mixed-method approach provides the opportunity to collect more than one type of data, which creates robustness in the findings when several types of data support each other. Criticism of insider research is nevertheless balanced against the value created regarding the professions and action-oriented knowledge (Costley et al., 2010). Insider insight, therefore, offers valuable and in-depth knowledge, but a critical approach to the researcher's work must be demonstrated in the process. It is, therefore, important that the research process is carefully monitored, with a particular focus on the reaction from the practice field's key people (Costley et al., 2010).

3.5.2. POSITIONING AS INSIDER

A crucial issue within Educational Design Research is not to "prove" that the design principles underlying a given prototype are "true". It is instead to focus on why and how the design principles change a particular situation in practice (diSessa & Cobb, 2004; Skovsmose & Borba, 2004). As an engineer in architecture and design, I can in this PhD project combine design skills with practical insider knowledge from my work as a teacher and personal experience as an active gamer.

Me

Sudents and colleagues

Being an Architect/Designer, Being a gamer, Being an educator

Research programmes, organisations, networks

Society, economy, and culture

Figure 7 – Showing what affects my own professional researcher identity.

Figure 7 inspired by Costley et al. (2010) illustrates the stakeholders I as a scientist am affected by and thus must relate to (Costley et al., 2010). Besides my personal relationships, respectively to students and colleagues, I have a professional identity that involves an expert 'insight into, and in-depth awareness of the tacit knowledge that characterises the practice I am researching. Also, the influence of organisations, networks, communities, etc. contributes to forming my general opinion on a professional and personal level. With this argumentation it is relevant in this PhD to work with a coupling between a first-person insider perspective and a third-person outsider perspective, also called an "intersubjectivity perspective" (second-person). The choice of this perspective means that the research of this PhD can be understood as a learning process where reflections on existing practices and the evaluation of the data regarding the scientific criteria are what creates a result. It requires a particular understanding of my professionalism versus my personality, including personal opinions and attitudes towards learning as a concept and the topic of Game Based Learning (Costley et al., 2010). The use of a first-person insider perspective in the design stage while working closely with colleagues combined with a spectator position in the intervention phase creates new opportunities to make significant changes that are inspired by both a theoretical and practical deposit.

3.5. MIXED METHOD AND EDR

The use of Educational Design Research often entails complex teaching designs where it's necessary to collect large amounts of data. In addition, a single method will rarely be sufficient to answer the research question itself. At the same time, this is a field of research that in itself contains a significant plurality, difference and contingency (Brinkmann & Tanggaard, 2010; Lehmann-Rommel, 2000). It is, therefore, a difficult task to have a structured procedure for how the research process should be carried out. As previously mentioned, Garland (2014) argued that educational research should be a pluralistic framework, meaning a combination of different approaches, methods, results, connections, actions, consequences, etc. (Garland, 2014; Tashakkori & Teddlie, 2010). A literature review by Akkerman and Bronkhorst (2013) also concludes that Educational Design Research comprises primarily mixed-method studies with results from both qualitative and quantitative data collection. Anderson and Shattuck agree with this conclusion and say, among other things:

> *EDR interventions are assessed on a wide variety of indices using multiple methodologies. EDR is largely agnostic when it comes to epistemological challenges to the choice of methodologies used and typically involves mixed methods using a variety of research tools and techniques. (Anderson & Shattuck, 2012, p. 17)*

They also emphasise that the choice of methods and the focus on authentic and meaningful issues resonate with the pragmatic philosophy (Anderson and Shattuck, 2012). The following section will, therefore, go into more depth with a general discussion of mixed methods as a research strategy. The section will also attempt to link Educational Design Research to a mixed-method approach. There will be a focus on how the use of different methods can contribute positively in order to capture and understand the complexity that an Educational Design Research project entails. A link is also made between the project's epistemological foundation and the mixed methods.

3.6.1. THE DEFINITION OF MIXED METHODS

The definition of mixed-method research has undergone a continuous process of change but it is still considered a relatively new concept (Creswell, 2010; Frederiksen, 2015). According to Frederiksen (2015), interest in mixed-method research is increasing internationally and across disciplinary boundaries. The reason is the vision of how combining methods allows familiar problems to be tackled in new ways or exceeds the limitations of individual methods (Frederiksen, 2015; Moran-Ellis et al., 2006). Especially in research related to social issues or intervention programmes, mixed methods have been actively promoted (Moran-Ellis et al., 2006). The mixed method has its epistemological point of departure in pragmatic philosophy, which means that the research and the knowledge it creates must be judged on how it helps us to answer questions and understand phenomena that occupy us (Frederiksen, 2015). The early definitions of mixed-method were focused on the application of multiple methods. Subsequently, Tashakkori and Teddlie introduced mixed methods as a "methodology" orientation (Creswell, 2010). Methods differ from methodology in that the former are focused on the procedure for data collection and analysis and possible interpretations. Methodology, on the other hand, deals with the entire process, from the epistemological perspective to the final procedure of reflection (Creswell, 2010). Several researchers from the United States, in particular, have gathered to proclaim mixed-method research into a third research paradigm in addition to the quantitative and qualitative paradigms (Frederiksen, 2015). Mixed-method research is thus distinguished by (a) the use of more than one approach to data collection or analysis, and (b) how those approaches are worked together to produce a cohesive, enhanced whole (Bazeley, 2018).

The fact that the use of mixed methods does not stem from a homogeneous positioning of what has been achieved when a research question is answered through the use of multiple methods means that there are often different reasons for the choice. According to Moran-Ellis et al. (2006), this means that *"different approaches to mixed methods reflects epistemological debates about the status of the data produced by different methods, and these have implications for the way researchers see the relationships among findings generated by methods situated within distinct theoretical perspectives"* (Moran-Ellis et al., 2006, p. 46). Therefore, it is pointed out that the choice of mixed methods as a method is generally based on an idea that the accuracy of the research results and confidence in them are increased (Moran-Ellis et al., 2006). In 2007, Johnson and Turner asked 21 researchers about their understanding of mixed methods, and the answers were marked by the wide variety of questions around what being mixed means (method or methodologies), the stage of the research process in which mixing occurs (data collection, data analysis), and the breadth and purpose of the mixing. Based on the review, Johnson and Turner developed the following definition:

> *Mixed-method research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g. use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the purposes of breadth and depth of understanding and corroboration. (Creswell, 2010, p. 51)*

In their research, Tashakkori and Teddlie, as well as Greene, mapped different attitudes to the philosophical foundation of mixed methods. One direction points out that paradigms are different and therefore cannot be mixed, while other directions say that paradigms are just independent and can, therefore, be mixed in different combinations. The third point of view is that paradigms are not incompatible, but because of their diversity should be kept separate in mixed-method research. In Europe, on the other hand, an extraordinary mixed-method tradition has emerged that rejects the paradigm problem altogether. The fact that the paradigms are different can creates tension that gives new insights (Creswell, 2010; Frederiksen, 2015). According to Frederiksen (2015), the different methods must be united and handled within the usual methodological categories, but with increased attention to justifying analytical approaches and choices (Frederiksen, 2015). Michael D Fetters and Dawn Freshwater (2016) also reflect on the trajectory of the field of mixed-method studies based on a review of the number and type being published in leading journals. They propose that future mixed-method studies should focus on the "integration challenge *"by producing "a whole thorough integration that is greater than the sum of the individual qualitative and quantitative parts"* (Fetters & Freshwater, 2016, p. 116). Mixed methods are thus about a desire to create more secure, comprehensive or complementary knowledge, which can be difficult to achieve through only one method (Frederiksen, 2015).

John W Creswell (2010) considers mixed methods to be primarily a methodological approach where the idea of mixing different philosophical basic positions contributes to critical discussions. However, he points out that mixed methods cannot be reduced to a simplified selection of independent qualitative and quantitative methods. In contrast, mixed methods are about creating integration and connection between two positions, so that they are invited to be dependent on each other (Creswell, 2010). Creswell, though, believes that studies where qualitative data are quantified through, for example, content analysis are an example of a distortion of the concept of mixed methods (Creswell, 2010).

However, this position and interpretation are being disrupted as several research projects using mixed methods exert a far more liberal approach to understanding when something is quantitative or qualitative in its underlying meaning. Tashakkori and Teddlie (2010), for example, describe it thus:

> *The simple problem here is that research in itself can be neither qualitative nor quantitative, only data can properly be said to be qualitative or quantitative. Data can either be quantitative (expressed in number) or qualitative (expressed in text). The problem is that in many discussions, the notations of quantitative research and qualitative research stand for much more than just the kind of data being used. (Tashakkori & Teddlie, 2010, p. 98).*

This approach is in line with Bazely's (2018) work, in which she illustrates how the handling of qualitative and quantitative data, respectively, is mainly about how they are presented, for example in graphic materials. She says, among other things, that *"qualitative responses add illustrative material that expands or explains statistical results"* (Bazeley, 2018, p. 2). If the premise that quantitative and qualitative methods are scientifically compatible is accepted on an elementary level and that mixed methods can be justified, then it is necessary, according to Frederiksen (2015), to make clear what mixed methods are for, as well as how they are used (Frederiksen, 2015). The next section thus explains why this PhD project uses the mixed-method approach and how this choice has been implemented in the research design.

3.6.2. MIXING METHODS IN SOCIAL INQUIRY

Research studies in the social field, including educational research, are very much about understanding complex phenomena. It is, therefore, crucial that there is a well-founded purpose for using a mixed-method approach combined with a clearly defined set of research questions (Greene, 2007). This is important as mixed methods are more than just a method choice, they are a methodological discussion. It is primarily a question of what synergy arises when working with both qualitative and quantitative data collection methods – a synergy that is often directly linked to how the research process is initially designed, including intentional choices that can leverage integration (Fetters & Freshwater, 2016). Therefore, the question of a mixed-method research practice is much more about what, how, when and in what way elements are added together (Frederiksen, 2015). Bazely (2018) has described this process as bringing methods together through techniques such as weaving, merging, conversing, blending, morphing and fusing data (Bazeley, 2018). As Bazely (2018) describes it, methods work *"together in an integrated (interdependent) way; each informs (illuminates) and adds to the other through the exchange of information and understanding, through suggesting new lines of data collection, new ways of interrogating data or through clarifying interpretation of data"* (Bazeley, 2018, p. 1). The mixed method is therefore about creating a framework that allows the researcher to think about how data integration can push research to new heights (Fetters & Freshwater, 2016). In this regard, Fetters and Freshwater (2016) argue that integration considerations should encompass all disciplines of the research process – for example, theory, conceptual models, design, methods, analysis, interpretation, visualisation, presentation, publication and terms. Thus, mixed method are no longer a simple matter of choosing more than one method for data collection (Fetters & Freshwater, 2016). Bazeley (2018) talks about what she calls the "analytical pathways through mixed methods", which is a form of iterative exchange of research disciplines. She points to three possible analytical paths, namely complementary, comparative and transformative, with the overall aim of bringing together different sources and data types through a variety of tools and strategies (Bazeley, 2018).

A review of relevant literature within the field of mixed methods illustrates many different terms and ways of describing the methodological choices associated with the integration of research disciplines (Bazeley, 2018; Frederiksen, 2015; Greene, 2007; Moran-Ellis et al., 2006). Based on Greene (2007), Figure 8 presents an overview of five different approaches to mixed methods. The complementarity approach is chosen for this PhD project as the way to work with mixed methods.

3.6.3. COMPLEMENTARITY APPROACH

The complementary approach is often used in mixed-method research, where there is an explorative aim (Frederiksen, 2015). As the intention of this PhD project is to use mixed methods based on Educational Design Research as the overall methodological framework, the project is built around an explorative approach. The primary purpose of complementary research is to provide more comprehensive knowledge through the use of several methods. The approach is linked in the literature with terms such as

Triangulering	Complementarity	Development	Initiation	Expansion
Convergence, Corroboration Correspondence	Elaborate Enhance Deepen Broaden Description Confirmation Initiation elaboration	Development Sampling and implementation	Paradox, Contradiction, Divergence Fresh insight, New perspectives, Original understanding	Expanding More than one methodological tradition
Used to measure the same phenomenon	Different facets or dimensions of the same phenomenon	Sequentially process	Identifying method that is significantly different from one another	Different method is used to assess different phenomena

Figure 8 – An overview of five different approaches to mixed methods.

“elaborate”, “enhance”, “deepen” or “broaden” with the point of departure being to uncover different facets or dimensions of the same phenomenon. The complementarity of the mixed-method approach is therefore particularly well suited to social research, which is often characterised by being complex and multifaceted (Bazeley, 2018; Frederiksen, 2015; Greene, 2007; Moran-Ellis et al., 2006). The approach may be reminiscent of triangulation but there is no expectation of a convergent validation between the methods. More specifically, the methods must be seen as an analytical complementary to one another in order to gain a deeper understanding (Frederiksen, 2015).

It is, therefore, about being able to analyse the meaning and quality of the educational components that constitute a given teaching design from the perspective of both the students and the teachers. According to Greene (2007), the combination of different data sources contributes to a more complete and comprehensive understanding of the educational design and the participants’ experience of it (Greene, 2007). Greene (2007) writes, among other things: “For purposes of complementarity, however, methods are intentionally chosen or designed to measure different facets of the same complex phenomenon” (Greene, 2007, p. 101). Thus, data in a complementary analysis are either collected at the same time or sequentially dependent on the research design itself (Bazeley, 2018). The integration of the different data types thus provides an improved insight when data and analysis through an iterative process inform design elements in the next iteration (Bazeley, 2018). In addition to understanding mixed methods as a research approach based on a vision of being able to combine and integrate different types of data and methods in different ways, it is also crucial to decide at what level and time in the research process this integration should take place. Frederiksen (2015) identifies six different forms of integration that form certain types of relationships between sections of the project: theory integration, design integration, method integration, data integration, analysis integration and interpretation integration (Frederiksen, 2015). Therefore, the research design for this PhD project is built through a series of iterations based on a complementary strategy through the six phases of the research process (see Figure 9). This means that the application of theory, study design, methods, data collection, analysis and interpretation strategy is intended to inform the development process of the design principles for the next iteration. Thus, complementary data are collected through various methods in carrying out three iterations of the design. These data are subsequently intended to provide a basis for the development of new designs. The data collected for the pre-study phase will also serve as the engine for the development of the first design. When the three iterations of the design are completed, all the data are used in a complementary final analysis (see Figure 10). It is said about mixed methods that the integration of the research disciplines indicates a specific relationship between methods with the aim of “knowing more” (Moran-Ellis et al., 2006). The quality of the research, therefore, relies on the question of when in the process the elements of the project are integrated, and the earlier this takes place, the more likely it is that an actual integration will occur and not just a combination of different methods. Another criticism that has been raised is the

Theory integration	By using Practice Theory as the ontological point of view, it is possible to create a bridge between the empirical parts of the study through theoretical arguments
Design integration	Two study methods are used: Educational Design Research and **critical utopian research** (pre-study). These two methods are also assigned specific roles to answer the research question.
Method integration	The following four data collection methods are used: **interviews, reflective conversation, surveys, workshops methods**. These are not directly linked but are subject to the same conditions at each stage of the research process. For example, the quantitative questionnaire survey contains the same questions.
Data integration	Connections are made between the particular data sets as the students constitute the population for both the quantitative questionnaire survey and the qualitative interviews. As a result of this, the qualitative and quantitative data sets are directly linked.
Analysis integration	The procedure for the analysis is an application of the individual data sets through a double analysis process, where the results from each iteration are used as a basis for a renewed analysis process across datasets.
Interpretation integration	The interpretation is the results of how the analyses are related to theory, hypotheses and previous research. The goal is thus to use the results of the analysis to create a new theoretical model for how the use of Game-Based Learning supports the development of an inquiry-based teaching environment.

Figure 9 – How each used method is integrated and mixed into a coherent research design.

problem of linking research paradigms based on different epistemological philosophies. To this, Moran-Ellis et al. (2006) reply that, based on pragmatic philosophy, it can be argued that methods can be regarded as tools rather than an epistemological framework (Moran-Ellis et al., 2006).

Later, in Chapter 8, under the heading "Criteria of quality within an EDR project", the quality criteria that apply in social research and more specifically concerning the chosen research strategy in this PhD project are elaborated.

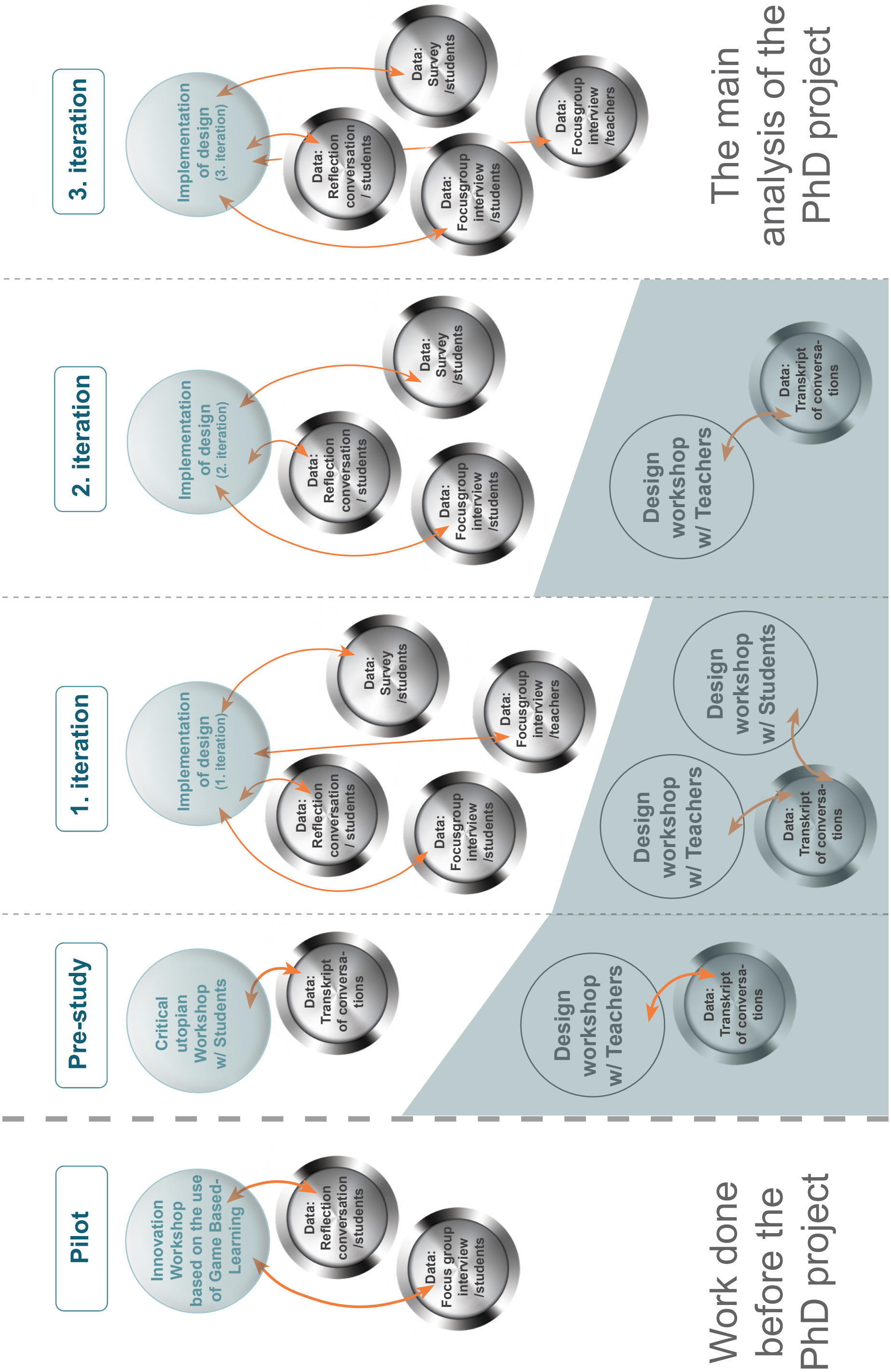
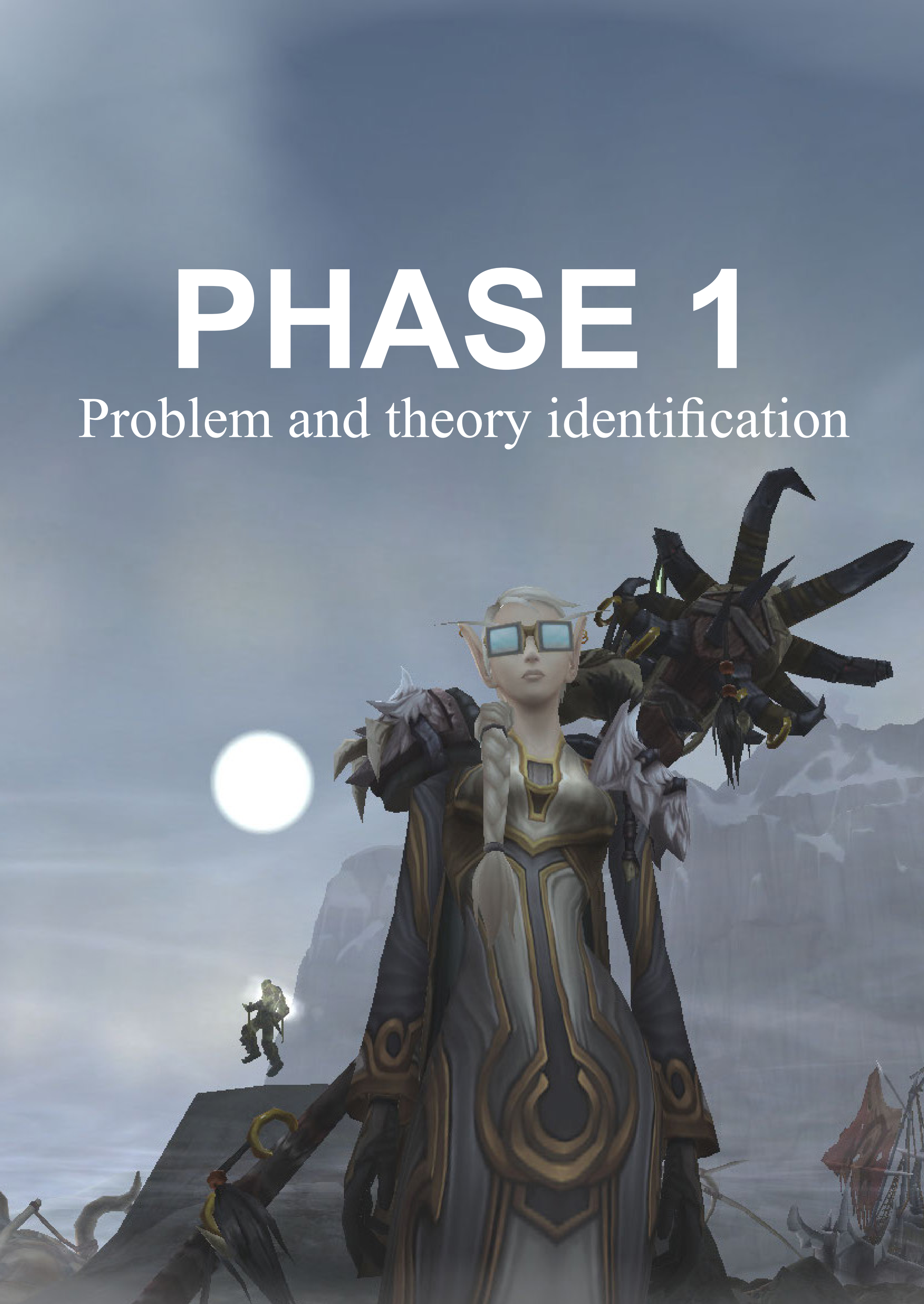


Figure 10 – A schematic overview of the project's overall research design

PHASE 1
Problem and theory identification



Introduction to Phase 1

The first step of the research process will be about deriving design principles. The chapters in this phase thus present three desk researches of relevant topics, namely Practice Theory, Game-Based Learning and World of Warcraft, as well as the result of the initial pre-study. As mentioned in Chapter 3, a part of phase 1 of Educational Design Research is about observing the existing pedagogical context with a focus on "describing", "explaining" and "understanding" the issues that characterise the existing practice.

The purpose of both the desk research and the pre-study is to derive design principles that can inform the design process in the next phase. The theory work and desk research conducted in this phase thus support the formulation of the design principles that underlie the development of new educational designs and prototypes in phase 2.

Deriving design principles from theory work and desk research creates an opportunity to ensure that the final design of phase 2 is based on theoretical insights. Based on the design principles from phase 1, design schemas can thus be developed and transformed into many different concrete pedagogic designs.

This means that the upcoming Chapter 4, 5 and 6 will derive a significant number of design principles. These are highlighted in the text with a **Orange** colour. The accumulated list of design principles from each desk research is presented and summarised in the final chapter of the phase. Next, it is visualised how continuous condensation has contributed to reducing 132 found design principles to 36.

CHAPTER 4. LEARNING APPROACH

The chapter will elaborate on the theoretical learning position of the PhD to be able, at the end of the chapter, to derive several specific design principles that can be used to design new learning concepts addressing some of the domain-specific situation and problems. Reflective Practice-based Learning as the current learning approach at University College of Northern Denmark (UCN) is, therefore, initially presented. To unfold and understand the more profound and theoretical assumption behind Reflective Practice-based Learning, “Practice Theory” is introduced in section 4.2.

The chapter ends with a summary of the pre-study (see appendix A and section 4.4), that reveals how the students in technology programs at UCN lack specific learning strategies for how to work in-depth with the curriculum through the process-oriented approach of Reflective Practice-based Learning. The consequence is a "passive-aggressive resistance" against the teaching and a lack of Autonomy. It is, therefore, difficult for educators to motivate students to be interested in an explorative and analytic approach to the academic representation - disciplines they might not even see the value of - if the teaching is based on traditional dissemination of specific knowledge. Furthermore, the students do not develop a reflective practise that enables them to challenge and change the professional context.

4.1. REFLECTIVE PRACTICE-BASED LEARNING

Reflective Practice-based Learning is a relatively new learning practice that was initiated in 2013 at University College of Northern Denmark (UCN). The motivation for developing a shared understanding of learning that applies to all education at UCN has been the desire to ensure that graduates from UCN are prepared for the future job market with relevant professional, personal and social competence (Horn et al., 2019). UCN thus describes the reason for having a shared understanding of learning at an institutional level as follows:

> *At UCN, we have a shared foundation and a shared understanding of learning that allows the individual employee to make qualified educational and professional decisions in the organisation of study activities. Thus, Reflective Practice-based Learning is a common, pedagogical point of departure at UCN; a special educational pedagogy for the professions that UCN provides education for. (Horn et al., 2019, p. 3)*

Reflective Practice-based Learning is thus an emerging concept that is still under development to which this PhD project is yet another contribution. The aim, in addition to the PhD thesis’s own agenda, is to be able to say something more general about Reflective Practice-based Learning based on the analytical interpretation of the collected data of this project. This chapter will thus contribute with in-depth desk research attempting to create a theoretical framework for Reflective Practice-based Learning through the philosophy of Practice Theory. The desk research thus examines the theoretical implications of Reflective Practice-based Learning through the lens of Practice Theory, which will help clarify and sharpen the future work of Reflective Practice-based Learning. For a description of the more specific findings and contributions, see Chapters 10, 11 and 12.

Since the launch of Reflective Practice-based Learning, UCN has worked intensively to qualify the theoretical foundation on which the learning approach rests. In 2019, an institutional White Paper was published (Horn et al., 2019) to clarify and define the framework for Reflective Practice-based Learning. The institutional White Paper presents six pedagogical core principles (see Figure 11) that are assumed to create proper conditions for Reflective Practice-based Learning. Since I have been part of the group writing up the white paper, the six pedagogical core principles are thus informed by the PhD project's early conclusions and trends. Likewise, writing up the White Paper has supported and sharpened the theoretical focus of this PhD thesis. The process of developing an institutional White Paper has thus been a parallel and integrated part of this PhD project. One of the contributions of this PhD is, therefore, a theoretical substantiation of the six principles through the lens of Practice Theory.

Core principle 1:
The students' own experiences are incorporated into teaching and learning activities

Core principle 2:
Teaching and learning activities are designed to include appropriate disturbances

Core principle 3:
Teaching and learning activities are organised as exploration

Core principle 4:
The content of teaching and learning activities is based on good example

Core principle 5:
Lecturers and students work together on learning processes

Core principle 6:
Lecturers and students create room for dialogue

Figure 11 – The six core principles of RPL.

The six core principles assume that the educational focus must first and foremost be on experiences, as a precondition for reflection and learning processes. Next, reflection occurs to a given action by the educational activities allowing the student to experiment and explore the academic field. And finally, a student's actions are always related to both the world and the student (Horn et al., 2019). This PhD thesis thus has a particular focus on principles 2 and 3, which deal with students learning through disruptions that initiate processes of exploration. The project's focus on these two basic principles is argued by some of the theoretical assumptions that characterise Game-Based Learning (see Chapters 5 and 6).

The perspective of Reflective Practice-based Learning is thus a profession-oriented pedagogy that works purposefully with practice-based learning activities that link practice knowledge, theoretical knowledge and research knowledge so that the students can acquire competencies that will enable them to make a positive difference in the future labour market.

Inspired by Dewey's work, Schön (2001) was one of the first to put the concepts of reflection (theory) and practice into what he termed "reflective practice" (Dewey, 1933, 1938a, 1938b; Schön, 2001) – an understanding of learning that aims to clarify how current theory has an impact on the development of professions through processes of reflection (Fook, 2007; Schön, 2001). David Boud (1989) also talks about reflective practice, as a process where action, experience and reflection coalesce (Boud, 1989). Dau (2016) explains that because Reflective Practice-based Learning is composed of the concepts of reflection and practice, it is a *"diffuse concept that relates to different theoretical optics within different traditions and contexts"* (Dau, 2016, p. 68). According to Dau (2016), this means that Reflective Practice-based Learning contains different ontological positions that traditionally have divergent views concerning an understanding of the concept of learning as being respectively mental or social processes (Dau, 2016). The concept of reflection is traditionally associated with mental constructivism, especially the cognitive learning that is characterised by having the individual at its centre. The concept of practice-based learning, on the other hand, is rooted in social learning where the community and the interaction between people are what constitute the learning (Dau, 2016).

As Reflective Practice-based Learning is created through the educators at UCN's reflections on learning processes, it has a much more pedagogic foundation concerning what works in practice rather than a more learning-theoretical and philosophical dimension (Dau, 2016).

Teaching methods in professional studies

The concept of "profession" was introduced in the first half of the 20th century (Laursen, 2004). The word "profession" comes from the Latin professio, which means "I declare publicly". In a common understanding, the term today is applied to the work that a person lives or is trained to do. Hence, the term can be defined as a profession whose practitioners have a background in a particular formal education that gives them professional authority and status. In this understanding, a profession is characterised by professional norms and standards as well as, in some cases, a professional ethic. According to American sociologist Merton (1982), professionals have roots in three fundamental values: knowing, doing and helping (Merton, 1982).

> The first value, KNOWING, deals with systematic knowledge and specialised thinking. "Knowing" means that the profession refers to theoretical and empirical knowledge that the general population generally does not know (Merton, 1982).
>
> The second value, DOING, means that the profession attaches high value to technical skill and practical competence. This means that the professionals are expected to apply their theoretical knowledge to solve problems in practice (Merton, 1982).
>
> The last value is the ideal of HELPING, which means that the professionals' knowledge and skills, "knowing" and "doing", are used to help and service the client (Merton, 1982).

Since the introduction of the Professional Bachelor's Order in 2001, the relationship between theory and practice has undergone renewed discussion (Haastrup et al., 2013). The reason for this is more stricter and new requirements for the theoretical grounding and foundation of the professional educational programmes. In particular, the understanding of the concept of the profession, which is based on a fundamental assumption that a *"technical knowledge of the profession enables the professionals to develop the profession's practice and not merely carry on the tradition"* (Haastrup et al., 2013, p. 9), has given life to a theory-practice discussion. Thus, the dominant understandings are based on the assumption that the application of theory through processes of reflection can strengthen and develop practices on a well-founded basis (Haastrup et al., 2013). In this context, Bjerre (2016) describes theory as a professionalism at a higher level of abstraction: *"To be reflective, practice-based learning must assume that students have acquired a professionalism that is at a different level of abstraction than that which unfolds in practice, since this must be considered a prerequisite for being able to reflect qualified on practice"* (Bjerre, 2016, p. 37). This means that the educational challenge consists in breaking down the students' intuitive understanding of practice with the aim of subsequently acquiring a more systematic and professional understanding of the field (Bjerre, 2016; Horn et al., 2019). Also, theoretical involvement in the form of empirical research will, over time, create an evidence-based practice (Haastrup et al., 2013). In many cases, practice is guided by routines, habits, values and perhaps even prejudice, and here theory and research-based knowledge play a crucial role in opening up alternative options for action (Bjerre, 2016; Haastrup et al., 2013). According to Fook (2007), this means that some discrepancy may arise between theory espoused by practitioners and the theory then embedded in the actual practice of professionals (Fook, 2007). According to Haastrup et al. (2013), a practice that cannot document its knowledge will lose its character of being a profession (Haastrup et al., 2013). It is, therefore, essential that students can distance themselves from practice through a reflective approach (Fook, 2007). This means that students must be able to analyse and discuss practice from both a general and explicit perspective to gain the ability to take a critical position towards the profession's questions (Bjerre, 2016). Haastrup et al. (2013) argue that it may be appropriate to work with several different strategies and understandings of how theory and practice relate to each other (see Figure 12). They talk about how a combination of different positions and understandings of the theory-practice relationship creates a better connection. This view from several perspectives is necessary to capture the complexity of the theory-practice combinations (Haastrup et al., 2013).

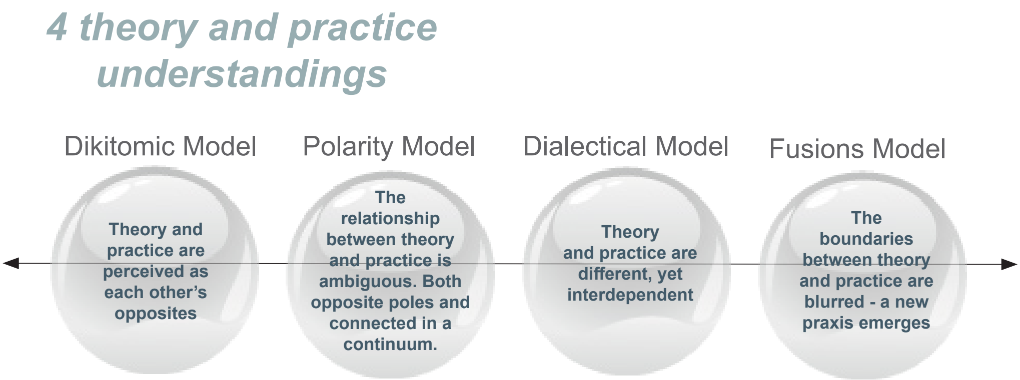


Figure 12 – Four understandings of the theory-practice relationships.

The concepts of theory and practice are often understood very simplistically, but it opens up new possibilities if the concepts are nuanced and expanded (Haastrup et al., 2013). For example, Fook (2007) speaks of critical reflection and reflective practice as two immediately different perspectives that are not mutually exclusive as both are based on several standard features regarding processes of thinking (Fook, 2007). Thus, Reflective Practice-based Learning seeks to create a settlement with a prevailing dichotomy by allowing students to alternate between a theoretical understanding and a practical trial. Emmerik et al. (2015) summarise it as a vision to formulate a meeting point between these positions by leaving the starting point in practice didactic (Emmerik et al., 2015). The importance of practice as a prerequisite for learning makes Reflective Practice-based Learning reminiscent of existing learning theories such as project pedagogy, activity theory, apprenticeship learning or the theory of community of practice (Emmerik et al., 2015).

Reflective Practice-based Learning, therefore, reflects the fundamental learning approach that characterises UCN as a value-adding educational and knowledge institution. As a premise for creating value-based knowledge are situations where a bilateral meeting between concrete, practical experiences and abstract principles is created (Horn et al., 2019). This bilateral meeting between theory and practice implies that RPL fits the dialectical perspective, as illustrated in the model (see Figure 12). In the next Section, Practice Theory is presented to provide a more in-depth theoretical elaboration. The choice of Practice Theory is argued because of the way it describes the boundaries between theory and practice as blurred and in symbiosis with each other. This means that an elaboration of RPL through Practice Theory will constitute the connection of theory and practice as dialectical, where the two concepts are different yet bound to be dependent (see Section 4.2.1).

4.2. PRACTICE THEORY

Based on the six pedagogical core principles, which in the institutional White Paper are assumed to create proper conditions for Reflective Practice-based Learning, Practice Theory is presented to create a deeper understanding of the theoretical learning aspect of RPL. The PhD thesis argues that Practice Theory can formulate and deepen the learning intentions that characterise the vision behind the six core principles of Reflective Practice-based Learning. Besides a general discussion on Practice Theory, formulated by, among others, Theodore Schatzki, John Dewey's work on experience-based learning is the primary theoretical source.

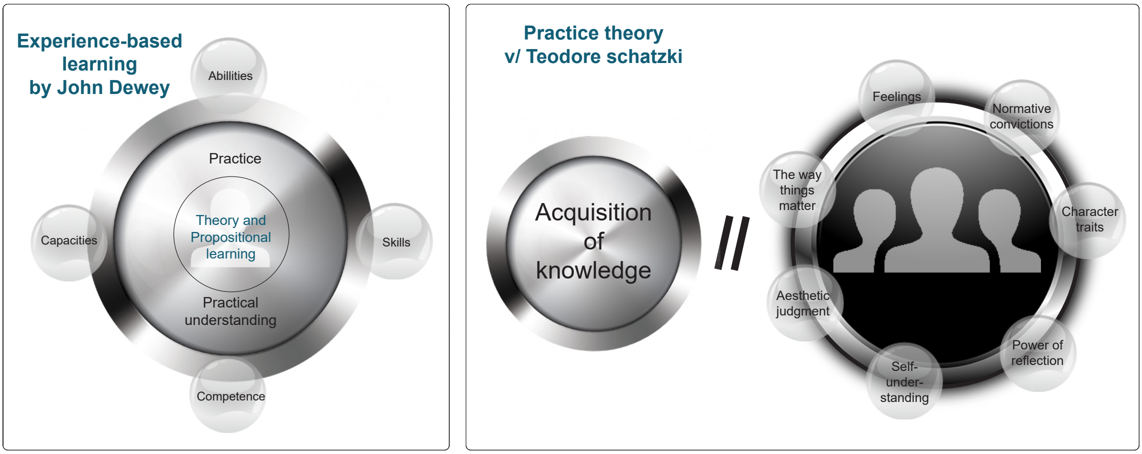


Figure 13 – the similarities between practice theory and experience-based learning

The ontology of Practice Theory argues that learning arises from designed learning spaces where a combination of different activities strengthens the ability to act professionally in a changing reality. Practice Theory is defined and drawn through a variety of theoretical positions, for example those of Ludwig Wittgenstein, Pierre Bourdieu, Anthony Giddens, Michel Foucault, Theodore Schatzki, Ole Dreier, etc. (Schatzki, 2016, 2017). Common to all these theoretical positions is that they all start from a theory-practice link as a foundation for creating learning. In this regard, Teodore Schatzki (2016) is considered to be one of the most current in the field of Practice Theory. Schatzki talks about learning as something that occurs as gradual, cumulative or anticipated developments that follow predictable paths (trajectories). When obstructions, disruptions and disturbances challenge these predictable paths, reflective behaviour is triggered, which creates new meanings and knowledge (Dreier, 2008; Schatzki, 2016, 2017).

In addition, John Dewey's experience-based learning rooted in pragmatic thinking can be seen as an early but significant contribution to the field of Practice Theory (Buch & Elkjaer, 2015; Dewey, 1938a, 1938b). The following are considered to be the most influential works by Dewey: How We Think; Democracy and Education; Logic: The Theory of Inquiry (Elkjær & Wiberg, 2013). Dewey's basic idea is that humans learn through investigative processes in which the dynamics and constant movements of reality influence what is investigated. This means that knowledge is developed in continuous interaction with the surroundings (Kjær, 2010). Dewey uses the term "event" to describe reality as temporal, historical and procedural. Learning and learning processes must, therefore, be understood as dynamic in relation to the practices and activities in which they are based and where humans are the focal point. We (re)construct meaning and actions through an experimental approach through the concepts of tools where the social context acts as stimuli that elicit particular reactions (Buch & Elkjaer, 2015; Dewey, 1933; Elkjær & Wiberg, 2013; Kjær, 2010).

The combination of Schatzki and Dewey will thus form the primary learning theoretical foundation for this project. The argument for combining Dewey's pragmatic experience-based learning and Schatzki's ontological interpretation of Practice Theory can be found in Buch and Elkjær's (2015) work. They described how the theories behind Practice Theory and pragmatic learning understanding have a natural ontological focal point. Based on a condensation of Dewey's and Schatzki's most important works and texts, respectively, the following seven main points within Practice Theory were found to be relevant to the topic of interest in this PhD.

An anti-dualistic learning approach
Experience
Acquisition of knowledge
Inquiry and exploration
Trajectories
Normativity
Transformation of disturbed experience

Also, these thematisations have increasingly contributed with design principles that through an abductive design process have subsequently been converted into meaningful design schemas regarding the PhD thesis's overall problem (see Chapter 8). Furthermore, the seven concepts have provided significant analytical perspectives on the understanding of learning of the students at UCN technology and thus have been important regarding analytical findings of the pre-study.

The individual themes are further elaborated in the following Sections in order to qualify the theoretical basis for Reflective Practice-based Learning.

4.2.1. AN ANTI-DUALISTIC LEARNING APPROACH

In pragmatic learning theory, action and thinking are an integral part of each other. Based on the preliminary discussion of RPL as a dialectical perspective of learning, illustrated in the model (see Figure 12). In the next Section, Practice Theory is presented to provide a more in-depth theoretical elaboration. The choice of Practice Theory is argued because of the way it describes the boundaries between theory and practice as blurred and in symbiosis with each other. This means that an elaboration of RPL through Practice Theory will constitute the connection of theory and practice as dialectical; here the two concepts are different yet bound to be dependent (see Section 2.1).

A fundamental element of pragmatic philosophy is the compilation of dualisms such as action and thinking, and individual and environment. The analytical perspective, then, is that action cannot be seen as something separate from consciousness. Instead, Dewey refers to it as **"intelligent action"** (Dewey, 1933; Elkjær & Wiberg, 2013). According to Schatzki (2017), cognitive learning theory is based on the idea that it is the person who learns: *"Learning is the acquisition by individual people of propositional knowledge"* (Schatzki, 2017, p. 2). In this understanding, the brain is thus the focal point of learning and hence the accumulation of knowledge. It does not matter whether knowledge is accumulated through personal research, transmitted through books/the Internet or created through interactions (Schatzki, 2017). From a historical and psychological perspective, there has also been a general idea that it is in the brain that this accumulation of knowledge takes place, also called internalisation (Dreier, 2008; Schatzki, 2017). It is this notion of learning that Practice Theory is rebelling against. Brinkmann (2006) describes how Dewey's work points in the direction that learning and how people recognise are directly linked to social processes. Dewey accepts contingency as a basis for learning, where **experimentation** and **exploration** in social communities are key to recognition (Brinkmann, 2006; Dewey, 1933). Both Dewey and Schatzki agree that experience or meaning is created through the practical and often accustomed actions of the practitioners (Dewey, 1938a, 1938b; Schatzki, 2016, 2017). They both try to create oppose against the dualistic view that learning is either a social phenomenon or an individual process. Dewey's work, in particular, is based on **anti-dualism**, where learning should instead be understood as procedural activities and relational phenomena (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1938a, 1938b; Kjær, 2010). Schatzki also talks about how people, based on their motives and intentions, transform the world they are part of. According to him, it is a **dialectical approach** where social structures and human agency work together in a dynamic coexistence. Where Dewey sees the boundaries between theory and practice as blurred and in symbiosis with each other (Brinkmann, 2006), Schatzki, on the other hand, believes that the concepts of theory and practice have a **dialectical context** in which they are different yet bound to be dependent (Schatzki, 2016, 2017).

The peculiarity of Schatzki's understanding of learning is that he argues that there is an ontological transformation of people and that learning cannot be considered a "thing" that has a "location" independent of context. Learning is, therefore, about embracing the acquisition of a full set of "features" in combination with learning theory that is based on the acquisition of knowledge (Schatzki, 2017). Therefore, Practice Theory is critical of the idea that learning alone is something that can be taught or transferred from books and scholars' heads. This means that it is more about changing the perspective of learning by putting the academic disciplines in line with other practical activities (Brinkmann, 2006).

Where Dewey believes that theory and practice are definitively interrelated and inseparable, Schatzki speaks more to the fact that learning is constituted by different ontological understandings of learning theories, which are linked in a dialectical and parallel context (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013; Schatzki, 2016, 2017). Thus, Practice Theory argues that the conceptual pairs theory and practice, individual and environment, thinking and acting, goals and means, and facts and values are **transactive related**, and mutually constitutive in an integrated and holistic whole (Brinkmann, 2006; Buch and Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013; Schatzki, 2016, 2017).

Practice Theory does not create a new understanding of learning but provides new insights into an understanding that the acquisition of knowledge cannot constitute learning alone. Therefore, Practice Theory challenges the traditional conception of learning as a proportional acquisition of knowledge (Dreier, 2008; Schatzki, 2017). Learning is also the embracement of elements such as **normative beliefs, aesthetic judgments, emotions, the power of reflection, self-understanding, the way things matter, character traits**, etc. (Schatzki, 2017). Also, teaching should take the concept of **"time"** into account as a factor, and thus move away from the idea that teaching is based on the assumption that the future will be like the past (Dewey, 1938a, 1938b).

According to Schatzki, learning should instead be seen as a part of a flat ontology, where the practice is the central element that constitutes social phenomena, where two of the essential concepts are **"practice"** and **"material arrangements"** (see Figure 14 and 15). The term "practice" deals with spatial and temporal dispersed activities of doings and sayings that are organised with a shared understanding, **teleoaffectivities** (goals, tasks, emotions) and rules – no one organises the activities. Material arrangements, on the other hand, deal with how bodies, organisms, artefacts and nature, etc. are interconnected (Schatzki, 2016).

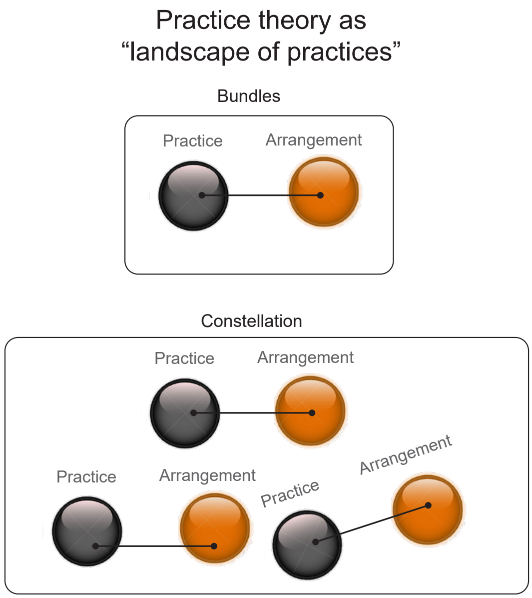


Figure 14 – How "practices and arrangements" create bundles.

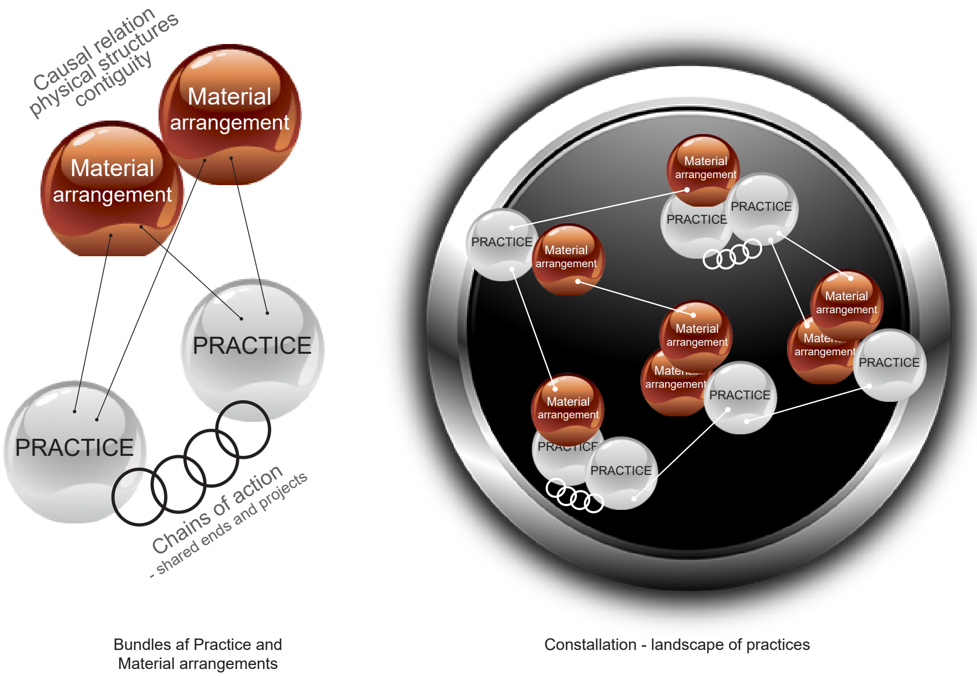


Figure 15 – How multiple bundles create "landscapes of practices".

These bundles of practice and material arrangements can be combined in what Schatzki calls a **"landscape of practices"** (see Figures 14 and 15) (Dreier, 2008; Schatzki, 2016). The combination and connection of different bundles thus create sequences of actions that inform and affect each other.

Reflective Practice-based Learning as a learning theory can thus be argued partly through pragmatic philosophy and partly through Practice Theory, where practical and theoretical reflection creates a **transaction** and thus learning (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013; Frega, 2011; Godfrey-Smith et al., 2015; Kjær, 2010; Schatzki, 2016, 2017; Tashakkori & Teddlie, 2010). Thus, Reflective Practice-based Learning is a learning approach that aims to pedagogically facilitate a clash, connection, coupling, etc. between practice and theoretical reflection.

4.2.2. EXPERIENCE

A central and fundamental part of Dewey's work is about experience-based pedagogy, where the concept of exploring plays an important role in establishing learning (Kjær, 2010). Experience has traditionally been understood as an epistemological concept where the purpose is the production and acquisition of knowledge through reflection based on actions. However, Dewey's understanding of **experience** must be viewed as an ontological understanding where people will always be situated, and therefore he talks about a transaction between individual and environment (Dewey, 1938a, 1938b). The concept of experience in Dewey's thinking is, therefore, something more and something other than mere knowledge gained through past actions, and therefore it cannot be said that experience has a beginning or an end. It is, on the other hand, about the relationship between thinking and action and the relationship between people and the environment (Brinkmann, 2006; Dewey, 1938a, 1938b). Dewey argues, as previously described, that we participate in a world where action and thinking are interconnected, and experience is thus the concept that describes both our connection with the environment and the relationship between action and thinking – it is the transaction itself that is the experience (Dewey, 1938a, 1938b). Experience is thus both active and passive in a way in which it unfolds through experiments and at the same time submits to the **consequences** of the activities (Kjær, 2010). According to Kjær (2010), it is a misleading simplification when Dewey's learning concept is summarised as "learning by doing", which is a derivation of "learn to do by knowing and to know by doing" (Kjær, 2010).

Learning is, therefore, a flow of experiences consisting of continuous "practices" and "material arrangements" that integrate. According to Dreier (2008), this means that learning is **open-ended** (Dreier, 2008). The continuous merging of activities means that no gaps, **mechanical intersections** or dead areas occur when we experience something. However, the openness of the learning process makes it difficult to define the status of incomplete learning (Dreier, 2008). Dewey, therefore, talks about the need to establish

breaks or **rest periods** where it is possible to define the **quality of progress.** The break thus becomes a way to make status, sum up and maintain the experience (Buch & Elkjaer, 2015; Dreier, 2008; Elkjær & Wiberg, 2013). One of Deweys metaphor for this is a comparison to the process of boiling water. By turning down the flame, it is possible to prevent all the water from evaporating.

Similarly, the break is used to maintain the experience and prevent it from **"evaporating"** (Dewey, 1980). The experience thus expresses both who we are and how we become aware of it (thinking). Experience is both the process of experience (the learning process) and the result thereof (experience). Learning is thus the key to gaining experience, and the concept of **inquiry** is the method we use to construct knowledge systematically based on our experiences (Buch & Elkjaer, 2015; Dewey, 1980; Elkjær & Wiberg, 2013).

The continuum of experience is basically about being able to distinguish between the experiences that are worth something and those that are not (Dewey, 1938a, 1938b; Dreier, 2008). A fundamental principle in the continuum of experience is about **habits,** which, in Dewey's understanding, should be regarded as something more than just a fixed or habitual pattern of action. The concept of habits thus covers the formation of attitudes, like emotions. And one can add to that the underlying receptivity and way in which new challenges are met or answered (Dewey, 1938a, 1938b).

4.2.3. ACQUISITION OF KNOWLEDGE

Practice Theory divides the concept of knowledge into three forms: 1) know how, which is characterized by being action-oriented, 2) knowing that, which is about propositional content, and 3) **acquaintance**, which refers to the concepts of perception, emotion and experience (Schatzki, 2017). Both Dewey and Schatzki, therefore, talk about the concept of **"coming to know"**, which is about a student's agency, capacity and ability to act in the learning process. Here, knowledge is something that is acquired over time through active participation in practice (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1938a, 1938b; Schatzki, 2017).

> *Learning, as a result, does not just happen to take place in social practices: it is integral to them. It follows that the progression of any person's learning over time is the history of his or her participation in different practices. (Schatzki, 2017, p. 5)*

Therefore, learning is still about the acquisition of knowledge, but Practice Theory understands the concept of acquisition as a **transformation**. Learning occurs only when changes have occurred in the individual and thus not through changes in the environment. Schatzki thus acknowledges that traditional learning theory is relevant to viewing **change** as the acquisition of knowledge (Schatzki, 2017). Schatzki (2017)

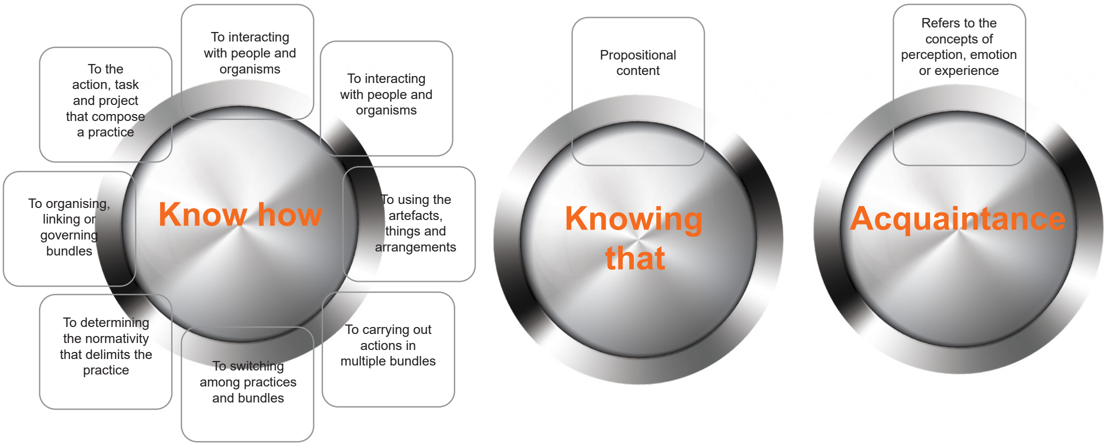


Figure 16 – The way Practice Theory divides knowledge into three different concepts.

talks about the acquisition of knowledge but emphasises that in his interpretation, he believes that there must be a modulation in the acquisition, especially in the case of practical knowledge. He argues that different individuals acquire knowledge over time at different levels (Schatzki, 2017).

> *In writing of the "acquisition" of knowledge I do not mean – regardless of what some conceptions and theories of learning as acquisition might have implied – that acquiring knowledge is a discrete, one-off event that does not admit degrees, in which some "units" of knowledge are fully acquired. (Schatzki, 2017, p. 3)*

Elkjaer (2003) suggests through pragmatism's understanding of learning that there is no separation between *"coming to know about practice"* and *"coming to be a practitioner"* (Elkjaer, 2003). Understanding a situation is, therefore, about being able to manoeuvre in complex interpersonal situations, which requires **innovative responses** and **transformations** (Schatzki, 2017). Therefore, learning emerges when the individual becomes able to perform a much better range of **doing and saying** in order to perform **intentional actions**. It also means gaining the ability to handle rules flexibly, including following them, interpreting them, ignoring them and considering them (Dewey, 1933; Schatzki, 2017). It enables the individual to be able to articulate a general understanding of the knowledge and activities that permeate practice. Therefore, according to Practice Theory, a practice is an **open manifold of doings and sayings** organised through rules, general understanding, prescribed or acceptable goals, projects, tasks or feelings (Buch & Elkjaer, 2015; Frega, 2011; Schatzki, 2017).

Practices can, therefore, be regarded as being coordinated through temporary collections of doings and sayings – these are linked in a certain way to an understanding of 1) what needs to be said and done, 2) explicit rules, principles and instructions, 3) teleoaffective structures such as beliefs, emotions and moods (Buch & Elkjaer, 2015; Schatzki, 2017).

A wide range of generic skills or abilities is thereby learned through participation in **multiple practices**. Gaining an ability requires considerable experience from different situations played out in different **bundles** (Schatzki, 2017). Learning is, therefore, about the acquisition of "know-how" and the objects that are a prerequisite for participation in practice. The main difference between traditional perceptions of learning lies in the idea that it is the composition of the social world that defines the type of knowledge that is acquired (Schatzki, 2017).

> *In this context, the learning process over time involves the continual acquisition of new behaviours, which in turn implicates a continual enlargement of an organism's capacities, a multiplication of options and possibilities. (Schatzki, 2017, p. 11)*

If this is related to Bourdieu's concept of habitus, learning is the result of the acquisition of a specific habitus that it is necessary to operate within a particular practice. Learning is, therefore, closely linked to the argumentation of being able to **operationalise** (Schatzki, 2017).

4.2.4. INQUIRY AND EXPLORATION

When "acquisition of knowledge" in Practice Theory is perceived as a form of transformation, it means that learning is closely linked to Dewey's understanding of inquiry (Buch & Elkjaer, 2015; Elkjær & Wiberg, 2013; Frega, 2011; Tashakkori & Teddlie, 2010). These concepts are a core element of Dewey's description of what knowledge is and how it is created. Inquiry is the means to resolve **emotional tension** by using thinking to change the direction and content of the experience (Buch & Elkjaer, 2015; Elkjær & Wiberg, 2013).

Dewey sees initial thinking as an individual process, but because he understands thinking as actions that are situated, it also becomes a social process. Thinking is about experimenting, making hypotheses, drawing conclusions, and in doing so, reflection becomes the tool that educators can use to support these processes (Buch & Elkjaer, 2015; Dewey, 1933; Elkjær & Wiberg, 2013). Inquiry is an emotional encounter in an experience with an embedded conflict. It is a feeling that something is difficult; an uncertain situation where inquiry is the method to resolve this conflict and make sense (Buch & Elkjaer, 2015; Dewey, 1933; Elkjær & Wiberg, 2013; Horn et al., 2019). To do this, it is necessary to activate past similar experiences by experimenting with **different possible paths** to make sense of the situation. Therefore, the emotional experience is transformed into something that can be understood cognitively and communicatively through the mediation of thinking and actions (Buch & Elkjaer, 2015; Horn et al., 2019). Inquiry can, therefore, be understood as a **looping process** where past experiences create the prerequisite for being able to overcome difficult situations. Experience is, therefore, a **series of interconnected situations** that Dewey calls **"organic circles"**.

All situations are interconnected while each has its unique characteristics (Buch & Elkjaer, 2015; Elkjær & Wiberg, 2013; Horn et al., 2019). Experience formation, therefore, has an experimental nature and Dewey argues that education and teaching are the elements that underpin and guide experience through a systematic approach to the inquiry process to produce "intelligent actions" (Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013; Tashakkori & Teddlie, 2010). Kjær (2010) describes it as an educational situation that releases its potential by creating a **free space** that requires a **far-reaching imagination** (Kjær, 2010). In such a situation, it is the ability to reflect and investigate that systematically provides the opportunity to react flexibly while taking into consideration the consequences certain activities entail (Dewey, 1933; Kjær, 2010). Dewey thus places the initiative with the learner, pointing out that a prerequisite for creating inquiry is that there is a curiosity to discover and investigate something (Brinkmann & Tanggaard, 2010; Dewey, 1933). **Curiosity** is thus expressed as an exploration of intellectual purposes through **sequences** of studies and observations that ties experiences together. In order to create an inquiry process characterised by being reflective, explorative and innovative, it is necessary for the process to contain some form of coherence and continuity. In this context, Dewey speaks of a form of organised mindset where the right balance and distribution of the three dimensions of thought – ease and speed, scale and variation, and depth – create learning processes that incorporate both flexibility and diversity (Dewey, 1933).

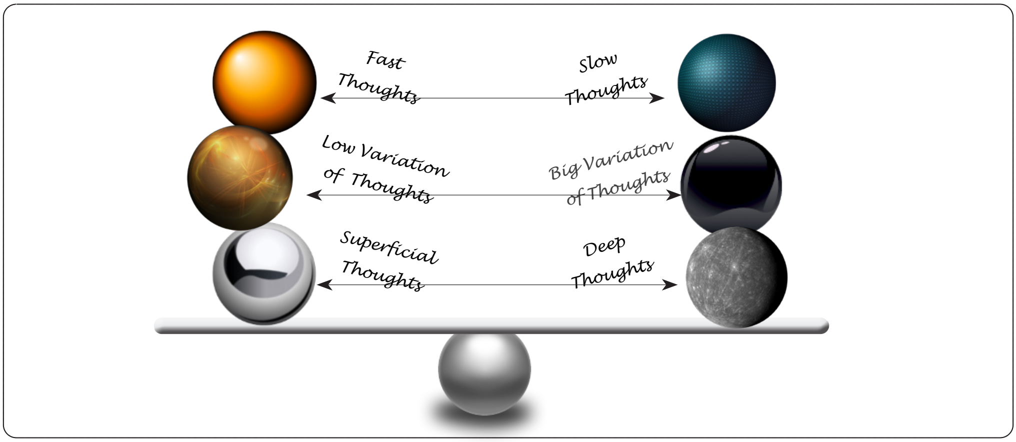


Figure 17 – An interpretation of Dewey's understanding of the three dimensions of thoughts.

This means addressing the situation, activity or curriculum from **multiple angles**, such as through data and knowledge collection, evaluation and assessment, asking questions, discussions and arguing (Dewey, 1933). Thus, Dewey contributes to Practice Theory ideas about the importance of thinking as he offers a conceptual apparatus that transforms intellectual thoughts into a form of practice. According to Kjær (2010), through this argumentation, it becomes apparent how thinking is an integral part of the action (Dewey, 1933; Kjær, 2010).

Brinkmann and Tanggaard (2010) reach the same conclusion and point towards the idea that *"thinking is itself an activity in the ongoing process of taking care of problems encountered in everyday life"* (Brinkmann & Tanggaard, 2010, p. 250). Inquiry or the exploration process thus assumes that there is an intrusion that needs to be figured out or something unclear that needs to be solved by means of thinking (Dewey, 1933; Frega, 2011). In order to operationalise this process, there must be a particular order of thought. The **consequence** of one thought sets in motion the next (consequence). Frega (2011) describes it as a coherent explanation of things observed or measured. This also happens when disagreement, moral dilemma, blocked agency or unsatisfying alternatives emerge (Frega, 2011). Dewey, therefore, divides thinking into two phases: 1) a state of doubt, hesitation or confusion, or mental challenges that kick-start the reflection process, and 2) actions characterised by a quest, hunt or study designed to remove the doubt and stop the confusion.

4.2.5. TRAJECTORIES

The significant aspect of Practice Theory's understanding of learning is the idea that the learning process should be understood as **episodic** as well as a **complex learning trajectory** with important prominent qualities that have no definite, **immutable end point** (Dreier, 2008; Schatzki, 2017). Schatzki (2017) describes it as learning understood as a process that follows a "path" that adds metaphorical and literal meaning (Schatzki, 2017). This path can be described at two different levels: 1) a metaphorical path, which forms a progression where different episodes of activities overlap and build on previous ones, and 2) a literal path, which can be seen as a **broken space-time path** through bundles of practices and arrangements that create a **personal trajectory** (Schatzki, 2017).

The path chosen will reflect opportunities for learning given through a specific **"space-time"** situation in a "bundle". Which learning opportunities are provided through these situations is determined by the practices that define them, as well as the **"material arrangement"** involved (Schatzki, 2017). Furthermore, learning can occur unplanned in any practice or bundle, which Dreier calls **"concomitant" learning** (Dreier, 2008). Concomitant learning is also about learning that is not goal-oriented but happens along the way. This will intuitively and intentionally help the learner to perform new activities in a particular practice. It could be the execution of specific exercises or techniques. Several learning activities will directly lead to a current practice being learned while it is being implemented, while others entail generic competencies such as active listening, group work, collaboration, reporting, reflection, etc. (Dreier, 2008; Schatzki, 2017).

Understanding learning as **complex learning paths** opens up complexity and variation where the learning activities of a given practice are of different duration and composition (Dreier, 2008). As part of an exploration process, the student, therefore, needs to find the "right" path that links and combines the learning activities in a way that new realisations arise through reflection (Dreier, 2008). In order to find these paths, the student must be able to carry out research processes by reflecting and analysing the events that have an effect both intentionally and unintentionally, and thus **disrupt** the learning path and create a **temporal conception** (Dreier, 2008). Schatzki (2017) describes it as a chosen path that over time will reflect opportunities to achieve specific learning based on the dependency relationship between the two concepts **proceed and depends** – how are the students going to proceed, depending on what they have already learned (Schatzki, 2017). The learning paths thus create incipient thinking or reflection when the student faces an unclear situation, or dilemma, that suggests the alternative (Dewey, 1933). According to Dewey, the desire to stop the confusion acts as the stabilising and guiding factor in the reflection process (Dewey, 1933).

4.2.6. NORMATIVITY

The concept of habit is analytically related to Dewey's understanding of action concerning how humans adapt or reconstruct the environment. The concept of adaptation can be understood as a form of adjustment in which a passive element is embedded concerning the acceptance of the surroundings, as well as an active element that challenges the environment. Habits are an expression of **readiness** to act in specific ways depending on the situation. Habits make it possible to predict your own and others' actions in certain situations and thereby be able to **decode** a possible learning path. These habits are often governed by social norms of behaviour that change and evolve continuously over time (Buch & Elkjaer, 2015; Dreier, 2008; Elkjær & Wiberg, 2013).

The notion of **normativity** thus has a crucial bearing on understanding how Practice Theory interprets learning as being **situated.** A student's ability to interpret and understand the normative structure influences how they fundamentally act in a given educational situation (Buch & Elkjaer, 2015; Schatzki, 2016, 2017). This means that the student's actions are linked together through individual normative systems, thereby drawing and characterising the learning path that is formed. Whether the learning process's activities are considered qualified and competent depends on the standards and procedures described through the student's existing practical competence and "know-how" (Schatzki, 2017). Often it is **teleoaffective structures** that link doings and sayings to a practice. The teleoaffective structures occur when there is a general understanding of what is acceptable or not acceptable in a given situation (Schatzki, 2016b).

4.2.7. TRANSFORMATION OF DISTURBED EXPERIENCE

Within the theory of learning, several researchers have described how new experiences can block or interfere with the possibility of learning something new (Berliner &

Berthelsen, 1989; Dewey, 1938a, 1938b; Illeris, 2007; Lewin, 1947). Dewey also speaks about how the formation of experiences can be blocked by habits and normative behaviour, which affect the quality of the effort. On top of this, experiences that are so incoherent that they do not intertwine into a whole will create confusion (Dewey, 1938a, 1938b). Any experience that blocks or interferes with the possibility of gaining new experience is negative. An experience can be of such a nature that it creates insensitivity, a lack of openness, that it locks, with the result that further experience is limited. The consequence of these normative dynamics having a negative impact on the learning environment is the failure to acquire special skills, which results in the absence of **judgment** and the ability to act intelligently in new situations. The error is not to be found in the absence of experiences but in the lack of and/or incorrect nature regarding the opportunities to create curious and explorative learning paths (Dewey, 1938a, 1938b).

When a learning process starts with the **condition of contingency** (Brinkmann, 2006), it is essential that transformation of doing and saying happens on an intellectual scale without evaporating or degenerating curiosity (Dewey, 1933). Dewey speaks about a strong dogmatism, in which routines make the student unable to accept new facts. A condition for maintaining curiosity is that the student engages in studies and experiments that can provoke a wide variety of thoughts leading to a more sophisticated understanding (Dewey, 1933; Dreier, 2008). Another challenge is hasty decisions, impatience or the action after the first push, as the reflective process occurs only when uncertainty is tolerated. Therefore, the student needs to exert a tolerance of ambivalence in order to continue to be in a state of doubt (Dewey, 1933).

4.3. SUMMARY OF PRACTICE THEORY

Reflective Practice-based Learning as a learning theory can thus be argued partly through pragmatic philosophy and partly through Practice Theory where practical and theoretical reflection creates a transaction and thus learning (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013: Frega, 2011; Godfrey-Smith et al., 2015; Kjær, 2010; Schatzki, 2016, 2017; Tashakkori & Teddlie, 2010). Thus, Reflective Practice-based Learning is a learning approach that aims to pedagogically facilitate a clash, connection, coupling, etc. between practice and theoretical reflection. Through disturbances and disruptions of the normative conditioning, exploration processes are initiated that aim to re-establish meaning in learning situations characterised by clashes of meaning. Inquiry is the means to resolve emotional tension by using thinking to change the direction and content of the experience (Buch & Elkjaer, 2015; Elkjær & Wiberg, 2013). To do this, it is necessary to activate past similar experiences by experimenting with different possible paths or learning trajectories to make sense of the situation. In order to find these paths, the student must be able to carry out research processes by reflecting on and analysing the dependency relationship between the two concepts of proceed and depends – how the students are going to proceed depends on what they have already learned. Inquiry can, therefore, be understood as a looping process of a sequential learning process where past experiences create the prerequisite for being able to overcome difficult situations (Buch & Elkjaer, 2015; Elkjær & Wiberg, 2013).

Based on a theoretical presentation of Reflective Practice-based Learning through the perspective of Practice Theory, the next Section will focus on the practical expression and challenges of RPL. A pre-study thus investigates the students' understanding and perception of learning in order to say something more confirmative about how the students understand and interpret Reflective Practice-based Learning. The proposition for the analysis of the students' understanding of learning is thus based on the concepts and theoretical understandings of Practice Theory.

4.4. PRESENTATION OF PRE-STUDY

The development and incorporation of RPL as UCN's response to some of the current trends and political agendas causes a need to investigate the students' perception of learning. The introduction of RPL contributes to strengthening teaching methods that previously have created situations with a high degree of resistance from the students. The PhD project, as described in the introduction, is based on practical experience regarding the issues concerning "passive-aggressive resistance" against the teaching created by the educational institution's process-oriented approach to learning. These experiences are unexamined and imprinted with tacit knowledge that can potentially be full of biases, prejudices and unchallenged assumptions. A pre-study investigating the students' understanding and perception of learning is therefore needed to be able to say something more confirmative about how the students understand and interpret Reflective Practice-based Learning.

The following Section presents a summary of the results from the initial pre-study of the understanding of learning of students at UCN, Technology. The pre-study can be read in its full length in Appendix A. The aim of the pre-study is thus not to identify who has the "right" answer, but rather to gain an understanding of differences and similarities that are important for the development of new educational designs based on Reflective Practice-based Learning - in other words to identify possible paradoxes, tensions and contradictory views. The study aims to contribute to knowledge about practice-related problems.

The use of critical utopian action research in the pre-study is chosen as the method ensures that the students' voices can be heard without the researcher influencing the content of the perspectives being discussed. Critical utopian action research as a method deals with these imbalances through recognition of the researcher being present while students have the opportunity to express themselves in "free space". The method makes it possible to address criticism about bias as the students contribute new knowledge and insight, without being directly affected by the researcher. The use of critical utopian action research as a form of interview is not only to gain knowledge about the practice but also to visualise the paradoxes and inconsistencies that exist in practices between teachers and students. It is, therefore, crucial to establish a "free space" where students have the opportunity to discuss respectively critical and utopian perspectives on teaching and learning as a concept (Skovsmose & Borba, 2004). A more detailed description of the research design and data collection is also found in Appendix A.

The pre-study is based on four different workshops with four selected educational programmes at UCN, Technology. In total, 68 students participated. The students who attended the workshop were on average one year into their education and thus had an idea of what it means to study in higher education. Based on the coded data from the critical utopian action research workshops, the pre-study reveals that one consequence of the students' "passive-aggressive resistance" against the teaching is a lack of **autonomy**. It is, therefore, difficult for educators to **motivate** students to be interested in an **explorative** and **analytic** approach to the academic representation – disciplines they might not even see the value of – if the teaching is based on traditional dissemination of specific knowledge. Furthermore, the students do not develop a **reflective practice** that enables them to challenge and change the professional context.

The pre-study thus indicates that the following three main topics are particularly challenging regarding developing Reflective Practice-based Learning at UCN, technology:

- **Motivation** and **autonomy**
- **Exploration** and **analysis**
- **Reflective practice**

In the following section, these three topics will be elaborated according to the theoretical position of Practice Theory as described in previous chapters.

4.4.1. THE STUDENTS' AUTONOMY

Reflective Practice-based Learning points toward a process-oriented approach that contrasts with the learning approach the students are familiar with from earlier schooling systems. The consequence is a "passive-aggressive resistance" against the teaching and a lack of autonomy. The students exhibit passive behaviour in situations where, in their opinion, they do not feel that they have received enough teaching to be able to work with their projects. The students explain that they react to this situation by choosing not to do anything or go home. Their statements indicate an understanding of learning as something that involves the presence of a teacher who presents the curriculum. It is, therefore, difficult for educators to motivate students to be interested in an explorative and analytic approach to the academic representation – disciplines they might not even see the value of. The students cannot actively and independently acquire knowledge and subsequently formulate relevant issues they can investigate and explore. They thus lack the necessary skills and tools to facilitate and initiate their learning and study process. In the students' utopian presentation they talk about how they want their educational programme to be organised in such a way that there is no "wasting of time" where they do not know what to work with and thus risk making mistakes if they start up on their own initiative.

The education programmes at UCN are composed in a way where a large part of the study time is self-study. This means that students are expected to work independently with their projects for up to 42½ hours per week. Only half of the study time is covered by teachers, which does not mean that the students are free to go home for the rest of the day. However, the teachers and the students have no clear and shared understanding of the normative rules for what it means to be a student in full-time study. The students express a clear desire for the teachers to spend more time explaining the material rather than the academic depth taking place through self-study. This means that the students place the responsibility for the learning process unambiguously with the teachers. There is no recognition that the individual has a responsibility to acquire knowledge themself through active participation and immersion. Moreover, understanding complicated topics takes time, and the process is often confusing and unclear at the beginning. The pre-study thus shows that there is a mismatch between the students' and the teachers' normative understanding of what good teaching practice is. There is a lack of shared understanding of what Schatzki refers to as the "teleoaffective structures" regarding what is acceptable or unacceptable in a given teaching situation (Schatzki, 2016, 2017). The students' frustration reveals itself through criticism of the teachers' planning and structure of the classes. According to Dewey's understanding of learning, there is a risk of the students' frustration blocking and disrupting the opportunity to learn (Dewey, 1938a, 1938b). On top of that, the students' learning experiences are so incoherent that they do not intertwine into a whole, which leads to confusion.

4.4.2. LEARNING THROUGH EXPLORATION

A large number of generic competencies or abilities are acquired through participation in multiple practices consisting of different situations played out in different bundles (Schatzki, 2017). Therefore, according to Schatzki, learning is a result of acquiring a specific habitus that it is necessary to operate within a particular practice (Schatzki, 2016, 2017). Dewey describes learning as something that has an experimental nature and therefore argues that education and teaching are the elements that underpin and guide the experience.

A problem-based project is a teaching approach aimed at creating multiple practices through an experimental approach. The pre-study shows that especially the exploratory behaviour provokes the students as it brings them into situations where they do not know what the next step is and also they cannot expect a final result. The experimental approach involves situations and activities that require a reflective approach to achieve learning. If reflection is the key to learning, it is not particularly interesting if the student presents a "sensible" solution to a problem. It is rather their ability to challenge their work through a reflective exploration. It is, therefore, a challenge when the students, as previously described, maintain a passive and pending approach to avoid making mistakes. The students perceive the projects as messy and miss clear markings of what is fact and what it takes to be good enough. They thus lack a fundamental acceptance of the idea that "trial and error" provides learning.

4.4.3. REFLECTIVE PRACTICE

The students describe how they feel that the teachers have no control over what the projects should contain, what is right and wrong, and what they have to learn. Also, they experience teachers that do not have a shared agreement of what the academic content is, which leads to different and contrasting answers to the students' questions. The students thus lack a fundamental ability to assess what is relevant concerning their problem area critically. Further, there is a lack of understanding of the complexity that a professional-oriented project contains and the need for knowledge as a concept to undergo constant development. Therefore, the students must develop competencies to be able to enter into a professional dialogue and discussion with the teachers so that, through a reflective approach, they will be able to make decisions about what is "right or wrong". This is in line with Dewey's argument that it is the relationship between action and thinking and thus the transaction itself that is learning (Dewey, 1938a, 1938b). If teaching is based on a communicative handing over of "best practice", the students will not achieve a practical understanding of the challenges that a professional practice contains. Schatzki describes this as learning, understood as a process that follows a "path" that adds metaphorical and literal meaning to a personal trajectory (Dreier, 2008; Schatzki, 2017).

Teaching built around the students' personal trajectories requires an open interpretation of both subject and problem (Dreier, 2008; Schatzki, 2017). However, the open frameworks for the content of the project reinforce the students' experience of their study process as messy with a lack of clear markings of what is right and what is not. The students acknowledge, partly, that there may be several different ways of working with a problem, but they argue that it then must be the teachers's responsibility to select the knowledge or methods necessary to solve the problem. The premise that knowledge can be discussed and developed through the confrontation of two different points of view is thus not recognised by the students. A pervasive element is the students' frustration at not attaining sufficient academic depth during their studies. They have a feeling that their knowledge acquisition is just “scratching” the surface of the topics they are dealing with. The students thus demand a clear marking of what is right or wrong and a precise and concrete definition of the syllabus.

4.4.4. CONCLUSION OF THE PRE-STUDY

Bente Elkjaer suggests, through pragmatism’s understanding of learning, that there is no separation between “coming to know about practice” and then “coming to be a practitioner” (Buch & Elkjaer, 2015; Dewey, 1938a, 1938b). Understanding a situation is therefore about being able to manoeuvre in complex interpersonal situations, which requires innovative responses and transformations. Dewey also argues that action and thinking are interconnected and that it is the transaction itself that is experienced and thus learning (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013; Schatzki, 2016, 2017). It is, therefore, crucial for the academic depth that the students work independently with the project subsequently to the teachers’ knowledge dissemination. In this way, the material will be transacted through an exploratory approach where action and thinking are coupled, which contributes to the professional depth.

According to Schatzki, generic competencies or abilities can be learned through participation in multiple practices. Obtaining an ability thus requires considerable experience from different situations played out in different bundles (Schatzki, 2016, 2017). Here, theorising of first-order abilities directly linked to a practice of doing and saying will contribute to the formation of second-order abilities such as coordination, organisation, communication, planning and designing. Learning, and thus academic depth, is linked to increasing the operationality that is created, through change and the acquisition of new tools (Schatzki, 2016, 2017). Thus, academic immersion in a professional learning context is an expression of a link between theory and practice or, as mentioned earlier, the transaction between thinking and action (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013; Schatzki, 2016, 2017).

The pre-study (see Appendix A) of this PhD, however, reveals that the students in technology programmes at UCN lack specific learning strategies for how to work in depth with the curriculum through academic disciplines – they are often brought into situations where they do not know what the next step is. Reflective Practice-based Learning points toward a process-oriented approach that contrasts with the learning approach the students are used to from earlier schooling systems. The consequence is a “passive-aggressive resistance” against the teaching and a lack of autonomy. It is, therefore, difficult for educators to motivate students to be interested in an explorative and analytic approach to the academic representation – disciplines they might not even see the value of – if the teaching is based on traditional dissemination of specific knowledge. Furthermore, the students do not develop a reflective practice that enables them to challenge and change the professional context.

CHAPTER 5. GAME-BASED LEARNING

Through an experimental approach, the PhD project investigates how Game-Based Learning can support motivation and autonomy, analysis and exploration, and reflective practice through the use of game principles. Game-Based Learning as a concept derives from computer games and is based on an idea of using game elements and principles in another context for the purpose of supporting learning (Adachi & Willoughby, 2013; Leith et al., 2019; Melero & Hernández-Leo, 2014; Morris et al., 2013; Sourmelis et al. et al., 2017). The challenge is to investigate the possibility of facilitating the development of generic competencies through the underlying mechanisms of computer games. Another question is whether Game-Based Learning as a teaching approach contains an untapped potential for higher education in particular since teaching through game thinking is viewed from an entirely new perspective and thereby creates new pedagogical approaches.

The concept of Game-Based Learning, and especially "massively multiplayer online role-playing games" (MMORPGs), has gained focus in the educational sector in relation to tapping into learning opportunities that meet the need of 21st-century learners (Adachi & Willoughby, 2013; Leith et al., 2019; Melero & Hernández-Leo, 2014; Morris et al., 2013; Rodrigues & Bidarra, 2017; Sánchez, 2014; Sourmelis et al., 2017;). Games present elements that can inspire the creation of active learning experiences that challenge students to apply new knowledge, solve problems and explore different viewpoints (Kulmanet al., 2014; McConville et al., 2017; Rodrigues & Bidarra, 2017). The new interest in using game principles in the educational context entails a reassessment of working with new opportunities for creating reflective, explorative and practice-based learning through the gaming concept. Particularly in higher education, games can be a source of inspiration when it comes to developing and exploring new models for how academic activities can be enhanced through learning situations with an individual expression related to the qualifications of participants, content and context, as well as the learning outcomes (McConville et al., 2017). This argumentation makes Game-Based Learning particularly interesting as regards the discussion in the previous chapter about developing teaching concepts that support the explorative nature of Reflective Practice-based Learning. Furthermore, by applying game principles to support learning processes, there is a particular potential to reach students who may otherwise feel alienated in learning situations because they do not feel academically strong in the traditional sense.

Initially, the topic of Game-Based Learning is described from a general perspective, after which a more detailed definition of the concept of games is presented, followed by an argumentation of why games are interesting to work with in higher education, in accordance with the PhD project's introduction. This chapter is followed up by a section describing the design challenges more accurately according to the factors that are particularly relevant in game development, and in particular in the development of educational games. Subsequently, the negative aspects of the use of games as a pedagogy strategy are discussed, including what challenges existing research has pointed out. Then "Massively multiplayer online role-playing game" is presented as the genre of computer games that will later inspire the development of a pedagogical model based on design principles from computer games. Furthermore, how games can be defined through an internal and external design grammar is elaborated. The game World of Warcraft will, in that context, constitute the primary source of inspiration.

5.1. GAME-BASED LEARNING

The use of Game-Based Learning in the classroom is increasingly common in higher education as a suggestion for one of the future educational tools, as games reinforce not only knowledge but also important skills such as problem solving, collaboration and communication (Chang & Hwang, 2019; Dicheva et al., 2015; Gee, 2007; Hainey et al., 2014; Qian & Clark, 2016; Sourmelis et al., 2017). Despite this, there is, however, a broad consensus in the literature about a lack of empirical research within the field, particularly concerning the development of meaningful learning trajectories through a dialogic approach mediated by Game-Based Learning (Dicheva et al., 2015; Gee, 2007; Hainey et al., 2014; Iliya et al., 2015; Qian & Clark, 2016; Silseth, 2012; Sourmelis et al., 2017; Squire, 2006). A literature review by Dicheva et al. (2015) shows that much has been written about the topic, but most of the studies focus on game mechanisms and game dynamics in a theoretical aspect or from presentations of theoretical models. They write: *"while true empirical research on the effectiveness of incorporating game elements in the learning environment is still scarce"* (Dicheva et al., 2015, p. 83). However, there is widespread agreement that Game-Based Learning has the potential to improve learning if the game is well designed. This means that game designs must be developed through techniques that can foster a long-term motivation or in-depth learning, which is still inadequately elucidated (Nørgård et al., 2017). Squire (2018) argues that this means having a curiosity for learning theory while at the same time understanding the mechanisms behind a well-designed game (Squire, 2018). Even though meta-analyses have shown promising results, several studies point out that there are still challenges in terms of the quality of the research, particularly concerning research based on interventions where it can be difficult to determine whether the reported result is a consequence of the implemented design, and not a cause of random circumstances (All et al., 2016). Therefore, more extensive empirical research is still needed, where studies of the connection between learning and gaming principles, in particular, are the focal point (Dicheva et al., 2015). Another challenge concerns a disagreement about how to actually do game research (All et al., 2016; Egenfeldt-Nielsen et al., 2013). Because research within Game-Based Learning can still be characterised as an emerging field, it is considered heterogeneous when it comes to research designs. This heterogeneity results in mixed findings and critiques on certain study characteristics (All et al., 2016; Moylan et al., 2015; Yáñez-Gómez et al., 2017).

All et al. (2016) point out that it is difficult to make generalised claims about successful findings because of a large diversity regarding how the experimental research is carried out regarding components such as participants, interventions, methods and outcome measures (All et al., 2016). Research in Game-Based Learning can be approached from several different academic angles, where foci on rules (the design of the game), play (the human experience of playing the game) and culture (connection and interaction with the game) are the three dominant ones (Egenfeldt-Nielsen et al., 2013). Silseth (2012), for example, states that the sociocultural practice associated with the game is just as important to understand as the game itself (Silseth, 2012). Back in 2006, Squire argued that research should primarily focus on three interrelated areas within Game-Based Learning: the critical study of games as participation in ideological systems, learning as performance and educational games as designed experience. Through the following statement, Squire explains Silseth's point: *"If games are possible spaces, then researchers need to account for how players inhabit them and the mechanisms by which meanings become interpreted from these experience"* (Squire, 2006, p. 20). Multidisciplinary backgrounds thus characterise the group of game scientists. Also, it is only recently that a new generation of researchers who consider video games to be their primary research interest has emerged (Egenfeldt-Nielsen et al., 2013; Squire, 2018). Since then, the research field has experienced significant changes as new technological developments have influenced the concepts behind Game-Based Learning. According to Jäger et al. (2015), it is seen that *"the digital transformation changes the educational design and structures fundamentally, particular the process of teaching and learning"* (Jäger et al., 2015, p. 250). This means that cycles of adaptation and evolution of general teaching concepts through technological innovations have an impact and influence on the quality of Game-Based Learning as a concept (Jäger et al., 2015; Signori et al., 2018; Squire, 2017). A large part of the reported research is therefore concerned with digital games or blended learning contexts (Dicheva et al., 2015; Melero & Hernández-Leo, 2014), but Melero and Hernández-Leo (2014) point out that game types including the use of physical objects facilitating contextualised learning are missing. Also, several studies, according to Ben et al. (2018), argue that there is a lack of general research interest in physical learning games, especially in higher education. They state that learning though games can be achieved even without the use of technology (Ben et al., 2018; Luttikhuizen, 2018; Marone et al., 2016).

A final dimension is that the prevalence of Game-Based Learning is far less in higher education than in the other educational sectors. This means that there is a need for an increased focus on how Game-Based Learning can inspire and challenge the academic teaching environments where learning has entirely different characteristics, such as being much more problem-oriented, analytical and reflective (Marone et al., 2016; Moylan et al., 2015; Sakamoto et al., 2017). Marone et al. (2016) point out that a *"literature review on the relationship between games and metacognition revealed a lack of studies dedicated to 'metacognitive games' or games that can improve and augment metacognitive skills, especially in higher education settings"* (Marone et al., 2016, p. 113). A study by Sakamoto et al. (2017) also shows that gaming mechanisms such as badges and points are inadequate because "these approaches do not support designing meaningful experiences directly" (Sakamoto et al., 2017), which is crucial in a complex holistic problem-based education environment. Furthermore, most educational games only support single-person use (Chang & Hwang, 2019), which contrasts with the vision of developing 21st-century competencies such as, for example, the ability to discuss, negotiate and collaborate – an exercise that can, among other things, be constituted by group work (Leith et al., 2019).

5.1.1. WHAT IS A GAME ?

Philosophically speaking, there exists no general classification of what defines a game as there is no objective way to measure it (Egenfeldt-Nielsen et al., 2013; Dicheva et al., 2015). Nor is there a definition of how games differ from other types of entertainment, including play. Instead, the definitions overlap in elements such as design patterns, technology, gaming platforms, game mechanics, social factors and scientific theoretical understanding (Egenfeldt-Nielsen et al., 2013; Schrier, 2016). In other words, games at a general, abstract level can be described as multiple **remediating artefacts** (Bolter & Grusin, 2000). From a research perspective, however, it is crucial to understand how different understandings of games differentiate from each other in order to choose the most suitable methods for analysing games. The challenge is therefore not to find the correct perspective or the precise definition, but rather to pay attention to the importance of the assumptions made (Egenfeldt-Nielsen et al., 2013).

It is primarily the aspects of **rules**, play and culture that can be characterised as the general standard features that cross many different genres of games (Salen & Zimmerman, 2004). Rhetorically there are some similarities between the concepts of play and games, where games can be seen as a subset of play. Games are likewise play built around different kinds of **playful activities** (Egenfeldt-Nielsen et al., 2013; Salen & Zimmerman, 2004). Various theorists, such as Brian Sutton-Smith, Bernard Suits, Sid Meier and Roger Caillois, have, from a historical perspective, tried to frame and define the phenomenon of games through concepts such as **voluntarily, make-believe, choices**, rules, etc. (Egenfeldt-Nielsen et al., 2013). Salen and Zimmerman (2004) represent one of the more accepted and recent definitions of what characterises and defines a game: ***A game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome*** (Salen & Zimmerman, 2004). In their understanding, games are a complex system that can take many different forms and settings. Another popular definition, and for this PhD project the most interesting, is Johan Huizinga's idea of games as a **"magic circle"** where every game exists within a frame bounded by time and space (Nørgård et al., 2017).

Playing a game in Huizinga's understanding means "setting oneself apart from the outside world, and surrendering to a system…submitting to a formally defined experience with rules that are clearly distinct from those we follow outside this special activity" (Egenfeldt-Nielsen et al., 2013, p. 34). A set of rules thus describes how

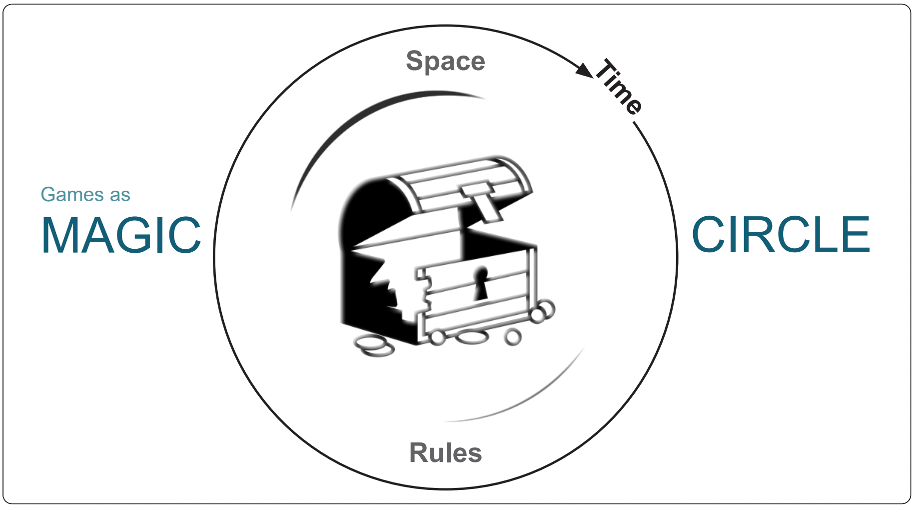


Figure 18 – Johan Huizinga's idea of games as a "magic circle".

this framework is perceived as meaningful and guides the game's **progress** (Salen & Zimmerman, 2004).

Johan Huizinga's idea of games as a "magic circle" will be used as the primary theoretical lens. The reason for this choice is that Huizinga's definition contains a simplicity that does not seem to be exclusive, which presents many design possibilities. The concept of Game-Based Learning will thus be elaborated further in the next section in regard to this understanding.

5.1.2. WHY GAMES?

Educational games in higher education are often aimed at creating learning within a specific topic through social interaction and professional development, as well as changing the students' attitude and perception (Leith et al., 2019). The term "serious games" is used to describe games that are intended to create learning. Serious games contain a high degree of **interactivity** and, unlike many other game genres, are not necessarily focused on the element of "winning" as the final goal (Cain & Piascik, 2015). The existing research in the area thus indicates that games with an implemented holistic and educational design can strengthen and support educational elements such as active learning, cognitive abilities, motivation, reflection, problem-solving skills and situational learning (Adachi & Willoughby, 2013; Ben et al., 2018; Leith et al., 2019; Melero & Hernández-Leo, 2014; Morris et al., 2013; Sourmelis et al., 2017). According to Squire (2006), educators, therefore, *"ought to pay closer attention to video games because they offer* ***designed experiences****, in which participants learn through a grammar of doing and being"* (Squire, 2006, p. 19). Cassie (2018) also talks about games as formative assessment, which can support the teacher's ability to facilitate the students' learning process through the game design as a safe "playground" shaped by the students (Cassie, 2018; Nørgård et al., 2017). It means that the teaching moves away from the traditional teacher-centred approach towards a more active and involving learner-centred approach that scaffolds and empowers the students toward autonomy (Ben et al., 2018; Luttikhuizen, 2018). In that context, the importance of the concept of **"gameplay"** is an essential and fundamental component when developing educational games, as it defines the entire aesthetic experience of playing and thereby constitutes the learning process (Cassie, 2018; Leith et al., 2019). Educational games, therefore, typically deal with many different types of multimodal activities or representations that when combined arbitrarily motivate students to work in depth through different pacing strategies while creating an integrated autonomy (Fabricatore & López, 2014; Woo, 2014). Here it is crucial to rethink the educational content so that the current domain can be conceptualised through games as the mediating factor. The inclusion of Game-Based Learning goes beyond the traditional notion of education as exposure to content by reformulating it to designed experiences represented by challenges, curiosity, goals and activities (Squire, 2006, 2018).

Multiple trajectories of participation and meaning making

A literature review by Sourmelis et al. (2017) shows several studies that indicate that gaming activities can facilitate the development of particular problem-solving skills among users. They write, for instance: *"[...] can instigate players to analyse new situations, interact with people that they don't really know, solve problems, think strategically and collaborate effectively, all of which are essential skills for the knowledge workers of the 21st-century workspace"* (Sourmelis et al., 2017, p. 42). However, Qian and Clark (2016) state in their literature review that despite growing rhetoric about the positive effects of Game-Based Learning's ability to develop analytical and reflective competencies, there is still no model for how it is done most effectively (Qian & Clark, 2016).

However, they agree that the understanding of Game-Based Learning is about improving students' acquisition of knowledge and skills through activities that involve problem solving using game principles (Gee, 2007; Qian & Clark, 2016; Signori et al., 2018). Here, a number of studies point out that the core understanding of learning as constructivism with the goals of (1) engaging, (2) providing the opportunity to explore, articulate and represent knowledge, (3) challenging existing conceptual perspectives, and (4) examining the impact of new ideas is covered by the underlying principles of Game-Based Learning (Ben et al., 2018; Gee, 2007; Kim et al., 2009; Melero & Hernández-Leo, 2014; Qian & Clark, 2016; Ravyse et al., 2017 et al.), as well concepts such as "learning by doing", where the student explores and works in a problem-oriented manner through game mechanisms, by constructing concepts in authentic contexts (Farber, 2015; Melero & Hernández-Leo, 2014; Ravyse et al., 2017; Warren et al., 2008; Woo, 2014). In discussion with Matthew Farber (2015), Katie Salens explain the link between problem-based learning and Game-Based Learning:

Games are spaces of inquiry, spaces of problem solving[…]. The notion is a stylisation of behaviour or mechanic that gets repeated over and over again – it affords choice to the player […]. You can constrain the problem space enough so you can anticipate types of choices a player might make. […] the philosophy of learning is the same – it's problem-based, it's inquiry-based. (Farber, 2015, p. 133)

Well-designed educational games based on a complex holistic problem-based educational environment can thus support active and situational learning and therefore be seen as the engine for the development of future learning design (Ben et al., 2018; Gee, 2007; Han, 2015; Qian & Clark, 2016). In addition, games are perceived as motivating and entertaining, which is both a natural and essential part of any human learning and development process (Dicheva et al., 2015; Iliya et al., 2015; Kim et al., 2009; Nørgård et al., 2017; Warren et al., 2008). Kretcmar (2018) argues, for example, that regardless of the importance of theoretical understanding, it is crucial for any learning process that it contains an active and practical know-how experience formation, and here games in the broadest sense offer an interesting approach (Kretchmar, 2018). The argument is that when games are used in teaching, the student is encouraged to combine knowledge from different areas while deciding on a direction at any given time in the process. Marone et al. (2016), for example, describe how games *"provide a structured and non-judgmental environment in which students can explore open-ended problems and reflect on possible solutions derived from the metacognitive strategies presented"* (Marone et al., 2016, p. 113). It is necessary to ensure that the gaming elements create a process of activities that are targeted transformations of a preliminary understanding towards the desired and final goal – including **overcoming obstacles**, and the development of new knowledge along the way. Thus, games create metacognitive strategies or metacognitive agility that help the student to consciously reflect on a systematic level (Fabricatore & López, 2014; Marone et al., 2016). It is the game's procedural approach that naturally motivates the students to discuss and negotiate future steps in their process. A distinct and essential element is that the students are continuously encouraged in the process to test how a given outcome changes based on decisions and actions (Frost et al., 2015; Kim et al., 2009; Marone et al., 2016). A study by Fabricatore and López (2014) describes how selected successful commercial computer games are analysed for developing learning designs that can support students' perception of academic disciplines. They identified five general patterns that characterised the games' activities: **quest structure, strategic, open-ended, non-linear progression, Challenge-based reward** (Fabricatore & López, 2014). The open and dynamic quest structure creates an autonomy that reflects an inner desire to take control of one's situation and act on personal and meaningful choices (Deterding, 2012; Frost et al., 2015; Holden et al., 2016; Squire, 2018). Frost et al. (2015) write: *"Incorporating autonomy allows a person to make choices and experience the result without experiencing serious ramification of their actions"* (Frost et al., 2015; p. 61). This argument points towards Game-Based Learning as something primarily being about creating multiple trajectories of participation and meaning making. According to Squire (2006), a prevailing model of game theory is about giving students a situational experience through activities through which they can develop new ways of thinking, knowing and being in worlds (Holden et al., 2016; Squire, 2006, 2018). The result of Fabricatore and Lopez's (2014) study indicated that the use of Game-Based Learning resulted in an autonomy created by a frame of **clear expectations, goals and strategies** in a situational and meaningful context. The students thus experienced the freedom to plan and adjust their **learning rhythms**. The **quest structure**, in particular, was an influential factor for the instructive design by facilitating the acquisition of academic competencies with a problem-solving nature (Fabricatore & López, 2014). The key is thus whether the game is designed in such a way as to improve users' chances of accomplishing through an effective **scaffolded learning process** (Melero & Hernández-Leo, 2014).

Playing with fun-failure

Many computer games are designed in a way where it takes time to complete, combined with being built around difficult and tough challenges, also called **fun-failure** (Boskic & Hu, 2015; Morris et al., 2013). When educational games are designed as "multiple trajectories of participation and meaning making", it then means, according to Squire (2018), that an innovative behaviour supports the students' journey of learning. Squire states: *"What may be a good project at the beginning of a group's life cycle may not be a good project later, when more forward learning projects might drive innovation"* (Squire, 2018, p. 25). The innovative approach is further enhanced by the fact that gaming in its essential nature is dangerous, dabbling with risks, creating and destroying, and keeping a careful balance between both (Holden et al., 2016; Sicart, 2015). Several studies of commercial computer games have also shown that these games have a culture where the process is repeated until the goal is reached. This leads the player to continually force errors and through those develop new solutions, which creates momentum in the game (Deterding, 2012; Erenli, 2013; Kim et al., 2009; McGonigal, 2011; Morris et al., 2013). This behaviour can be characterised as being innovative, analytical and reflective, which the two anthropological studies of Bonnie A. Nardi (2010) and Mark Chen (2012) also confirmed (Chen, 2012; Nardi, 2010). The ability of video games to suppress the fear of failure through a platform or framework that serves as a kind of safe zone is therefore markedly different from the conditions that apply to problem- and process-oriented teaching, where errors often lead to a lack of motivation (Berliner & Berthelsen, 1989; Gyldendahl-Jensen, 2018; Illeris, 2007; Janas, 1998; Madsen, 2013). In the book Reality is Broken from 2012, Jane McGonigal describes how game developers know better than anyone else how to inspire extreme efforts, and facilitate collaboration and co-creation at a high level. Knowledge of game theory and game design in a learning context is thus not just about technical aspects (McGonigal, 2011). For example, Fabricatore and López speak about translating and understanding, respectively, computer games and education courses as problem-based activity systems in which key elements are identified as the correlation between the core game mechanisms, the contextual information, and motivating and engaging gameplay (Fabricatore & López, 2014). This approach to Game-Based Learning, therefore, opens up new opportunities for how academic topics can be learned in a much more process-oriented and explorative way. What is interesting here is how it is possible to facilitate the acquisition of generic academic skills through explorative learning inspired by Game-Based Learning as an overall designed teaching strategy. Nørgård et al. (2017) talk about the potential of the game to be able to create what they call *"a signature pedagogy of playful learning in higher education to consider the possibilities of an educational system that recognises the importance of openness, curiosity, risk taking and failure in learning"* (Nørgård et al., 2017, p. 273). The study by Fabricatore and López (2014) shows that the students felt challenged by the activities, but it motivated them to continue and complete the tasks despite their difficulty. The students worked with various cognitive and behavioural strategies to be able to cope with the requirements of the teaching programme. They had to define their team project and their goals (objectives), manage their own time and coordinate the completion of tasks (Fabricatore & López, 2014). Jane McGonical (2011) states that the ability of commercial game developers to create the perfect balance between tough challenges and attainability results in "always playing on the edge of competencies". This is a state of mind the players want to stay in – neither quitting nor winning will be a satisfactory outcome (Cassie, 2018; Han, 2015; McGonigal, 2011; Ravyse et al., 2017).

5.1.3. THE NEGATIVE ASPECTS

In practice, it can be difficult to reconcile the elements of education and entertainment where there is the right balance between knowledge transfer, goals and learning mode, where neither a dominant game mode nor a lack of fun element is present (Kim et al., 2009; Ravyse et al., 2017). This means that the academic content must be an integral part of the core game activities. Otherwise, the students risk only learning how to play the game (Ben et al., 2018 Squire, 2006). Many learning games, however, are characterised by being built around an uninspiring **narrative** coupled with an uninteresting gaming structure that does not motivate and involve the students through a holistic approach (Deterding, 2012; Warren et al., 2008). Thus, the students do not acquire learning from the properties of complex systems, but simply simple heuristics (Squire, 2006). A literature review by Qian and Clark (2016) indicates this particular criticism and concern that a significant proportion of the games developed for educational purposes do not adequately support reflective, explorative and innovative learning activities. They conclude that *"many educational games are simple designs that are narrowly focused on academic content, target low-level literacy, provide drill and practice methods similar to worksheets, and stress memorisation of facts"* (Qian & Clark, 2016, p. 51). A successful blend of learning theory and game design is not just about a simple reduction of game principles, which will ultimately create some kind of ineffective behavioural approach through the use of points and badges (Deterding, 2012; Egenfeldt-Nielsen et al., 2013; Gee, 2007; Nørgård et al., 2017; Qian & Clark, 2016; Sakamoto et al., 2017; Squire, 2006). This simplification of the game design therefore often entails a limited learning, where the focal point is the acquisition of the curriculum and skills, which does not adequately create the necessary learning activities that encourage curiosity and exploration (Gee, 2007; Egenfeldt-Nielsen et al., 2013; Gyldendahl-Jensen & Sorensen, 2017; Qian & Clark, 2016). Nørgård et al. (2017) point out that the use of Game-Based Learning is only really effective when it is based on *"the deeper playful underpinning and provision of opportunities to learn from failure that is at the heart of playful learning in higher education"* (Nørgård et al., 2017, p. 273). This means a lack of focus on inner motivation as it is much more than just the feeling of mastery from completing a level (Egenfeldt-Nielsen et al., 2013). This particular connection in which the educational content is integrated into the core game structure is difficult to construct in practice, which means that the student is risking only learning how to play the game (Dicheva et al., 2015). When there is no integrated learning experience, learning processes are then experienced with an increased focus on "playing the game" rather than learning through the game (Egenfeldt-Nielsen et al., 2013; Ravyse et al., 2017; Squire, 2006). According to Egenfeldt-Nielsen et al. (2013), educational games are often being developed as what they call "drill-and-practice thinking" rather than understanding. This kind of game only encourages the student to memorise the answers and is thus not learning supported by discovery, exploration, problem solving and experience-based learning (Egenfeldt-Nielsen et al., 2013). This is clearly seen when games are reduced to game mechanisms like badges and points (Sakamoto et al., 2017). A study by Frost et al. (2015), for example, reaches a negative conclusion. The study is precisely characterised by the fact that the selected learning management system alone is gamified through an approach that is based solely on points and scores and thus does not support a complex holistic problem-based educational environment (Frost et al., 2015). Ravyse et al. (2017) point out in the context that games are also challenged by a lack of autonomy that goes beyond the game's design. They write: *"No matter how captivating the game, the learner will not step away from a game with the desire to learn more about the game subject material"* (Ravyse et al., 2017, p. 53).

It is perhaps here that the real potential of Game-Based Learning must be found – games developed to inspire learning that extends beyond the game's design and works as a trigger for an autonomous personal learning trajectory. It also points to the fact that future games for higher education should be based on a narrative based on the students' own exploration. As Ravyse et al. (2017) describe it, it is not nearly as challenging to work with linear gameplay entailing progress from one game scenario to another in a fixed sequence. Instead, much more motivation can be created when the students are given opportunities to explore and mould their own narrative (Ravyse et al., 2017).

One final criticism that dominates is the reduction of the teacher's role where the supportive and facilitating role is attributed solely to the game's design grammar. Several studies have shown that **debriefing** is critical for learning and crucial for creating a consolidation of what has been learned (Egenfeldt-Nielsen et al., 2013; Ravyse et al., 2017). According to Egenfeldt-Nielsen et al. (2013), research has shown that *"students can make incorrect assumptions based on their game experience. Therefore debriefing is the key, as the teacher needs to take time to correct any mistake,* *clarify misconceptions and expand on the game experience"* (Egenfeldt-Nielsen et al., 2013, p. 243). Therefore, depending on the design of the game design, there is a real risk that students cannot recognise bias or the hidden curriculum of what is left out (Squire, 2006).

5.1.4. ASPECT OF GAME DESIGN

The following section describes the design challenges more accurately according to the factors that are particularly relevant in game development, and in particular in the development of educational games.

Predicting the experience of a game can never be done by drafting a design document, and it is crucial to understand games as a space of opportunity that is experienced by players (Salen & Zimmerman, 2004; Sharp, 2015). Games create experiences, and a game designer therefore needs to be interested in how to design experiences. According to Schell (2015), it is essential to understand that the game itself is not the experience, but rather a medium or artefact that enables the experience (Schell, 2015). This particular argument has a significant influence on the nature and content of the design process where different elements and actions together create the artefacts. Game development is, therefore, an iterative and play-based design process where it is about creating intentional experiences by continually testing the game design in practice (Salen & Zimmerman, 2004). As Schell (2015) says, *"all we can do is create artefacts"* (Schell, 2015, p. 11). Nor is it a linear experience, as the game designer leaves control of the order and composition of the experiences to the player, making it difficult to predict the link between the artefact and the formation of experience (Schell, 2015). The unique thing about game development is, therefore, to understand the game as an artefact with contingency, as many factors have an impact that cannot be controlled by the designer – for example, historical context, situational context, prior experiences, etc. (Sharp, 2015).

All the design principles and design schemes that need to be assembled and woven together into a coherent game design entail the need for some form of ongoing data collection. This relationship is further reinforced by the fact that the design process constitutes the methodology itself in the research project. Becker and Parker (2014) point out that the complexity of game development makes it difficult to capture all the aspects that arise as a consequence of both the development phase and the game tests themselves. This argument thus supports the choice of a mixed-method approach for this PhD project. In order to capture all the factors that are important for the development of educational game design, it is crucial to listen to the "voices" involved in the project. In this regard, Schell (2015) points to the importance of listening to the following five voices: (1) the teaching team, who, in collaboration with the designer, organises the teaching based on the developed Game-Based Learning design; (2) the students who will be playing the game; (3) the game mechanic in relation to whether it is the right combination of design principles and design schemas; (4) UCN, as the parent institution, including institutional desires for the teaching design to support Reflective Practice-based Learning; and (5) the designer's own voice and intuition (Schell, 2015). There is thus a close connection between EDR and Design Thinking as both students and educators participate on several levels in the four phases of research. Thus, an awareness of listening to "five voices" is thus directly represented through the use of the methodology of educational research design. This means preparing mock-ups and prototypes early in the design phase that can be played, evaluated, adjusted and played again, enabling decisions to be made based on successive iterations or versions of the game (Abt, 1987; Salen & Zimmerman, 2004). Thus, there is a close connection between the general design traditions, including the "design way" method, and the game design theories that are closely related to the development of games (Becker & Parker, 2014; Kolko, 2009; Krogh et al., 2015; BeckerNelson & Stolterman, 2014; Stolterman, 2008).

As this PhD project deals with the development of educational games, several special conditions apply to understanding the basic principles of the game. Here, it is essential to recognise that there is a difference between games such as entertainment and games as an artefact that mediates a particular behaviour (Sharp, 2015). Becker and Parker (2014) describe in the following quote how the link between learning principles and playing techniques needs to be meaningful: *"Designing a game for learning is not simply a matter of designing a game and adding some learning elements. Designing games for learning is a goal-driven activity. When we design a game for learning, we obviously have some learning goal in mind"* (Becker & Parker, 2014, p. 180) This means that games for learning have several distinct design disciplines built in that can be difficult to integrate. Becker and Parker (2014) write: *"Learning requires a synergy of multiple design disciplines: instructional design, simulation design and game design. These design approaches cannot simply be layered upon one another, but instead must be combined to form a new approach that reflects a true synergy"* (Becker & Parker, 2014, p. 192). Also, teaching in higher education, in particular, is characterised by a high complexity that is rarely contained within singular teaching techniques. Therefore, it is vital to ensure that educational games can be supplemented by other instructional methods and can also be incorporated into multiple learning and teaching sessions (Richard, 2014). This relationship is very much the case for this PhD project's chosen objectives since the teaching at ATCM has a tradition of students working in a project-oriented manner.

Thus, the unique characteristics of educational games must include designing a space of possibilities through a framework of mechanics and goals that allows students to explore in a way that leaves room for ambiguity and interpretation (Becker & Parker, 2014; Richard, 2014; Sharp, 2015). According to Richard (2014), this means that the chosen design principles must ensure that the developed game design supports (1) competence development, (2) autonomy that gives the student control over their learning through action-related possibilities and (3) relatedness that creates a meaningful connection to the other content of the education (Richard, 2014). Thus, the scenarios that unfold throughout the game must be both authentic and relevant to the general educational content. They must contain different choices. Because of an embedded autonomy, the game needs to be replayable to accommodate some randomness in the development of students' personal learning trajectory (Becker & Parker, 2014).

The design challenge is thus fundamentally about creating a system that consists of interrelated elements that together create a sophisticated and holistic context (Salen & Zimmerman, 2004). Game development based on the concept of behavioural design is particularly concerned with creating a balanced, holistic system that, through patterns of activity, influences a specific behaviour of the players (Klemm & Pieters, 2017). Richard (2014) writes: *"Game designers ask players to engage in Huizinga's magic circle, where game rules create opportunities to play within the safety of constraints"* (Richard, 2014, p. 200). This also means that the system's components must be balanced in relation to the gameplay (in-game balance referring to "how it feels to play a game"), rules, aesthetic experience of the game's narrative, consequences of choices, procedures, boundaries, conflicts, etc. (Egenfeldt-Nielsen et al., 2013). Although the consequences of specific rules often define the experience of gameplay, it is essential to link the success criteria of the game's quality to the concept of meaning (Becker & Parker, 2014; Egenfeldt-Nielsen et al., 2013; Klemm & Pieters, 2017; Salen & Zimmerman, 2004).

5.2. GENRE OF MMORPG

The "Massively Multiplayer Online Role-Playing Game" (MMORPG) genre stands out from the number of commercial games as being able to establish a link between learning and game mechanisms. Existing research has shown that the gameplay behind MMORPG develops analytical and reflective competencies that are not only created through the game's narrative story (Alexander, 2017; Bawa et al., 2018; Daneva, 2017; Silva & Mousavidin, 2015; Sourmelis et al., 2017). A typical MMORPG universe is built around a vibrant and extensive fantasy world that involves countless sites that an avatar can move to. An MMORPG requires players to engage both often and repeatedly in the game (Poels et al., 2015). The explanation behind an MMORPG's ability to maintain players over a long period is mainly related to the built-in cognitive structures that engage in a mental level reminiscent of flow conditions where time and space disappear. Also, there is a close relationship and balance between the players' skills and the challenges the game offers (Badrinarayanan et al., 2015). An MMORPG is thus about engaging in varied activities such as killing monsters, attacking castles, collecting goods, shopping for goods, etc. It is, therefore, a virtual world created through imagination and exploration combined with a social realism (Ang et al., 2007; Poels et al., 2015). Players thus advance in the game by acquiring skills, collecting objects and knowledge, interacting with others in real time and retrieving tasks (Badrinarayanan et al., 2015; Voulgari et al., 2014).

MMORPGs' characteristics as a network-based virtual universe where thousands of computer players interact with each other in real time (Alexander, 2017; Ang et al., 2007; Chang & Lin, 2014; Daneva, 2017; Hou, 2012; Silva & Mousavidin, 2015; Sourmelis et al., 2017) present the opportunity to investigate how the computer players interact with each other, collaborate, search for facts, plan, design strategies and implement the game's activities (Bawa et al., 2018; Susaeta et al., 2010; Voulgari et al., 2014;). An MMORPG is designed through specific built-in scaffolds for the acquisition of knowledge and skills, where specific goals are almost impossible to achieve as a solo player (Ang et al., 2007; Bawa et al., 2018; Klemm & Pieters, 2017; Silva & Mousavidin, 2015). This means that the game encourages social interaction as players in teams collaborate on defeating challenges or use in-game chat to engage in learning conversation (Snelson et al., 2017). A study by Billieux et al. (2013) showed that although a vast knowledge of progress and mechanics is crucial to achieving a high ranking in the game, long-term data show that reaching a good result is far more time-consuming if the players are not motivated to collaborate with other players (Billieux et al., 2013). In the literature, MMORPGs are therefore considered a genre of computer games that has an explicit incorporation of a designed sociality, as Squire (2006) argues: *"The most intense social learning is found in massively multiplayer games, where players interact with thousands of other players in real time over the Internet"* (Squire, 2006, p. 23). Players must, therefore, learn how to handle social dynamics in the game when interacting with the virtual spaces or game objects (Ang et al., 2007; Eklund & Johansson, 2013). The structural and social structure of the games requires various competencies in terms of achieving success. These skills are developed through the players' **shared understanding** of the game's social interactions and communication (Bawa et al., 2018; McConville et al., 2017; Susaeta et al., 2010; Voulgari et al., 2014).

5.3. MMORPG AS EDUCATIONAL FRAMEWORK

Several studies have looked at MMORPGs potential as an educational framework in higher education (Bawa et al., 2018; McConville et al., 2017; Susaeta et al., 2010; Voulgari et al., 2014), and point out that new models for a more creative learning approach can be developed by understanding the importance of MMORPGs' embedded game mechanisms (Voulgari et al., 2014). According to Snelson et al. (2017), existing research has shown that MMORPGs have an untapped potential in terms of developing academic skills such as strategic thinking, problem solving, communication and collaboration (Snelson et al., 2017). This statement indicates that game design enables reflection processes along the way through complex collaborative processes between players (Ang et al., 2007; Chang & Lin, 2014; Hou, 2012; Sourmelis et al., 2017; Susaeta et al., 2010). One of the reasons for this is that MMORPGs are not built around a general overall narrative but consist of small sequences of content, known as quests, and various activities that merge into an extensive complex system (Bawa et al., 2018; Susaeta et al., 2010). The argument is that when the narrative of the game is structured in a carefully **planned script** consisting of **challenges and missions**, new situations are continually being developed that demand critical thinking, teamwork and problem-solving strategies (Ang et al., 2007; Bawa et al., 2018; Chang & Lin, 2014; Hou, 2012; Sourmelis et al., 2017; Squire, 2006; Susaeta et al., 2010). Also, quests contribute to new knowledge as players create progress in the narrative, which means that knowledge as a concept is linked to the context and its importance (Susaeta et al., 2010). It is, therefore, interesting how this genre has embedded game mechanisms that combine different types of quest activities to create a narrative and **process-oriented trajectory** built on the capability to empathise, problem-solve, learn by doing and apply knowledge in different contexts (Thong et al., 2016). Players need to become acquainted with the quest system to be successful and achieve specific goals. The players explore and thus examine the narrative while adding their **substories** as a supplement (Egenfeldt-Nielsen et al., 2013).

MMORPGs thus create learning by offering an interactive environment where it is possible to manipulate and explore the content (Susaeta et al., 2010). Also, MMORPGs are designed in a way where the gaming activities take a long time to complete as they are built around hard and tough challenges (Gee, 2007; Nardi, 2010). Nardi (2010) uses Dewey's definition of **"aesthetic experience"** (Dewey, 1980) to explain the game design behind an MMORPG (see Section 4.2). "Aesthetic experience" can be defined as active participation towards a final goal, which at the same time is also experienced as satisfaction through interacting with a variety of different activities. MMORPG games thus create a form of practice that draws on more than one modality regarding communicating different types of meaning (Bawa et al., 2018; Golub, 2010; Kim et al., 2009; Susaeta et al., 2010). These **sequential structures** of quest lines maintain the user at a given level for a more extended period, as the game design requires curiosity and exploration rather than a single focus on winning. The MMORPG genre thus demonstrates a high degree of autonomy as players can set their own goal and there is no way to win (Egenfeldt-Nielsen et al., 2013; Frost et al., 2015). A study by Bawa et al. (2018) shows that especially an autonomy to influence the gameplay through actively interacting and selecting the game's content through a form of **way-finding** contributes positively to motivation (Bawa et al., 2018).

CHAPTER 6. WORLD OF WARCRAFT

The computer game World of Warcraft (WoW) belongs to the MMORPG genre and the popularity of the game has fostered several anthropological studies where in particular the books My Life as a Night Elf Priest by Bonnie Nardi (2010) and Leet Noobs by Mark Chen (2012) have been an inspiration (Castillo, 2019; Chen, 2012; Egenfeldt-Nielsen et al., 2013; Nardi, 2010). World of Warcraft has maintained its status over the last decade as one of the highest-grossing and most subscribed to games (Billieux et al., 2013; Castillo, 2019; Egenfeldt-Nielsen et al., 2013). Bainbridge (2012) argues that WoW's popularity is due to its complexity, cultural wealth and expansive structure (Bainbridge, 2012). The game takes place in a heroic fantasy-based world called "Azeroth" (Billieux et al., 2013) and has a **built-in problem-solution** feature through **quests, realistic scenarios, role play** and collaborative mechanisms that stimulate players' intuitive motivation (Deterding, 2012; Gee, 2007; Hou, 2012; Morris et al., 2013; Suznjevic et al., 2013). Nardi (2010) argues that the complex structure of World of Warcraft through a series of unique quests at each new level creates an **"aesthetic experience"** and thus the feeling of motivation (Dewey, 1980; Nardi, 2010).

The multifaceted structure of World of Warcraft implies that it is designed in a way where the gaming activities are **time-consuming** as it is built around hard and tough challenges. A player's chances of success, therefore, require an efficient learning process (Castillo, 2019; Gee, 2007; Nardi, 2010). A central feature of WoW is, therefore, the **concept of progression** where players need to acquire new skills and knowledge through succeeding in **quests and missions** (Bainbridge, 2012; Billieux et al., 2013). As a system, MMORPGs progress through a variety of game challenges such as **quests, missions and dungeons, levelling up, achievement systems, crafting and farming activities, and wiping** (Billieux et al., 2013; Chen, 2012; Daneva, 2017; Nardi, 2010; Newgarden & Zheng, 2016; Silva & Mousavidin, 2015). So, although WoW, to some extent, is based on **predetermined and programmed activities**, players experience many dimensions with a great deal of freedom (Bainbridge, 2012). The complexity of the game requires players to think flexibly and imagine alternative ways of achieving their goals. Also, information that seems insignificant may turn out to be crucial and necessary to continue. As Bainbridge (2012) says,

> *Insight learning involves abstracting a lesson from one's observation or by assembling information from multiple sources. A fundamental feature of insights is that they tend to exist in hierarchiesm with later insights modifying earlier ones. First a person develops a mental map describing part of the world, one that successfully achieves early goals. Then, he or she becomes aware of anomalies or contradictions that suggest a more sophisticated mental map is needed. (Bainbridge, 2012, p. 98)*

An important aspect of World of Warcraft is the question of **sense making** and how context affords actions that realise different arrays of values through dialogue between players (Newgarden & Zheng, 2016; Rodríguez, 2013). A study by Newgarden and Zheng (2016) shows that World of Warcraft facilitates an extensive range of communicative activities like coordinating, sharing game knowledge, reporting on actions, **negotiating meanings, seeking and offering help, expressing needs, locating,** etc. (Newgarden & Zheng, 2016). Observations made by Rodríguez (2013) show the same trend:

> *Members were observed discussing the importance of finding the most useful data when faced with the extensive amount of information available yet limited time. Both their frequent discussion on this topic and the situation-dependent use they made of several different sources of information were seen as fully supporting the claims made in the literature. (Rodríguez, 2013, p. 719)*

The designed game context draws on **multimodal resources** that create and **mediate sociocultural communication and collaboration**. Situated activities become sense making in the game world and thus support the progress of the games (Bainbridge, 2012; Newgarden & Zheng, 2016). Existing research also shows that a large part of the game is learned through activities such as ***"finding facts, developing tactics or strategy,*** *and being socialized to the norms and values that constitute game ethos"* (Bainbridge, 2012, p. 90). Bainbridge (2012) uses the theories of Bandura about adopting behaviour patterns from others to explain how the players non-verbally imitate each other through abstract perception, modelling and insight (Bainbridge, 2012). He points out that this highlights one of the flaws of behaviourist theories of learning, since learning in World of Warcraft is not solely constituted through the **reward system**, but to a greater extent through the social interaction of the players in between (Bainbridge, 2012; Silva & Mousavidin, 2015). Players are thus constantly developing and expanding their strategies for how to achieve their goals in the game through an experimental approach of **trial and error** (Bainbridge, 2012; Silva & Mousavidin, 2015).

6.1. WORLD OF WARCRAFT AS A MAGIC CIRCLE

A game like World of Warcraft can be challenging to define theoretically as it contains a unique complexity in terms of both mechanical and social design elements. Therefore, it is also challenging to fit the game into existing game theories or definitions (Corneliussen & Rettberg, 2008). For example, World of Warcraft does not have a clear and defined ending with a quantifiable outcome as Salen and Zimmerman's definition proposes (Egenfeldt-Nielsen et al., 2013; Salen & Zimmerman, 2004). This also means that this project's choice of the concept "the magic circle" as the general definition of a game is challenged by a multilayered game like WoW (Corneliussen & Rettberg, 2008). One of the challenges in understanding World of Warcraft as a notion of a magic circle that is separated from real life is the blurred boundaries between reality and games caused by its absorbing nature (Corneliussen & Rettberg, 2008; Nardi, 2010). According to Nardi (2010), gaming activities in World of Warcraft are thus part of both the conscious and unconscious mind outside the playing time (Nardi, 2010). Corneliussen and Rettberg (2008) share the same observations, but point out that the link between World of Warcraft and the magic circle is about how the World of Warcraft is understood culturally:

> *World of Warcraft seems to challenge the concept of the magic circle in several ways, both in relation to what is going on in the game, for example when the research guild meets to discuss, and what goes on outside it. Thus in order to understand WoW we must study it both as a game and as a cultural site requiring the application of multiple disciplines, analytical tools, concepts and methods so that we may fully comprehend this phenomenon. (Corneliussen & Rettberg, 2008, p. 9)*

Nardi (2010) also points to Huizinga's notion of the magic circle and that it opens up a discussion on how World of Warcraft can be understood as a cultural phenomenon where *"the meaningfulness of play is bound with the activity of those who actually play"* (Nardi, 2010, p. 116). Huizinga observed that the magic circle brings with it a sense of being together about something that creates its very own collective and social order. This social order is non-players excluded from participating by not understanding the cultural significance of the activities. As a result of this, the magic circle is constituted by defining who is inside and who is out based on cultural and social norms and values, more than through the game's concrete activities (Egenfeldt-Nielsen et al., 2013; Nardi, 2010; Salen & Zimmerman, 2004).

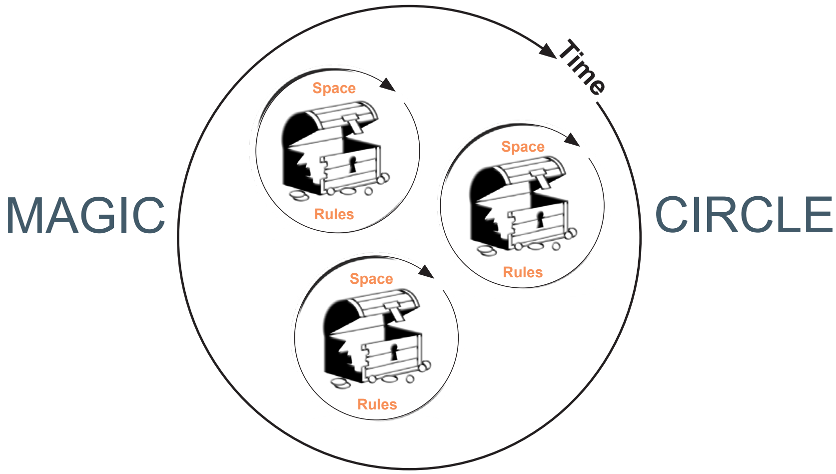


Figure 19 – World of Warcraft as a "magic circle" consisting of a number of magic circles.

The magic circle can be perceived as spatial and in particular the fictional world of World of Warcraft can be interpreted as an extension of the real world, or as a 'social media platform where people meet to socialise. Thus, players often make an active choice within the game where they initiate new game activities and venture out to quest, complete a dungeon or farm resources. This leads us to think of World of Warcraft as a magic circle consisting of a number of magic circles – like instances or the different zones of landscapes (Bainbridge, 2012; Chen, 2012; Corneliussen & Rettberg, 2008; Egenfeldt-Nielsen et al., 2013; Nardi, 2010; Salen & Zimmerman, 2004).

The following section will elaborate in greater depth with some of the more technical and theoretical aspects of game design. In this section, there will be a continuous focus on games described through a design grammar consisting of an internal and external design space, as well as a description of games as being scaffolded on three levels of learning opportunities.

6.2. INTERNAL AND EXTERNAL DESIGN GRAMMARS IN WOW

Playing a game is not just about decoding text and images but also about being able to focus on the context or the social and cultural conditions that affect understanding and interpretations (Sourmelis et al., 2017; Newgarden & Zheng, 2016;). Gee (2007) calls it "semiotic (sign) domains" that can be considered a series of activities that people treat, think of and value in a particular way (Gee, 2007). World of Warcraft consists of **sequences of semiotic domains** and thus forms a practice drawing on different types of meaning (Sourmelis et al., 2017). Each "semiotic domain" can be seen from two different perspectives: an internal perspective and an external perspective. As Gee (2007) explains, *"a **design space**, internally as a system of interrelated elements making up the possible content of the domain and externally as ways of thinking, acting, interacting and valuing that constitute the identities of those people who are members of the affinity group associated with the domain"* (Gee, 2007, p. 32). This means that World of Warcraft overall is built around a general design grammar based on sequences of activities. These activities can either be in-game skills in the **internal design grammar** or emergent skills in the **external design grammar** (Ang et al., 2007; Gee, 2007; Sourmelis et al., 2017).

Figure 20 – The internal and external design grammar creates the game design.

The internal design grammar is about principles and patterns that are recognisable regarding typical and acceptable content in the semiotic domain. It consists of skills needed to complete the game's missions (Ang et al., 2007; Billieux et al., 2013; Gee, 2007; Sourmelis et al., 2017). The external design grammar deals with the principles and patterns that are identifiable regarding typical and acceptable social practice (Gee, 2007). The external design grammar refer to abilities that are detached from the game, such as decision-making skills, strategic planning, facts, theories and principles – the way in which people interact in the game or each semiotic domain (Ang et al., 2007; Gee, 2007; Sourmelis et al., 2017). The internal and external design grammars have a close relationship as they both complement and transform each other. In video games, the players know which patterns or combinations of the individual elements within the "semiotic domain" are allowed. It is crucial to gain knowledge of the situated meaning of the whole system to understand the situated significance of the individual elements, how they can/should be combined, and used to complement each other to achieve the best performance (Gee, 2007). Sourmelis et al. (2017) conclude in their literature review the following: *"A consistent finding in the literature appears to be that learning in MMORPGs is a progressive, complex process that involves the use of in-game and external resources"* (Sourmelis et al., 2017, p. 44). One consequence of this relationship forces the players to create different discussions about the content that subsequently add to the virtual world subnarratives. In order to achieve active learning, the student must thus understand and operate within both internal and external design grammars. To learn in the game, one should be able to reflect, be critical, and be able to manipulate the internal and external design grammar at a meta level (Ang et al., 2007; Gee, 2007; Sourmelis et al., 2017).

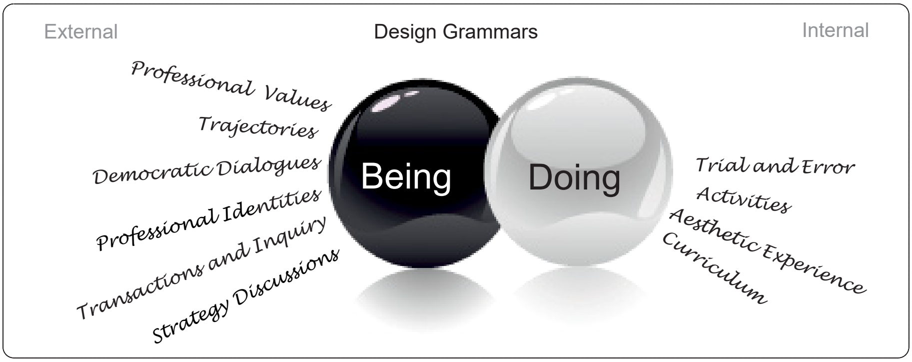


Figure 21 – Designing games for specific educational purposes must deliberately be a combination of doings (internal design grammar) and beings (external design grammar).

Morris et al. (2013) therefore point out that games are culturally situated and scaffolded activities. By analysing game elements and their relationship, they present three levels of scaffolding: **motivational scaffolding, cognitive scaffolding and metacognitive scaffolding** (Morris et al., 2013). This structure is known from scientific thinking,

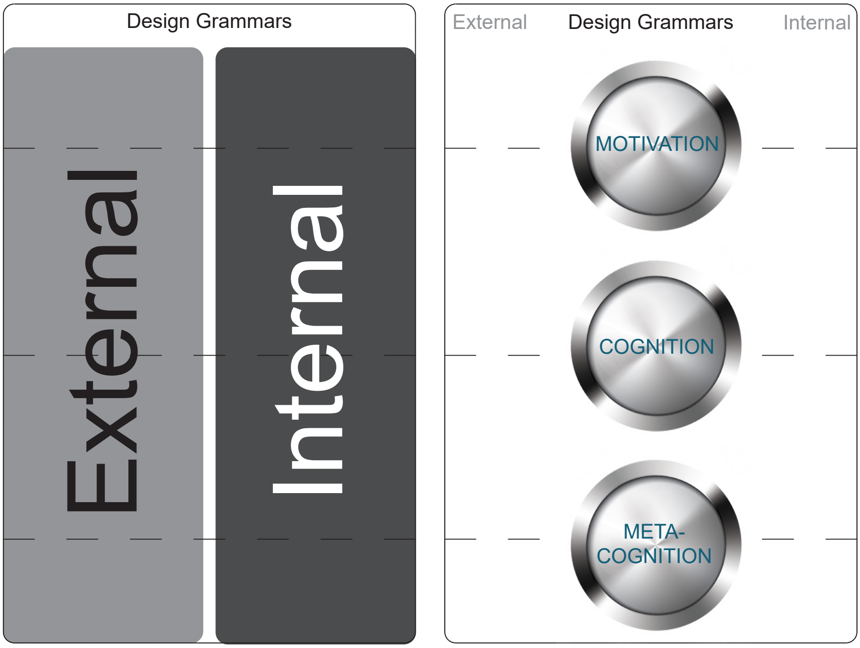


Figure 22 – Illustrates how Morris et al.'s (2013) three levels of scaffolding can be combined with Gee's (2007) understanding of internal and external design grammars.

and Morris et al. (2013) therefore conclude that there is a unique connection between learning and games.

The motivational scaffold is about creating flow thinking through quest and level strategies supported by reward systems and the use of cultural artefacts. The motivational scaffold can be compared to Dewey's definition of "aesthetic experience". Nardi (2010) uses aesthetic experience to explain the relationship between game design and its user's behavioural persistence and motivation (Dewey, 1980; Nardi, 2010; Morris et al., 2013; Waks, 2011).

The cognitive scaffold, on the other hand, is about understanding and acting in the various semiotic domains of the game, through a situational reflective and critical behaviour. It entails actions that are based on cognitive skills such as knowledge acquisition, analysis and problem solving. The game mediates this process through artefacts, including conceptual tools such as values and identity (Billieux et al., 2013; Morris et al., 2013; Newgarden & Zheng, 2016).

The metacognitive scaffold points in the direction of identity. At the metacognitive level, players process the consequences and temporal conception that the actions of the game cause. It entails an awareness of gained knowledge and skills that are used to regulate, plan and evaluate one's own efforts (Gee, 2007; Morris et al., 2013).

The next Section gives a more in-depth description of some of the core game mechanisms that constitute the activities and gameplay within World of Warcraft.

6.3. SIX CORE GAME MECHANISMS OF WORLD OF WARCRAFT

The following Section describes the six core principles that together characterise the gameplay behind World of Warcraft in greater depth. The principles have been selected based on the desk research on World of Warcraft. In particular, the anthropological studies by Nardi (2010) and Chen (2012) have been a great inspiration (Chen, 2012; Nardi, 2010). The principles selected are as follows:

Level
Quest
Achievements
Dungeons and missions
Farming and crafting
Game over and wiping

Also, these thematisations have increasingly contributed with design principles that through an abductive design process have subsequently been converted into meaningful design schemas regarding the PhD thesis's overall problem (see Chapter 8). The individual themes are further elaborated in the following chapters in order to qualify the theoretical basis for World of Warcraft.

6.3.1. LEVEL

The term **"level"** addresses how World of Warcraft categorises its players' overall effectiveness and capabilities. Each level a player achieves opens up new possibilities (Bainbridge, 2012; Chen, 2012; Corneliussen & Rettberg, 2008; Nardi, 2010). The division of gameplay into levels means that players must continuously acquire a deeper and more profound understanding of how to play (Daneva, 2017). The level describes the current ranking the player has, while the concept of levelling refers to the activities needed to achieve new levels. The game's official strategy guide (2004) contains the following description of levelling: *"Act of gaining experience by killing mobs, crafting or questing to advance your characters"* (Lummis & Vanderlip, 2004, p. 7). Each level, according to Daneva (2017), contributes to preparing the avatar for coping with the in-level challenges, execution and wrap-up (Daneva, 2017). Each new level can be considered an aesthetic experience, contributing to maintaining a continuous motivation while giving the player an increasingly nuanced view of the game world and gameplay (Dewey, 1980; Nardi, 2010). The gameplay at every level thus contributes to possible choices, each of which has some form of consequence. It is, therefore, essential to find the right balance between a level's severity and the feeling of being able to complete it (Daneva, 2017).

6.3.2. QUEST

Doing **Quest** also called "queste" is one of the most central activities that WoW is built on. Quest can be defined as a task the player is asked to perform that triggers a reward – so to quest is to learn (Bainbridge, 2012; Rettberg, 2008). The primary goal of solving a quest, besides an introduction to the game's narrative, is to gain enough points to unlock new levels (Rettberg, 2008). Each quest is unique and designed to emphasise key objectives related to a wide variety of activities (Susaeta et al., 2010), and in doing so, they are part of the big story either as a solo quest or as part of longer chains of quests. Thus, World of Warcraft does not contain an extensive and pervasive quest (Rettberg, 2008). In the game's official strategy guide (2004), the types of quest are described as kill quest, gathering quest, delivery quest, escort quest, faction quest, class quest, series quest, elite quest and, in the later expansion, world quest and daily quest (Lummis & Vanderlip, 2004). World of Warcraft is designed in such a way that the gameplay and narrative are endless, and even if a player reaches the maximum number of levels, the game still contains many activities (Rettberg, 2008). This also means that a quest does not have an ultimate meaning (Rettberg, 2008). A quest's objective goal is fixed, and there are no more alternative ways of achieving a goal – it is like kill 10 x, bring me x (Rettberg, 2008). It is not a goal in itself to figure out the quest, like a puzzle, but it is the action the quest is aimed at that is the challenge. Often, however, it may be necessary to devise innovative and smart strategies in order to complete a quest in terms of the actions required by the activities of the quest (Bainbridge, 2012; Rettberg, 2008). Most quests can be solved solo, but there are similar quests that require players to team up in groups (Rettberg, 2008).

Many quests are based on the same mechanisms or activities, but with different narrative content. In order to discover a particular sequence or **pattern of quests**, the player must examine and test the effect of each of them. When a quest type is repeated over and over, it becomes a habit (Silva & Mousavidin, 2015). According to Silva and Mousavidin (2015), this form of building action patterns is a form of **telescoping** where sequences of actions leads to a final goal.

> *Thus, we posit that over time, the repeated enactment of a telescoped sequence of actions becomes a habit [...] once strategies are transformed into habits, new strategies or lines of action can be integrated [...] the player has become used to a specific situation that seemed challenging in the beginning. (Silva & Mousavidin, 2015, p. 173)*

Telescoping is, thus, a way of developing the skills needed to achieve what is called "in-game progress" (Silva & Mousavidin, 2015). In addition to being smaller tasks, quests also help to create a narrative context of the game by providing the right information to players when they need it (Susaeta et al., 2010). Many quests also have built-in instructions or can be considered simple training exercises that support the game later. Other quests aim to get the player to experiment, be curious and explore the narrative (Bainbridge, 2012). Each quest in the World of Warcraft contains a tiny part of the narrative, and although research has shown that the players rarely read all the details of the quest, they nevertheless gain an overall sense of the game world from the quests being based on the same structures that are repeated over and over (Rettberg, 2008). Quests in World of Warcraft are generally built around a very rigid structure with a simple linguistic syntax consisting of information about the quest giver, the background story, objectives and rewards (Rettberg, 2008).

6.3.3. ACHIEVEMENT

One of the unique reward systems in World of Warcraft is the opportunity to obtain **achievements.** Achievements can be defined as independent goals, offering new challenges. Also, the player's progress is visible to others. Achievements are available in several variants, with some requiring specific actions, such as getting a haircut or visiting a particular area, while others are more time-consuming. The latter can be seen as a kind of meta-result that guides players in specific directions or initiates a more extended series of quests (Chen, 2012; Nardi, 2010).

6.3.4. DUNGEONS AND MISSIONS

A unique design principle in World of Warcraft is the concept of **dungeons or alternative missions**. A dungeon is an area of discovery within the game where a particular scenario or mission must be replayed through an often coordinated effort among multiple players. Each dungeon has its narrative and is recognised by being a defined and enclosed area or zone. It is often necessary to possess specific skills or to devise specific strategies to be successful and beat the challenges each dungeon offers (Rodríguez, 2013; Silva & Mousavidin, 2015). A dungeon is designed in a way where players must collaborate and experiment with different solution strategies to find the right combination of resources and actions (Chen, 2012; Nardi, 2010).

A dungeon may be considered as what Gee (2007) would call "semiotic domains" (Gee, 2007). As described in Section 5.5, a semiotic domain can be defined as a specific practice consisting of varied and recognisable activities. Each "semiotic domain" can be viewed from both an internal and an external perspective. In order to complete a dungeon, players need to know which patterns or combinations contribute to an experience of success. This means gaining knowledge about each dungeon's situated meaning concerning the overall system, but also understanding the situated significance of the individual elements (Rodríguez, 2013; Silva & Mousavidin, 2015). Newgarden and Zheng (2016) point out that the gameplay in World of Warcraft contains multimodal dimensions and forms of communication, where players, especially in a dungeon, must be able to obtain the right information needed to continue (way-finding). In addition, attention needs to be paid to a lot of cultural aspects that arise during the play. A dungeon can thus be characterised as a sociocultural practice (Newgarden & Zheng, 2016). The interesting thing about a dungeon is how a group of players constitutes themselves before the action itself by negotiating their understanding of the characteristics of the dungeons/missions. Research has also shown that World of Warcraft and other similar games strengthen negotiation abilities as well as teamwork skills (Newgarden & Zheng, 2016; Rodríguez, 2013).

Raids (a larger and more difficult dungeons) in particular, which are characterised by a larger group of players, often from the same guild (20–40 people), require much preparation, with each player having a great responsibility to be well prepared – being well prepared means having the right equipment and resources, but also having acquired the necessary strategic knowledge about the challenge a dungeon will offer (Rodríguez, 2013). Dungeons/missions are often repeated over and over to improve the players' abilities to master the challenges (Eklund & Johansson, 2013).

According to Silva and Mousavidin (2015) and Rodríguez (2013), being able to complete a dungeon thus requires players to clarify goals; identify, share and discuss strategies; state roles; coordinate work; correct mistakes; establish clear rules for a reward system; and keep the group on the same page for the task at hand – all of it both during and after the dungeon/raid (Rodríguez, 2013; Silva & Mousavidin, 2015).

6.3.5. FARMING AND CRAFTING

The concept of **farming and crafting** in games is not described particularly richly or in depth in the literature. However, many of the game activities in World of Warcraft are based on the concept of farming and crafting. Players within the game, therefore, spend hours of collecting material and resources, also called "farming" (Alexander, 2017; Chen, 2012; Gee, 2007; Nardi, 2010). The material or resources collected are later used to craft items. The farming activities are woven into the overall design of the game and act as small **breaks or oases** (Nardi, 2010). Nardi (2010) uses theories of Freud to explain how farming activities can be seen as a way of coping with frustration and uncontrollable events that are concomitants of life in society (Nardi, 2010). Nardi highlights the paradox that players accept the boredom that farming activities entail: *"The sheer boredom of farming and players' acceptance of it were surprising"* (Nardi, 2010, p. 111). However, it is difficult to achieve satisfactory success in the game without having to farm, as it is the key to obtaining, for example, better equipment and items. The collection of items contributes to solving complex tasks, which in itself is a reward (Gyldendahl-Jensen, 2016; Gyldendahl-Jensen & Dau, 2019; Nardi, 2010).
The basic principle behind crafting and farming is all about slowing the game down and keeping the gamers busy (Gyldendahl-Jensen, 2016; Gyldendahl-Jensen & Dau, 2019;

Nardi, 2010). The interesting thing about the farming activities is that they appear as repetitive actions with little contingency. Farming in World of Warcraft can, therefore, be seen as an activity that with its potential creates both affordance and meaning within its form of magic circle (Egenfeldt-Nielsen et al., 2013; Nardi, 2010; Nørgård et al., 2017; Salen & Zimmerman, 2004). Furthermore, crafting and farming stimulate both social communication and collaboration about preparing a joint action through quests and dungeons/missions (Chen, 2012; Gyldendahl-Jensen, 2016; Gyldendahl-Jensen & Dau, 2019; Nardi, 2010).

Another angle of the concept of farming and crafting is the collection of knowledge through external sources. It is challenging to achieve progression in World of Warcraft without gathering knowledge of the game's challenges or doing analysis of data from the game log (Chen, 2012; Nardi, 2010; Silva & Mousavidin, 2015). Alexander (2017), in his research, makes a link between crafting in World of Warcraft and real-life academic teaching environments:

> *My gaming participants told me they do not "write" often, and do not "read" often, but the volume of composing they actually did is staggering. Thousands upon thousands of words in strategy blogs, hours and hours of chat conversation, numerous complex user-generated videos – not to mention all the reading/viewing of other user-generated content. They were writing more on any given day than the students in my upper-level writing classes. The reason they didn't see their actions as reading and writing is because they didn't know how to break it down, how to look at what their processes were. In their minds, they were simply "playing". (Alexander, 2017, p. 11)*

The players thus share and publish their experiences in virtual forums, and by doing so, external sources become crucial to learn about the game's more complex gameplay (Alexander, 2017; Silva & Mousavidin, 2015). This develops (crafts) the players' different *"types of knowledge[...]develop through play and the ways they composed and shared that knowledge with other gamers"* (Alexander, 2017, p. 2). It is, therefore, a question of players achieving different and sophisticated ways of thinking and working regarding developing the right strategies and behaviours concerning meeting specific challenges (Alexander, 2017).

6.3.6. GAME OVER AND WIPING

Another essential gaming principle that is not described in detail in the literature is the concept of **"die", "game over" or "wipe"**, as it is called in World of Warcraft. Wiping refers to when a group of players repeatedly fail and have to start again (Chen, 2012; Golub, 2014; Nardi, 2010; Silva & Mousavidin, 2015). A wipe, therefore, is a situation where entire groups of players die. Wipes happen for many reasons: the group fails in their attempt to solve a problem, unforeseen problems in learning new difficult game content, etc. (Silva & Mousavidin, 2015). Silva and Mousavidin (2015) describe the reason why a wipe occurs as follows: *"Wipes occur because of an unbalanced group composition, unawareness of boss mechanics, poor communication or weak or total absence of leadership"* (Silva & Mousavidin, 2015, p. 172). A wipe creates afterwards processes of reflection regarding finding the right combination of resources and actions necessary to defeat the challenge given (Chen, 2012; Golub, 2014; Nardi, 2010; Silva & Mousavidin, 2015). From a design perspective, "dying" is thus a way to teach and train players to act more successfully according to the game's intentional gameplay. Thus, it is a method of pushing players to collaborate with others to improve their game (Klastrup, 2008).

One of the few articles dealing with the concept of "dying" in a game is Klastrup (2008). She writes, among other things: *"If we want to understand a world like WoW in all its complexity, death is important as a pivotal design element and something that every player experiences several times during the game"* (Klastrup, 2008, p. 143). Specifically, when a player in World of Warcraft runs out of health points, the player dies. The player's characters do not disappear permanently, but the player must instead spend time reclaiming the corpse in order to continue playing (Klastrup, 2008). In World of Warcraft, dying is something that happens all the time, and therefore it can be described as a game activity in line with many of the other repeatable activities that occur as part of the game (Klastrup, 2008). Klastrup's research also shows that the players in World of Warcraft utilise the **ghost state** (a transitional phase parallel and identical to the game world) you are in when you are dead, to positively explore the game's challenges (Klastrup, 2008).

CHAPTER 7. DERIVING OF DESIGN PRINCPLE

The purpose of phase 1 is to formulate the design principles based on both theory work and desk research as well as qualitative data collecting. By observing, describing, explaining and understanding the issues that characterise the existing practice it is possible to derive design principles based on the theoretical perspectives, which can act as an engine for the upcoming design process in the next phase.

By constantly translating and forming design principles based on different theoretical perspectives, it is possible to find relationships and patterns that can be combined in design schemas. The collection of design principles thus has the nature of being a form of data mining. Words or concepts from the previous chapter highlighted in **Orange** form the number of design principles that, through a condensed process, contributes to the development of design schemas. The accumulated list of design principles from each desk research is presented and summarised below. Next, it is visualised through pictures of the process of how a continuous condensation has contributed to reducing the many found design principles to 36.

7.1. DESIGN PRINCIPLE FOR PRACTICE THEORY

Based on both the desk research on Reflective Practice-based Learning and the result of the pre-study, the following schema presents the derived design principles for Practice Theory as a contribution to phase 2. The criterion for selecting these design principles is their theoretical potential to inform the development of new educational designs and prototypes in phase 2.

Disrupt	Proceed and depends	Personal trajectory	Curiosity
Condition of contingent	Tolerance of ambivalence	Broken space-time path	Far-reaching imagination
Judgment	Disturbed experiences	Immutable endpoint	Free space
Teleoaffective structures	An open manifold of doings and sayings	Complex learning trajectory	Series of interconnec-ted situations
Situated	Material arrangement	Episodic	Organic circles
Normativity	Concomitant learning	Consequence	Intelligent actions
Decode	Emotions	Multiple angles	Looping process

Readiness	Space-time	Sequential learning	Multiple practices
Emotional tension	Transformations	Inquiry	Transaction
Exploration	Changes	Evaporating	Experience
Operationalise	Experimentation	Quality of progress.	Normative beliefs
Bundles	Coming to know	Breaks or rest periods	Aesthetic judgments
Different possible paths	The power of reflection	Mechanical intersections	Complex learning paths
Intentional actions	Habits	Open-ended	Acquaintance
Self-understanding	The way things matter	Character traits	Transactive related
Dialectical	Anti-dualism		

Figure 23 – The derived design principles for Practice Theory as a contribution to phase 2

7.2. DESIGN PRINCIPLE FOR GAME-BASED LEARNING

Based on the desk research on Game-Based Learning, the following schema presents the derived design principles for Game-Based Learning as a contribution to phase 2. The criterion for selecting these design principles is their theoretical potential to inform the development of new educational designs and prototypes in phase 2.

Multiple remediating artefacts	Process-oriented trajectory	Scaffolded learning process	Dungeons and missions
Playful activities	Gameplay	Learning rhythms	Planned script
Voluntarily	Quest structure	Debriefing	Interactivity
Make-believe,	Strategic open-ended	Goals and strategies	Sub-stories
Choices	Way-finding	Fun-failure	Aesthetic experience

Rules	Progress	Narrative	Designed experiences
“Magic circle.”	Challenge-based reward	Non-linear progression	designed experiences
Artificial conflict	Overcoming obstacles	Shared understanding	

Figure 24 - The derived design principles for Game-Based Learning as a contribution to phase 2.

7.3. DESIGN PRINCIPLE FOR WORLD OF WARCRAFT

Based on the desk research of World of Warcraft, the following schema presents the derived design principles for World of Warcraft as a contribution to phase 2. The criterion for selecting these design principles is their theoretical potential to inform the development of new educational designs and prototypes in phase 2.

Developing tactics or strategy	Internal design grammar	Mediated sociocultural collaboration	Sequences of semiotic domains
Mission and dungeons	Aesthetic experience	Locating	Design space
Levelling up	Time-consuming	Roleplay	Quests
Achievements systems	Crafting activities	Seeking and offering help	External design grammar
Telescoping	Breaks or oases	Ghost state	Game over
Wiping	Sense-making	Finding facts	Cognitive scaffolding
Built-in problem	Negotiating meanings	Reward system	Farming activities
Concept of progression	Predetermined and programmed activities	Metacognitive scaffolding	Motivational scaffolding
Realistic scenarios	Multimodal resources	Trial and error	Pattern of quests

Figure 25 - The derived design principles for World of Warcraft as a contribution to phase 2.

7.4. THE CONDENSED DESIGN PRINCIPLES

Through the introductory theory work and the pre-study, 132 design principles are thus derived. These have been reduced to 36 core design principles through a condensation process. One way of doing this has been to "live" with the design principles written on physical post-it notes placed on the wall for a period. Figures 26 and 27 illustrate how the design principles have been both visible and accessible, which makes it possible to continue adding new principles, create new connections across topics and discover interesting patterns. Here, in particular, sketching has served as the primary tool where very early and simple design schemas have helped to create an overview. The process of sketching has been iterative and it is therefore difficult to say exactly when the condensation of the design principles starts to be more about developing design schemas. Therefore, there is a fluid transition between phase 1 and 2. The specific development of the subsequent design schemas is further described in the next Section.

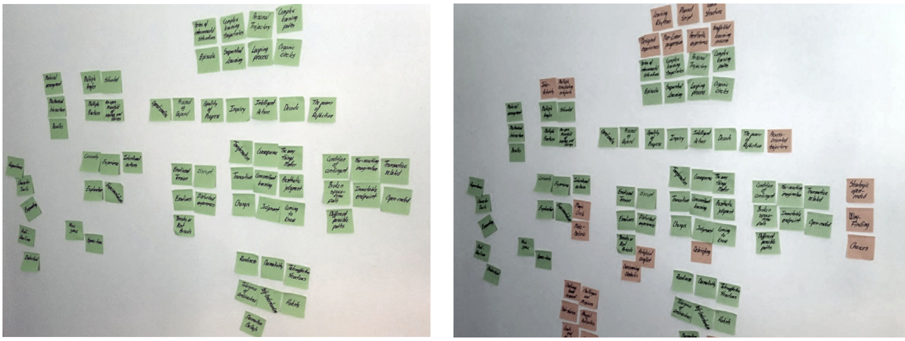


Figure 26 - Design principles from Practice Theory are being grouped and combined with the design principles from game theory.

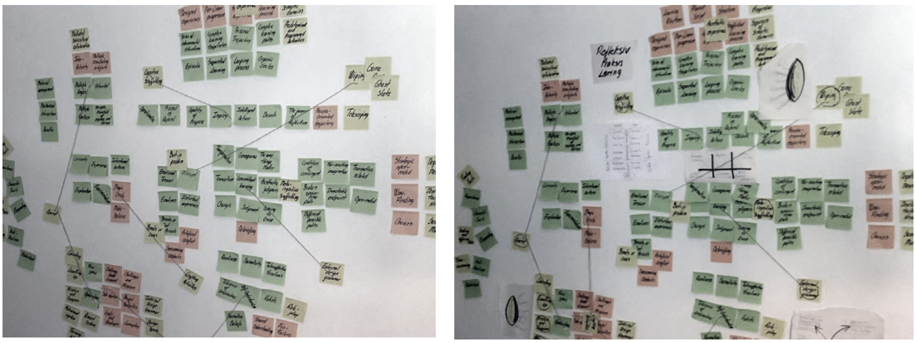


Figure 27 - The design principles for World of Warcraft are added to the process, and sketching is used to find shared connections, patterns and understandings.

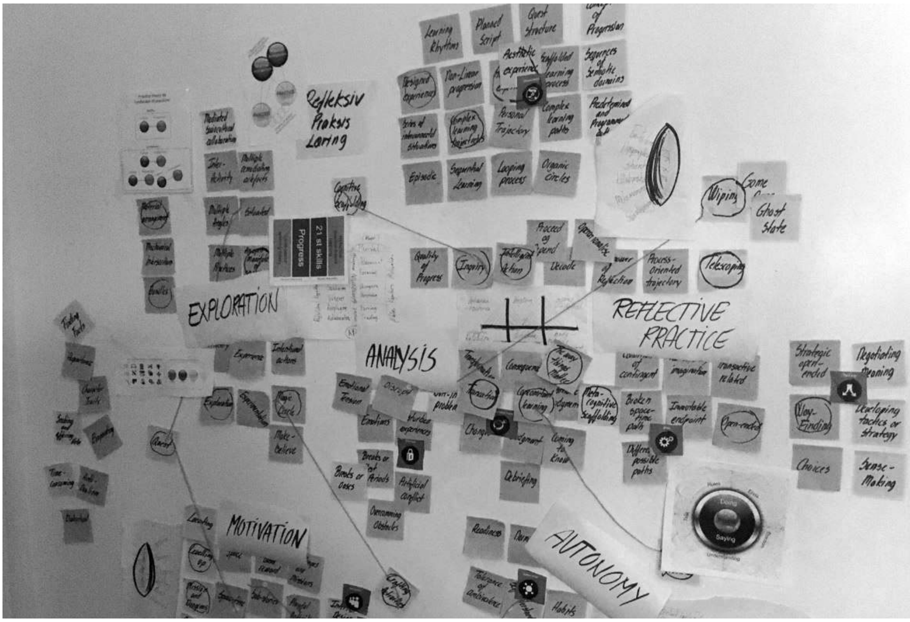


Figure 28 – The condensation and analysis of the design principles are starting to reveal the core and most interesting design principles.

Figure 29 – The picture is showing how the core and most interesting design principles are marked with a circle.

The table below (see Figure 30) summarises all the design principles from the desk research and pre-study in the previous phase that through the iterative process described above have been selected. These design principles, through the development of design schemas, will form the foundation for the development of the PhD project's educational design, which is tested in phase 3.

The table does not represent a visualisation of a horizontal relationship between the individual design principles and the columns. This connection is first created through the design process when the design principles are coupled by drawing up the design schemas.

Pre-study	Practice Theory	World of Warcraft	Game Theory
Autonomy and Motivation	Trajectories	Mission and Dungeon	Aesthetic experience
	Concomitant learning		Way-finding
	Bundle and material arrangement	Farming and crafting	Sequential structures
	The way things matter	Achievement	Designed experienc-es
Analysis and Exploration	Intelligent action	Telescoping	Open-ended and non-linear
	Inquiry and exploration	Semiotic domain	Magic circle
	Transaction	Internal/external design grammar	Fun-Failure
	Doings, saying		Learning trajectory
Reflective practice	Consequences and temporal conception	Level Thinking	Multiple remediating artefacts
	Sequential learning	Quest thinking	Integrated autonomy
	Landscape of practice	Wiping and game over	Scaffolded learning
	Normativity		Progress

Figure 30 - A comprehensive scheme of all the condensate design principles from phase 1.

PHASE 2

Designing the prototype

CHAPTER 8. PROTOTYPING

Phase 2 of Educational Design Research is called “prototyping”, where design principles from the previous phase are used to develop a new educational design. This will create an opportunity to ensure that the design will be based on theoretical insights where Game-Based Learning perspectives are balanced with practice-related knowledge. However, no matter what kind of synthesis process is used to combine and connect the design principle into a final design, the design process still appears to be something magical (Kolko, 2009).

8.1. PROTOTYPING THROUGH DESIGN-THINKING

The challenge is how to transform design principles into design schemas in a way that both externalises and memorises that process in order to create transparency within the research process. Through sketching techniques, it is possible to translate design principles based on different perspectives into a coherent design where theoretical and practical relationships and patterns can be combined in design schemas. In this way, design schemas become graphical abstractions that allow the thoughts and reflections created by the design principles to be discussed, defined and embraced.

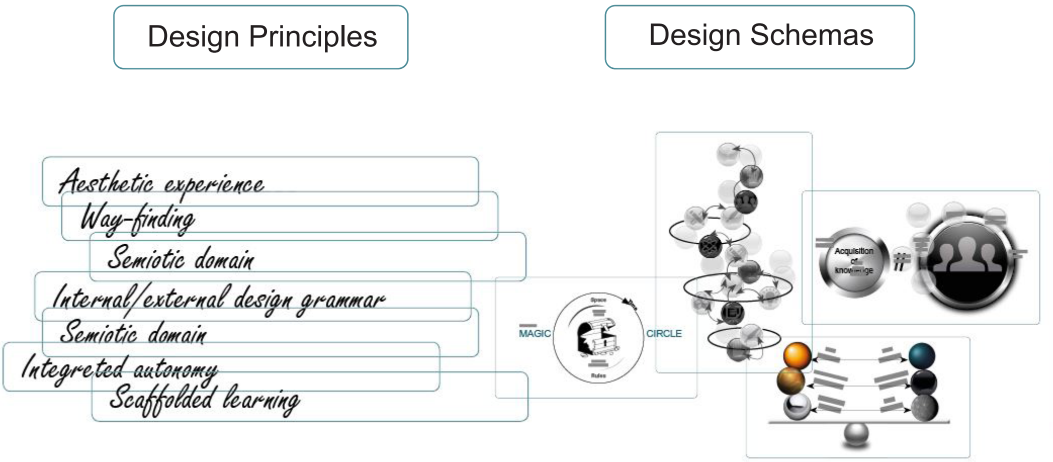


Figure 31 - The process of converting design principles into design schemas and prototypes.

The different perspectives expressed by the design schemas cause the designers to follow and examine different trajectories that ultimately influence the final design. The decisions that draw these design trajectories can, according to Nelson and Stolterman (2014), be regarded as a centre between intuition and logic or imagination (Nelson & Stolterman, 2014).

The graphic representations that make up the design schemas enable in practice a process of composing and connecting a variety of elements into functional assemblies. The process of converting design principles into design schemas transforms the abstractness of relevant scientific knowledge into prototypes that can be tested in practice. As described in section 3.4.1, this process is termed a form of synthesis like an abductive sense-making process that "organises, manipulates, prunes and filters gathered data into a cohesive structure for information building".

In this PhD project, there has thus been an iterative design process in which 219 different design schemas have been developed based on the initially defined design principles from phase 1 (see Figure 32).

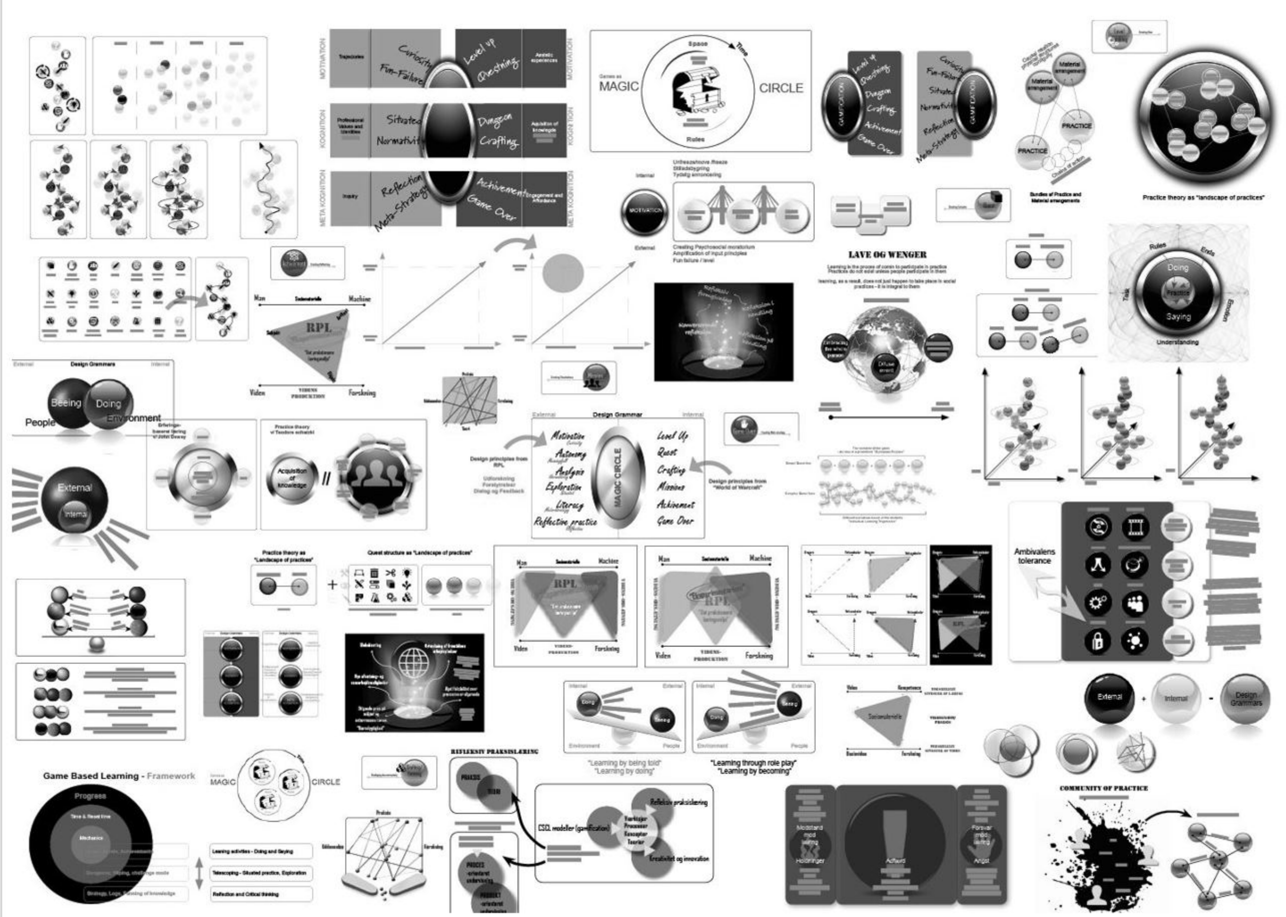


Figure 32 – The illustration shows a graphical collage presenting some of the 219 design schemas that have been developed during the PhD study.

In practice, it can be challenging to say precisely which steps in the development, or what design schemas, lead to new specific insights. This means that there will always be iterative processes that weave in and out of each other. However, the described systematic approach comfirms the notion that essential connections can be drawn between immediate unrelated elements, and thus it is key to link research to design (Kolko, 2009; Krogh et al., 2015; Nelson & Stolterman, 2014; Stolterman, 2008). The development of design schemas in this PhD uses methods such as sketching and drawing to capture periods of reflection, as well as the thoughts that arise continuously through the investigation process.

The work on design schemas is thus regarded as a form of data collection that has contributed to the production of knowledge (1) by challenging the analytical starting point and (2) through the development of the specific design that has formed the framework for data collection. The individual design schemas are continuously qualified and reviewed through conference presentations and the publication of research articles. This chapter discusses the outcome of the design process through the construction of the prototype that is subsequently tested in phase 3. The first section contains a specific description of the game's physical structure and elements. This is followed by a section that on a more fundamental basis discusses how the design principles through the elaborated design schemas together create a coherent model for how to work with Game-Based Learning in higher education (see Figure 33).

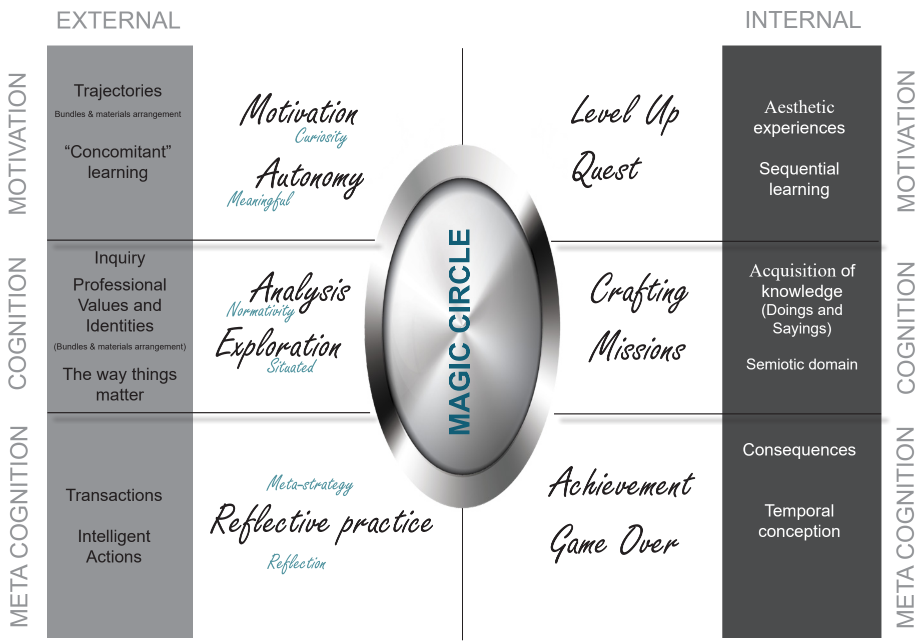


Figure 33 – The final model/prototype that is subsequently tested in phase 3.

8.1.1 DESCRIPTION OF THE FINAL PROTOTYPE

Before arguing for the theoretical structure of the final prototype, the physical game elements are briefly presented for the reader to be able to follow. The theoretical structure of the PhD project's educational game design is primarily developed by me as a researcher, while the teachers have been involved in the preparation of the quest structure and content (see Chapter 11).

The game consists of physical envelopes each representing a level. The envelopes contain several unique process-oriented quests (see Section 8.4.1) that aim to support the students' learning process. An envelope, and thus a level, contains from four to 15 quest cards. The envelopes may also contain a smaller envelope containing the material constituting a dungeon/mission (see Section 8.4.2).

Figure 34 – Illustrates how physical envelopes constitute part of the games.

In addition to envelopes with quest cards, students are given a scoreboard that they fill in to keep track of their score allocation. The relation between points and level is described in more detail in Section 8.4.1. There is also a detailed overview of each quest as well as their selection through the three iterations in Appendix D. The students are also given an achievement board as well as a sheet of achievement bricks. As the students complete a new achievement, the bricks are cut out and placed on the achievement board (see Figure 35). A more detailed description of the individual achievements can be found in Appendix E.

In addition, a document has been prepared that describes the rules that students must follow when playing the learning game. These rules are also described in detail in Appendix F.

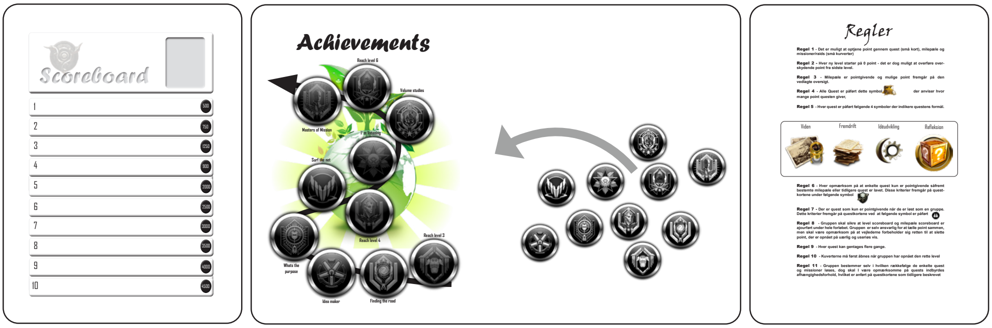


Figure 35 – Illustrates the physical scoreboard, achievement board and set of rules

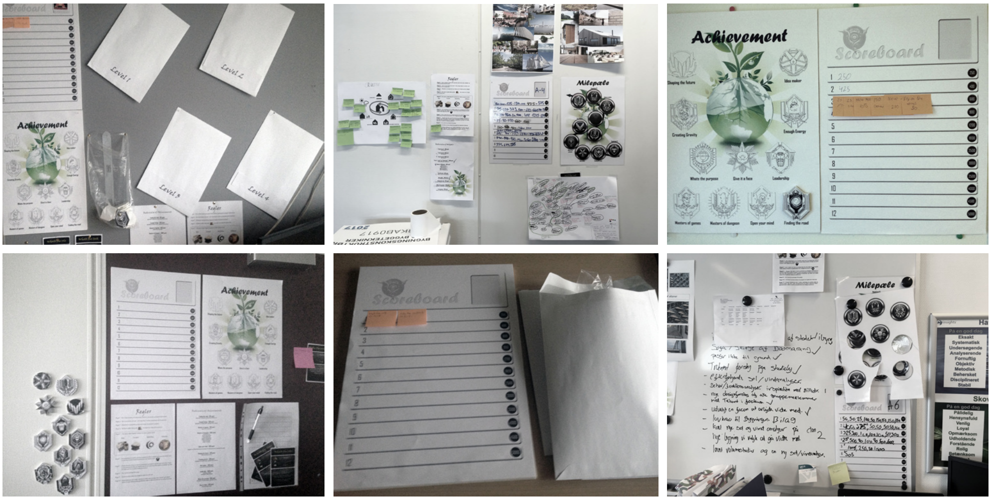


Figure 36 – Illustrates the game in use, including how students visually use the game's elements.

The following Section describes the result of the design process through a theoretical argumentation for the prototype that is subsequently tested in phase 3.

8.2. THEORETICAL ARGUMENTATION FOR FINAL PROTOTYPE

This Section will argue how design principles and design schemas presented in the previous chapters are coupled to develop a new teaching and pedagogical concept aimed at strengthening practice professionalism through analytical, reflective and explorative processes in a higher education learning environment. The Section thus contains an argument for how the design principles together through the elaborated design schemas create a coherent model for how to work with Game-Based Learning in higher education.

Strongly inspired by the understanding and interpretation of learning known from Practice Theory, Game-Based Learning must be seen as complex “possible spaces” that link thoughts and actions together. Instead of “learning as a performance”, this PhD project focuses on designing activities that allow the students to make sense of mediated experiences. Within Practice Theory, it is said that learning occurs as gradual, cumulative or anticipated developments that follow predictable paths (trajectories), but it is the sudden obstructions and disturbances that trigger reflective dialogues and discussions and thus put a perspective on the students’ knowledge.

Playing a game is not just about decoding text and images but also about being able to focus on the context or the social and cultural conditions that affect understanding and interpretations (see Chapter 5). In this thesis, the game is seen from two different perspectives: an internal perspective and an external perspective (see Figure 37). These two perspectives are combined in a design space or design grammar, which can be explained as a system of interrelated elements of activities. These activities can either be in-game skills in the internal design grammar or emergent skills in the external design grammar (see Section 6.2).

Figure 37 - The internal and external design grammar creates a game design.

The argument for this choice is, as explained in chapter 6.2 to challenge the development of educational games into shifting focus from "delivering content" to deliberately designing experiences consisting of a combination of doings/sayings (internal design grammar) and beings (external design grammar) (see figure 38).

The prototype of this PhD will thus be based on a combination of an internal and external design grammar. This choice will force the students through an autonomous

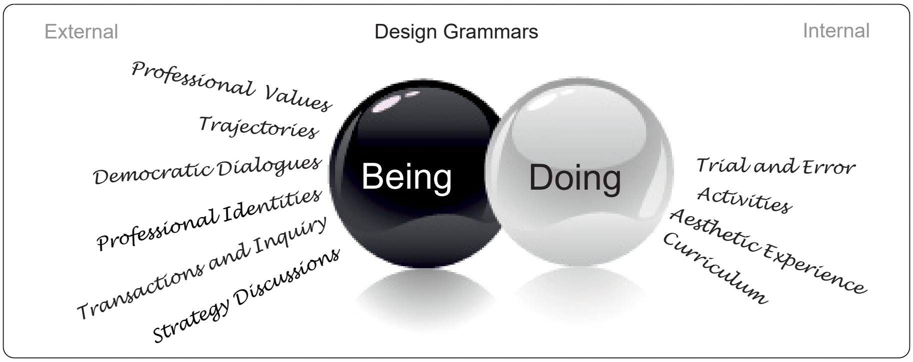


Figure 38 - The external grammar points toward social learning and should be prioritised over the internal design grammar to support developing 21st competencies.

approach to prepare themselves through strategic discussions on the practical exercises, where coordination and management of the tasks are central. In particular, the external design grammar strengthens the development of the users' democratic skills through active decision-making processes that require both meta-understanding of the situation and social construction of knowledge to achieve success.

The internal and external design grammars have a close relationship as they both complement and transform each other. It is important to gain knowledge of the situated meaning of the whole system to understand the situated significance of the individual elements – how they can/should be combined to achieve the best performance. One consequence of this relationship within the educational game design is that it forces the students to create different discussions about the content, which subsequently add subnarratives to the game. In order to achieve active learning, the students must thus understand and operate within both internal and external design grammar. To learn in the game, the student at ACTM needs to be able to reflect, be critical, and be able to manipulate the internal and external design grammar of the game at a meta level. The following section unfolds how the concept of "progress" known from World of Warcraft (see Chapter 6) can support the development of Relfective Practice-based Learning by connecting the internal and external design grammar. The purpose of the next Section is thus to argue how game theory is linked to Practice Theory.

8.3. THE CONCEPT OF PROGRESS

One of the design principles, the concept of "progress", is used by gamers to explain the process they are undergoing when the game's challenges are to be overcome (see chapter 5 and Section 6.3). Progress can be understood as Dewey's concept of sequential learning consisting of iterative or organic cyclic processes of exploration and reflection (Gyldendahl-Jensen & Dau, 2019). The PhD project's game design must, therefore, challenge the students through an experimental and sequential process consisting of reflection processes, knowledge creation, and the generation of new ideas and strategies based on the facts and suggestions that arise as a consequence of the experimental approach to the proposed solutions (Gyldendahl-Jensen & Dau, 2019). The goal is, through the use of gaming principles, to create progress that initiates the feeling of experienced autonomy as the students create and explore their learning trajectories by working with the game. How this is handled in practice through the developed game design is further elaborated later in this Section.

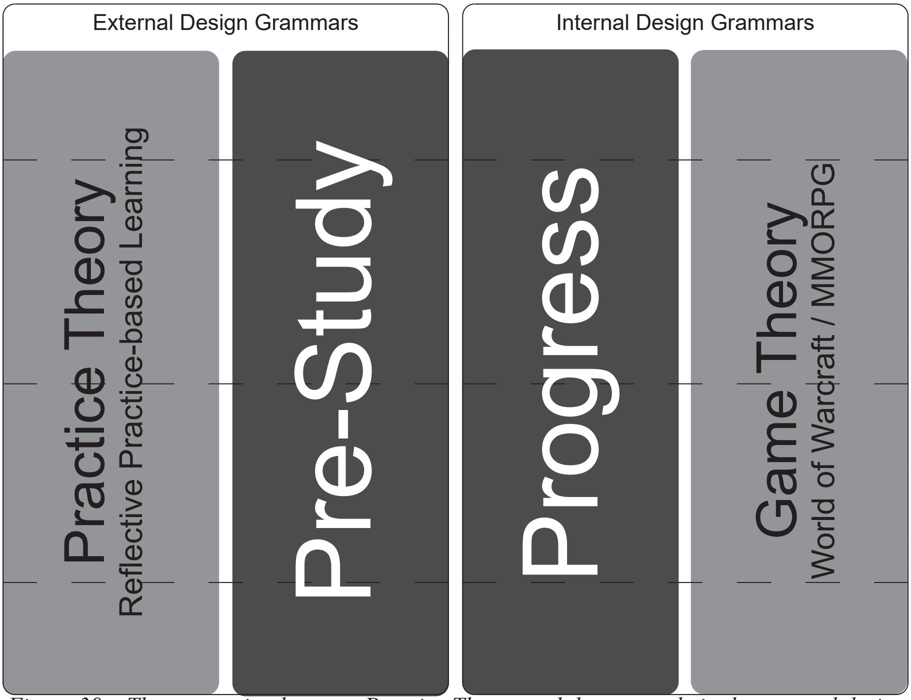


Figure 39 – The connection between Practice Theory and the pre-study in the external design grammar and the connection between game theory and the concept of progress in the internal design grammar.

Based on the analysis of MMORPGs, this thesis argues that the game mechanics that characterise World of Warcraft and create "progress" have some similarities with the learning principles described through the lens of Practice Theory (see Chapters 4, 5 and 6) (Kim et al., 2009; Ravyse et al., 2017), especially if the design process focuses on avoiding reducing the complexity that characterises World of Warcraft to a simple "drill-and-practice thinking" based on only points, levels and badges (Gyldendahl-Jensen & Dau, 2019).
One of the assumptions presented in Chapter 1 is that a connection between Practice

Theory and game theory can create an experience of "progress" as it is known in World of Warcraft and thus a learning process that supports the development of analytical and reflective skills. As described earlier in Chapters 5 and 6, progress is characterised by being a sequential process that connects in-game actions with a critical reflection where the theoretical insight is used to devise strategies for new in-game actions through an exploratory process (Gyldendahl-Jensen & Dau, 2019). This means that the prototype, through its design, equates the concept of progress with a teaching process based on Practice Theory and thus Reflective Practice-based Learning.

Progress is created primarily by the internal design grammar's game mechanics finding its depth through the external design grammar. It is essential that the students, through an understanding of the external design grammar, understand how to create a strategic mapping to challenge their actions in the internal design grammar. The students thus need to be able to manipulate and explore the content by discussing and reflecting on the game's challenges (Egenfeldt-Nielsen et al., 2013; Gyldendahl-Jensen & Dau, 2019). From a design perspective, it is, therefore, essential to work with time as part of the aesthetic experience. This means designing activities that are focused on professional content, discipline and activities aimed at initiating reflections and meta-strategic discussions. In practice, there will thus be a difference between game time in general and event time, where the latter in particular connects directly to the execution of missions or quests. The game must, therefore, contain different time gaps with a different commitment to the internal and external design grammar (Egenfeldt-Nielsen et al., 2013). As described in Chapters 5 and 6, "aesthetic experience" can be defined as active participation towards a final goal, which at the same time is also experienced as satisfaction through interacting with a variety of different activities (Dewey, 1980; Gee, 2007; Nardi, 2010; Waks, 2011). This means that the developed educational game includes activities that focus on translating breaks or time wasting into valuable activities for the project, as well as activities that play with the idea of "game over" or reset time (see Section 6.8). It sets demands for the content of the design as well as how the individual game mechanics complement and influence each other with the aim of supporting the students' process by combining different types of quest activities to create a process-oriented trajectory (Chai et al., 2013; Egenfeldt-Nielsen et al., 2013; Thong et al., 2016). Thus, the feeling and experience of progress in the project become a success criterion of the game by having the students focus on curiosity and exploration rather than a single focus on winning. On top of that, the game challenges them to demonstrate a high degree of autonomy by setting their own goal through some meaningful way-finding. Thus, the game must be able to kick-start and strengthen a natural autonomy that drives the project to completion, more than it is about the student completing all the game's tasks and levels.

Based on the desk research of both Game-Based Learning and World of Warcraft, the internal design grammar will thus consist of the following six game mechanics: quest, level, mission, crafting, achievement and game over. The selection of these six design principles for the internal design grammar is based on an ongoing sketching process and development of design schemas as described in Section 3.4. When the six selected design principles are coupled with the external design grammar, it is this PhD's argumentation that it creates an experience of progress in the project and hence a learning process that supports the development of reflective, analytical and autonomous skills.

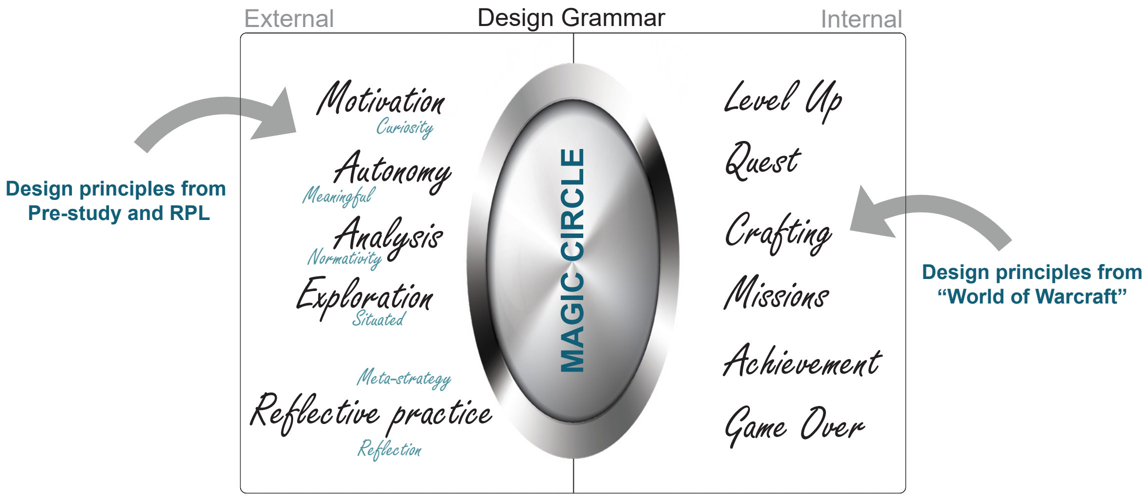


Figure 40 – A model for how the theoretical aspect from phase 1 informs the design grammar of the educational game.

Based on Figure 40, the six paragraphs below describe how the selected design principles create a link between the external and internal design grammar. The six paragraphs will be further elaborated in Section 8.4.

1) The principles of level up aim to create an increased motivation through a gradual disclosure of the content of the semester that stimulates a curious behaviour.

2) The principles of quest aim to support autonomous behaviour by allowing the students on their own initiative to combine the activities of the game to create a personal and meaningful learning trajectory.

3) The purpose of the principles of crafting is to help the students to gather knowledge, ideas and thoughts and subsequently, through an analytical approach, challenge the existing normative understanding of the project and the profession.

4) The principles of mission aim to support the depth of the student analysis process in the project through an explorative and inquiry-based project.

5) The principle of achievement aims through an increased focus on reflective practice to support meta-strategic thinking that enables the students to identify the depth and goals for the project.

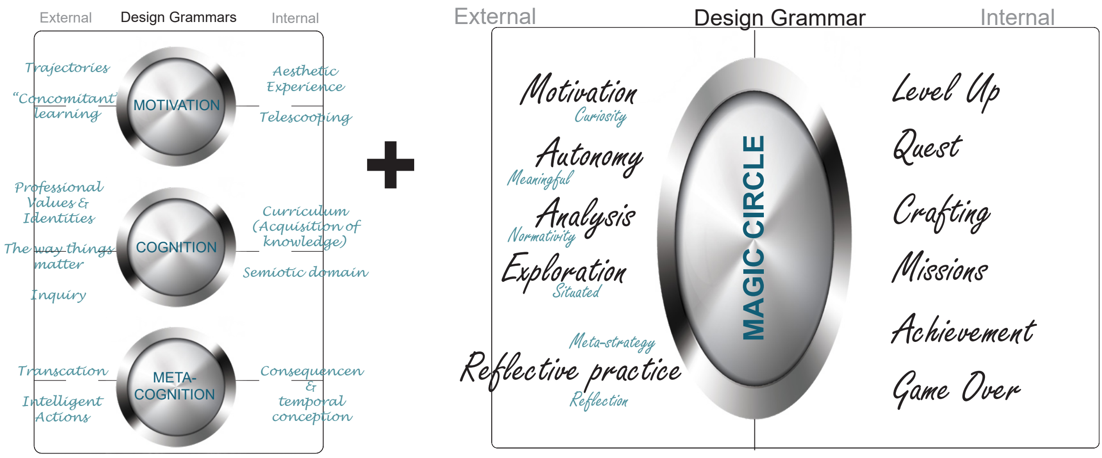
6) The principle of game over is understood as disruptions, mechanical stops or obstructions, which aim to create a reflective practice where the students are naturally being pushed into critical thinking.

The following Section elaborates and clarifies the described design grammar concerning the link with the PhD project's theoretical learning perspective.

8.4. SCAFFOLDING THE GAME-DESIGN

In order to prepare specific content and activities in the PhD project's game design, it is important to have a clear definition of what depth of learning and educational focus the selected design principles in the internal and external design grammar are supporting. Therefore, the previously described design grammar (see Figures 41 and 42) is coupled with Morris et al.'s (2013) theories on how games can be considered scaffolded activities.

It is then possible to define a more specific educational link between Practice Theory and the applied game theory. Based on an analysis of game elements and their relationship, Morris et al. (2013) present (see Section 5.5) three levels of scaffolding: a motivational scaffolding, a cognitive scaffolding and a metacognitive scaffolding (Morris et al., 2013).



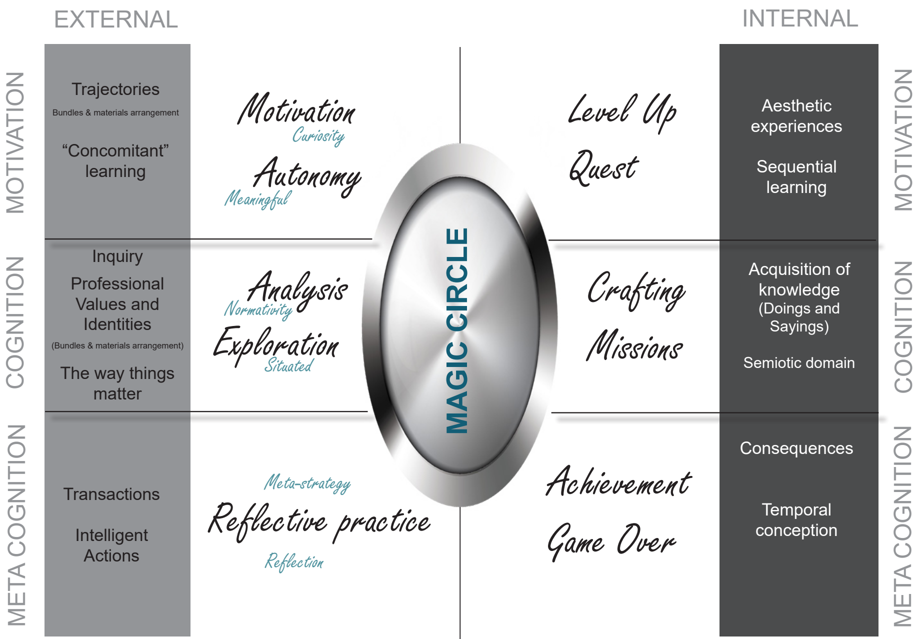


Figure 41 – Shows how two design schemas are combined into one coherent model.

Figure 42 – Shows how the three scaffolded levels that define the learning depth and direction of the learning activities are linked to the design principles of the internal and external design grammar.

The organisation of the teaching is through the developed game design based on the preparation of 1) learning activities that together support the three scaffolded levels, 2) learning activities that are able to link the internal and external design grammar, and 3) learning activities that through a clear framework and sets of rules create a magic circle. Students must be able to step in and out of the magic circle along the way as their project takes shape.

8.4.1. MOTIVATIONAL SCAFFOLDS

The motivational scaffold deals with the placement of game activities in the internal design grammar that supports the aesthetic experience (Dewey, 1980; Nardi, 2010) and telescoping of the content explicitly. These choices of activities are supposed to enable the student in the external design grammar to create personal learning trajectories (Dreier, 2008; Schatzki, 2017) and from this experience a form of concomitant learning (Dreier, 2008) that arises spontaneously through autonomous and curious behaviour. Learning can be understood as a process that follows a path that in a metaphorical sense consists of different knowledge and experience episodes overlapping and building upon each other, while in practice, it would be a series of multimodal activities that are constantly challenged by obstructions and disturbances (Schatzki, 2016). The motivational scaffold is thus about creating an autonomous behaviour through quest and level strategies supported by reward systems and the use of cultural artefacts. The learning activities should be seen as indirect facilitation of processes through a playful and motivating aspect where goals that vary through different levels afford the student's attention. The motivational scaffold has a similarity with Dewey's definition of "aesthetic experience" where the ability to combine a wide variety of quests is supposed to create individual learning trajectories.

The first educational link of learning activities in the internal and external design grammar of the motivational scaffold is based on the following conceptual pairs:

Motivation (curiosity) – levels

An autonomous behaviour in an educational environment where contingency is the foundation of learning requires a secure environment for the student to act in an investigative and exploratory manner. The learning activities in the motivational scaffold, therefore, help the student to bridge what is known and unknown by stimulating a curious desire to explore the topic of the semester.

The game mechanism behind level up can be described as "successive phases" that are an emphasis on varied colours of quest activities organised as sequential structures. When activities (quest) are divided into levels, it provides the students with the ability to review the next step. It creates a form of flow where the students actively and critically choose and select activities based on relevance criteria in order to reach new levels. Level thinking thus allows the students initially only to consider smaller parts of the process, which will open up in terms of complexity and extent as new levels are reached. They are forced to consider activities they usually would not see the purpose of. The students thus have the opportunity to work with their skills and knowledge at their own individual pace. It is also possible for the students to replay a specific level – for example, to practise specific competencies. At the same time, the nature of the game is supposed to provide the teacher with the opportunity to influence the students' progress as they are going to work with a certain number of activities in order to accumulate enough points to get to the next level. The teacher can thus place assignments strategically and thereby motivate the student to work with challenging assignments.

Figure 43 shows the structure of the relationship between levels and points. The gameplay at every level thus contributes to possible choices, each of which has some form of consequence dependent upon accumulating enough points for unlocking a new level. It is, therefore, essential to find the right balance between a level's severity and the feeling of being able to complete (Daneva, 2017). Finding this balance in this PhD project has been an ongoing process of trial and error where adjustments of the score allocation in each quest, the scoreboard has been compared with the students' experience of coherence and progress. Initially, this balance was based solely on intuition and the teachers' immeasurable thoughts about the weight of student work. During the three iterations, this balance was further eroded. Each new level starts at 0 points, but it is possible to transfer excess points from the last level. It is possible to earn points through quests (small cards), milestones/achievements and missions/ dungeons (small envelopes). Some quests are only rewarding if certain and previous quests are completed. Also, some quests are only rewarding when resolved as a group. These criteria appear on the quest cards.

3. Iteration (Spring 2018)

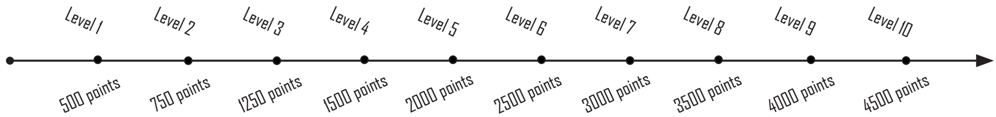


Figure 43 – The relationship between levels and the number of points needed.

The next educational link of learning activities in the internal and external design grammar of the motivational scaffold is based on the following conceptual pairs:

Autonomy (meaningful) – quest

The concept of quest is understood as a variation of activities to stimulate the students' autonomy into following individual and unique problem formulations. By dividing the curriculum into a quest structure, the intention is that the students will be supported along the way by academic activities and material arrangements that hopefully challenge the learning process on several levels – letting the students create individual learning trajectories.

By considering learning as a complex landscape of personal learning trajectories, it creates a way of thinking that moves the educator's focus from dissemination of knowledge to process thinking. If quests are to stimulate the students' desire to challenge the prescribed syllabus, the assumption is that the selected quest cannot be built around a narrative story that points to a particular curriculum. Instead, each quest needs be focused on generic academic tools or material arrangement that can strengthen and support the students' freedom to challenge their learning process.

This approach implies a constant shift of positions for the students created by the game activities, combined with one particular direction that leads them towards the final goals of their project. The structure of the quests can, therefore, be considered a landscape of practice consisting of a collection of unique quests.

Each quest is based on a professional topic within a particular practice coupled with

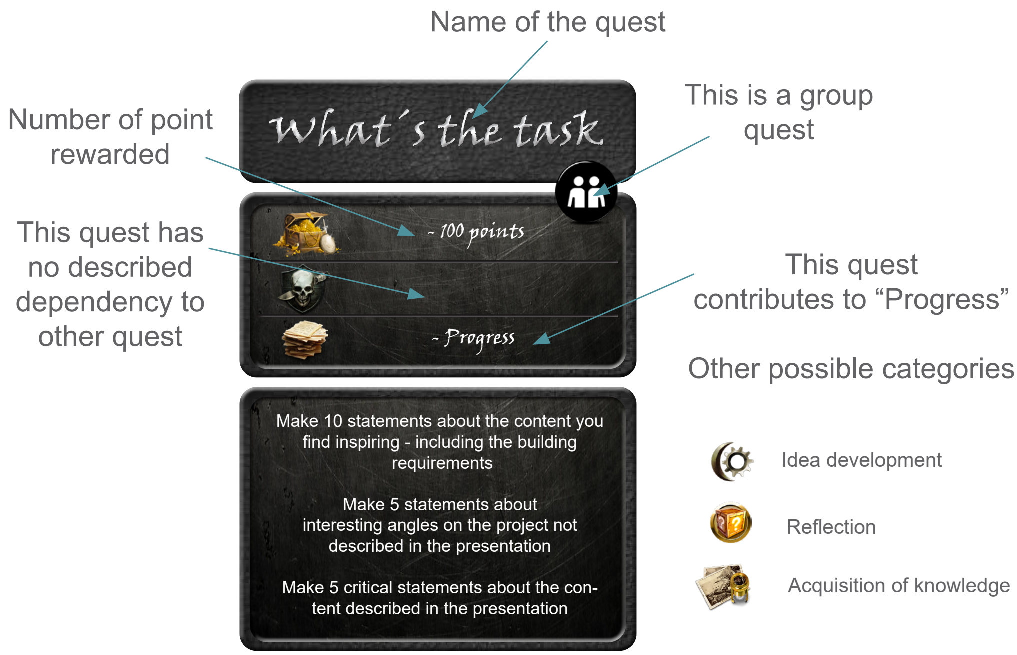


Figure 44 – A description of a quest card

a form of material arrangement. Material arrangement is interpreted as academic disciplines or methods that serve as tools for the learning process (see Figure 45). Graphically this can be illustrated by describing a quest as a sphere constituting a practice coupled with an icon expressing a material arrangement. Each sphere thus becomes an expression of a bundle (see Figure 46).

This creates an endless number of different quests that set different perspectives on the professional content through different approaches and methods. The students will thus be able to experience a quest that deals with the same topic but with different ways of solving and unfolding it through different tools.

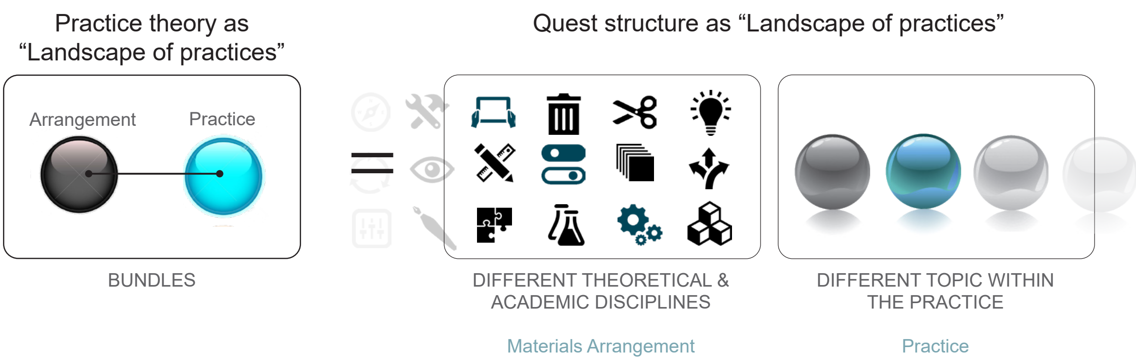


Figure 45 – Illustrates how quest activities can be interpreted as bundles.

Figure 46 – Schematic overview of academic disciplines or activities.

Through a brainstorm created in one of the design workshops with the teachers (see Chapter 11), various suggestions for academic disciplines or activities that point towards a reflexive, innovative and explorative learning culture were identified. When these academic tools or disciplines are combined with a professional practice it creates a bundle.

When students select and connect the many quests in serial relationships, the intention is that they are challenged to an autonomous behaviour where they independently evaluate which quests are meaningful to the current activity within the project. The chosen path will, over time, reflect possibilities for achieving specific learning based on the dependency relationship between the two concepts proceed and depends – how the students are going to proceed, depending on what they have already learned (Schatzki, 2016b).

The quest activities thus present the students with new fields of study and theories that may potentially obstruct their process and challenge them to seek new and unknown solutions. Within that framework, students have the freedom to independently and actively mix activities and thereby create learning trajectories that follow individual problem formulations or project descriptions. The theoretical argumentation is that it opens up a puzzling mindset where the possibilities of combinations are supposed to contribute to depth in the learning process. Each quest activity triggers points that allow new levels and thereby new quests (see Figure 48).

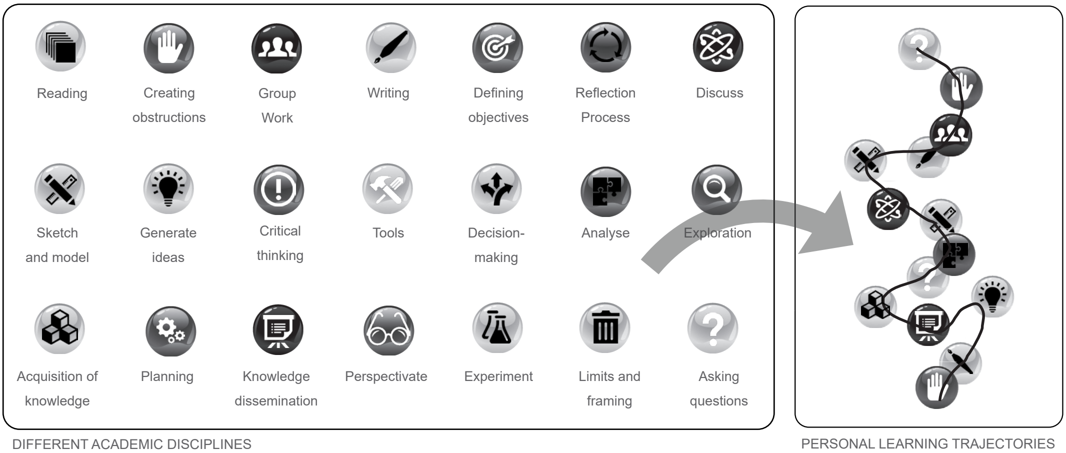


Figure 47 - Schematic overview of how academic disciplines can be combined into a personal learning trajectories.

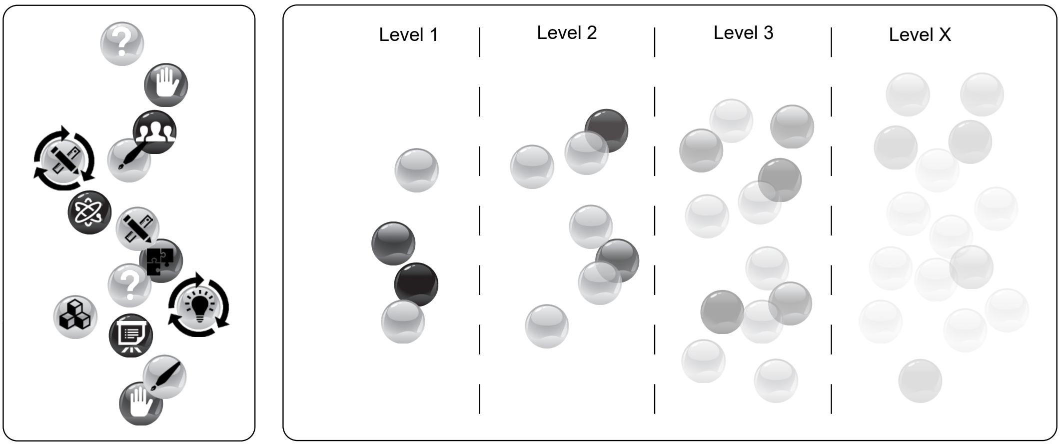


Figure 48 - Activities divided into levels providing the students with the ability to review next step

The game design needs to contain a significant number of different quests, so the student has the opportunity to create a learning trajectory that is perceived as meaningful. Salen and Zimmerman (2004) make the point in the following quote that meaningful play in a game occurs when there is an interaction between actions and the desired outcome.

> *Meaningful play in a game emerges from the relationship between player action and system outcome; it is the process by which a player takes action within the designed system of a game, and the system responds to the action. The meaning of an action in a game resides in the relationship between action and outcome. (Salen & Zimmerman, 2004, p. 34)*

Thus, based on Dewey's understanding of learning, game design is a system that consists of different types of activities that mediate and support the students' learning. It involves a shift from an understanding of Game-Based Learning systems as a predefined narrative that is built around specific content toward seeing it as generic tools and methods that can stimulate and facilitate a learning process.

8.4.2. COGNITIVE SCAFFOLDS

The cognitive scaffolding unfolds through mission in the internal design grammar, the profession's semiotic domain with a focus on knowledge acquisition. The intention is to support the conception of professional values and identity within the external design grammar. Also, the idea is that the student systematically acquires new knowledge through crafting principles where knowledge, ideas and thoughts are collected and analysed according to the context. The identification of the power of innovation, academic thinking, data and knowledge collection, evaluation and assessment, asking questions, discussions and argumentation are some of the points that characterise the cognitive scaffold. The activities of the cognitive scaffold are based in particular on the principles that create depth in the MMORPG through an experimental and investigative approach. Through the activities of the cognitive scaffold, the PhD project's educational game design aims to create an authentic representation of a given practice by presenting the students with tasks and challenges focused on specific practices within their profession.

The first educational link of learning activities in the internal and external design grammar of the cognitive scaffold is based on the following conceptual pair:

Exploration (situated) – dungeons/missions

The cognitive scaffold is central to the concept of dungeons or missions. In World of Warcraft, dungeons or missions are a defined and closed system within the game characterised by a particular practice or semiotic domain defined through a variety of activities that users treat in a particular way. Both are characterised by containing specific content that requires specific skills and systems to succeed. A dungeon or mission is thus a more complex form of activity – often a bundle of activities. These bundles of activities represent what could be called "semiotic domains", which are a series of activities that people treat in a certain way. Thus, they are a form of practice that draws on more than one modality in regard to communicating different types of meaning. Each dungeon or mission can be seen partly from a theoretical perspective relating to the type of content (facts, theories, principles) and partly from a practical perspective – how people interact in the field. Dungeons or missions are therefore crucial for building a bridge between theory and practice, and the student needs to know about the situated meaning of the theoretical position to understand the situated significance of the individual elements – how they can/should combine knowledge, ideas, perspectives, etc.

Dungeons or missions thus affect and challenge the other quest activities, which creates new understandings and assumptions. It is thus argued that the influence of missions supposedly makes new activities meaningful and encourages reflective and critical changes in the learning trajectories. The student might even add their own activities to the game. The size of the mission also causes the students to be retained in what could be called a "horizontal learning process", in which the student is more keen to explore and experiment in depth with subtopics (see Figure 49).

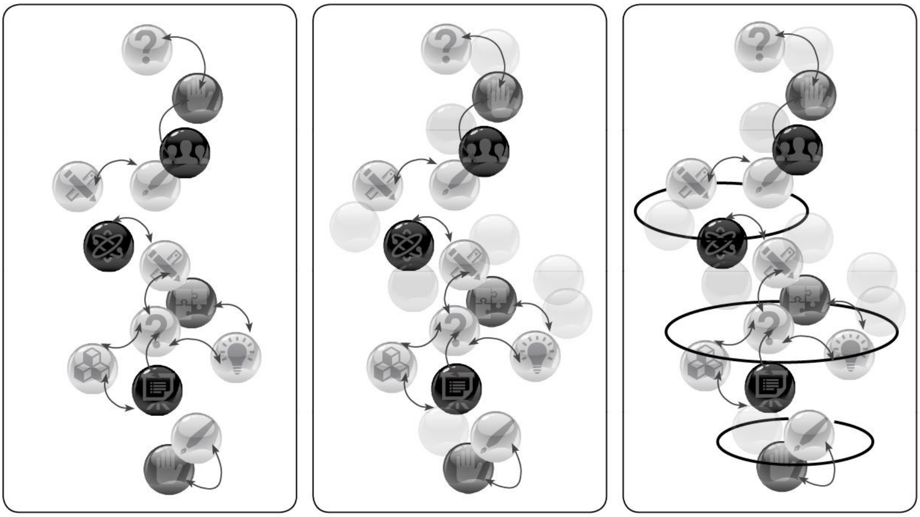


Figure 49 – Picture 1 shows how the individual quest and dungeons/missions are tied together through reflection processes. Picture 2 shows how the students initiate new activities on their own initiative. Picture 3 shows how dungeons hold students at a horizontal level for more extended periods.

Dungeons and missions thus aim to set the framework for students to be able to perform a much better range of doing and saying within their profession in order to carry out intentional actions. In addition, the ability to flexibly handle professionally oriented methods and tools, including following them, interpreting them, ignoring them, considering them, etc. While quests are focused on general academic disciplines that support the learning process, dungeons/missions are focused on making the student better at articulating a general understanding of what permeates the practice.

Practices can, therefore, be regarded as being coordinated through frequent but temporary collections of doings and sayings – they are linked in a certain way to enable an understanding of 1) what needs to be said and done, 2) through explicit rules, principles and instructions, and 3) teleoaffective structures such as end goals, projects, tasks, purposes, beliefs, etc.

In addition to the internal perspectives, computer games also contain a high degree of normativity in which users must jointly develop strategies, plan resource use and define specific goals.

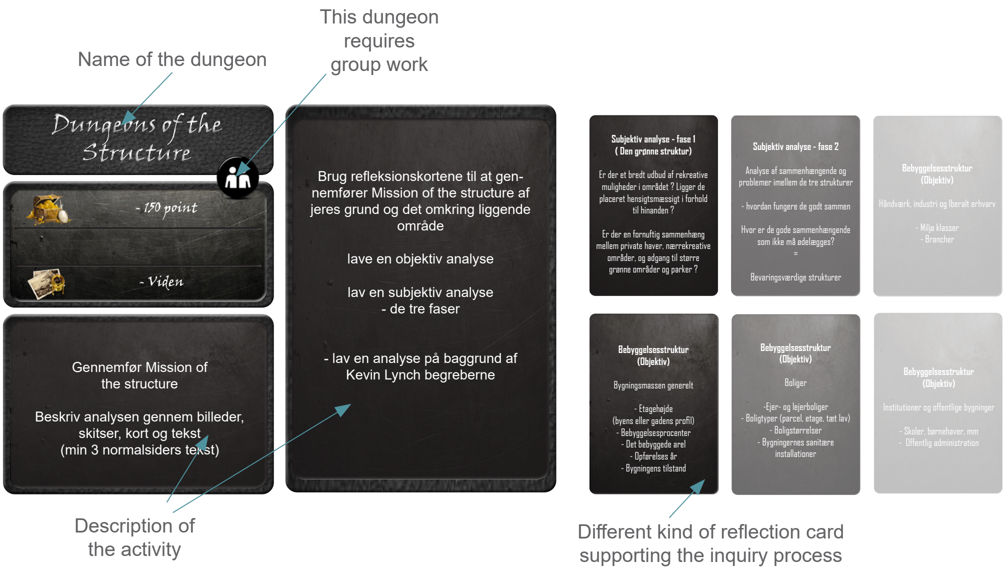


Figure 50 – A description of a dungeon/mission card.

It is, therefore, a form of situated cognition where social and bodily experiences are the focal point for the acquisition of the necessary cognitive skills and competences in order to win the game. Another factor is the collaboration between the users, where the challenges of the computer game offer scaffolding to an engaged and instructive dialogue – Morris et al. (2013) designate this as distributed knowledge. By sharing values and attitudes to participation in specific activities, it is possible to reduce the cognitive load. Through collaboration and strategic use of resources, the players can perform before they acquire competences. If this is transferred to a learning situation, the students will be able to engage in practice before necessarily acquiring all the necessary skills (Morris et al., 2013).

The next pedagogical link of learning activities in the internal and external design grammar of the cognitive scaffold is based on the following conceptual pair:

Analysis (situated) – crafting

Many of the game activities in World of Warcraft are all about crafting new items or strategies, and players, therefore, spend many hours collecting material and knowledge, also called "farming". The basic principle behind crafting and farming is about slowing the game down and keeping the gamers busy, which creates a duality to trivial but necessary everyday activities. The collection of items or knowledge contributes to solving complex tasks, which in themselves are a reward. Furthermore, crafting and farming stimulate both social communication and collaboration about preparing a joint action through quests and dungeons (Chen, 2012; Nardi, 2010).

The idea behind crafting could be viewed as activities that support the "development of ideas" or the "acquisition of knowledge" with a focus on innovative use of the curriculum. The quality of the creative process is often dependent on the number of new ideas and angles to a problem. Using a crafting principle provides a natural opportunity to incorporate fun-failure as a way to launch a fast idea generation where students during a fixed time frame brainstorm relevant concepts and words for their project and thus "farm" new potential topics, directions or ideas that can subsequently challenge their project. To stimulate the flow of creative thoughts, it is essential to use different types of idea-generating tools. Crafting/farming thinking is thus about creating quests and dungeons/missions based on activities that have a specific focus on tools for collecting material that can challenge the process or content.

The intention of the prototype is thus through the idea of crafting activities where the students are allowed and given the opportunity to work with intermediate actions and activities that require finding new objects or ideas as a prerequisite for achieving a more distant goal. Combining crafting and farming activities with quests and dungeons is a way of controlling a far-reaching goal through sequences of explorations and reflections that tie it all together. Dewey describes it thus:

> *The question of methodology in connection with the formation of reflexive thinking is a matter of establishing the conditions that can arouse and control the curiosity, to create coherence in the perceived things, a context that will later promote the flow of spontaneous thoughts and lead them to the formulation of issues and purposes that promote the connection in the flow of thought. (Dewey, 2009, p. 54)*

By implementing crafting elements into the game system, it is possible to support and facilitate conscious activities consisting of different ways of working through systemic thinking that creates sequences of explorations pointing to a final goal.

Reflective, explorative and innovative processes imply, according to Dewey (2009), a form of coherence and continuity of an organised mindset with the right balance and distribution of the three dimensions of thoughts – ease and speed, scale and variation, and depth. Combining Dewey's three dimensions of thoughts creates four different categories of crafting activities that represent disciplines characterising an academic and educational process. Each of the four categories will create, through the crafting principles, four different kinds of learning activities that, in combination with the quest system or dungeons/missions, will create learning sequences:

Progression – Low variation of Thought + Fast Thought + Superficial Thought

Knowledge acquisition – Big variation of Thought + Deep Thought + Slow Thought

Development of ideas – Fast Thought + Superficial Thought + Big variation of Thought

Reflection – Deep Thought + Slow Thought + Low variation of Thought

When these four categories of crafting are incorporated into the PhD game design, it is assumed to open up a puzzle and analytic mindset where the combination possibilities contribute to a depth in the learning process. This approach to Game-Based Learning implies for the students a constant shift of positions created by the game activities, combined with one particular direction that leads them towards the final goals of their project.

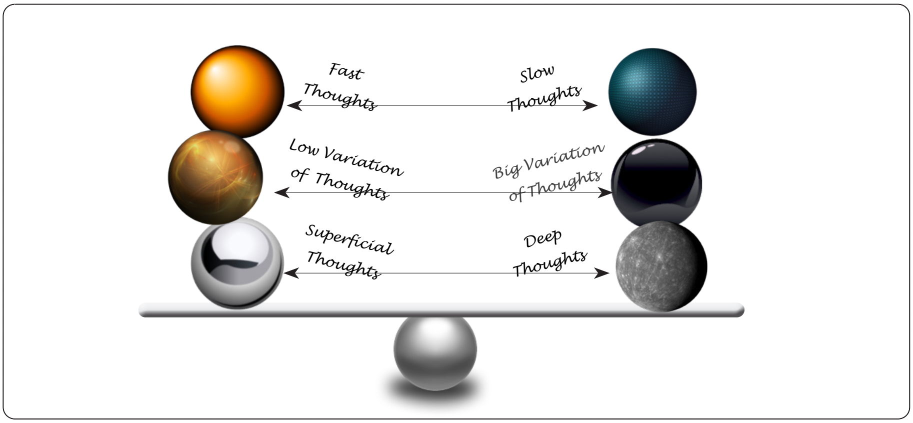


Figure 51 – Dewey's understanding of the three dimensions of thoughts.

The crafting activities thus support the learning process, and as a result of this, the acquisition of the academic disciplines does not take the form of being a mechanical and routine uniformity or, as Dewey describes it, the movement of a grasshopper (Dewey, 1997, 1998, 2013). Instead, the crafting activities provide the student with opportunities to address the curriculum from several angles, including gathering of

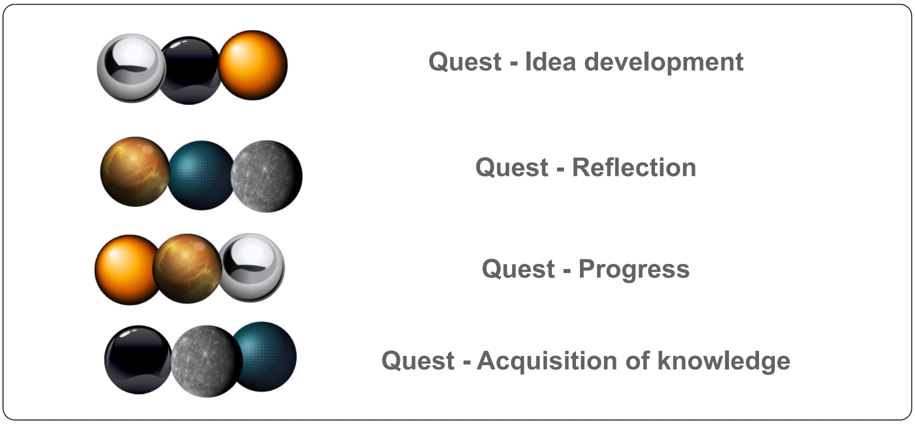


Figure 52 – An interpretation of Dewey's understanding of the three dimensions of thoughts combined into four quest categories.

data and knowledge, evaluation and assessment, asking questions, discussions and argumentation. The following sections exemplify how each of the four categories can be turned into crafting activities through the quest system or the use of dungeons/missions.

Crafting as progression

This category contains quest activities that through the principle of crafting aim to orient students' process towards reaching a final goal. These activities are characterised by rapid thoughts that train students to make competent decisions based on their existing knowledge base, development of ideas and reflection. The activities of the "progress" category help students to focus and create an indirect motivation and sense of feeling that the project is taking shape and direction without losing its depth.

Crafting as development of ideas

This category contains quest activities that, through farming, aim to focus on innovative use of the curriculum. A prerequisite for being able to work innovatively with a particular topic is a systematic process of fast thinking processes triggered by external inspiration or stimulus. The quality of the creative process is often dependent on the number of new ideas and angles to a problem. It is therefore crucial that the process has a speed that does not take into account the usefulness, relevance, rendering or quality of the ideas along the way.

To stimulate the flow of creative thoughts, it is important to use different types of idea-generating tools. Games provide a natural opportunity to incorporate fun-failure as a way to launch a fast idea generation where students during a fixed time frame brainstorm relevant concepts and words for their project and thus "farm" new potential topics, directions or ideas that can subsequently challenge their project.

Crafting as acquisition of knowledge

This category contains quests and dungeon activities that initiate and support students doing analysis, studies, exploration and innovation as well as written materials. The activities are characterised by being a time-consuming performance that takes the pace out of the process. These activities ensure the necessary depth of mind needed to make sufficient learning progress. Also, the activities present the students with new fields of study and theories that may potentially obstruct their process and challenge them to seek new and unknown solutions.

Crafting as reflection

This category contains quests and dungeon activities that focus on an in-depth and slow process that allows reflection processes along the way. The activities in this category have the particular purpose of creating reflection based on the project's analytical contexts and theory links. Also, the activities contribute to an increased understanding of academic content. Quests that include reflection activities also aim to initiate metacognition partly related to how gamification as a method supports the learning process and partly to whether the intended goal is achieved.

8.4.3. META-COGNITIVE SCAFFOLD

The metacognitive scaffold aims to support the notion that the choices that draw and affect the development of the personal learning trajectories are so clear that they allows the student to reflect on the relationship between proceed and depends (see Section 4.2.5). The presented activities in the game contain disturbances, obstructions and consequences of choices processed through reflection processes that naturally push the student towards new knowledge pathways. In doing so, students create their individual learning trajectories that show how they are going to proceed, depending on what they have already learned and explored through inquiry processes. It thus becomes the role of the teacher to design the educational game so that the students are supported in building bridges between theory and practice through the interaction of reflection processes combined with analytical and explorative behaviour.

The metacognitive scaffold is thus about the teacher setting a clear framework around the goals that are crucial for the student to aim for. Weitze (2014) explains the link between how the learning goal can interact with the game goal as a way of defining the limits and available opportunities through the game mechanics used in the game: *"The game mechanics support the goal since the rules, possibilities and challenges in the game are constructed in a way such that the player has to gain knowledge to experience and practise how they reach the end goal"* (Weitze, 2014, p. 227). The teacher can continuously challenge a series of multimodal and academic activities through the design of subgoals, also called "achievements". These subgoals also create obstacles or challenges that need to be overcome and thus influence, shape and develop a learning trajectory that over time reflects opportunities to achieve new knowledge and

Figure 53 – Quest of Progress – quick and superficial thoughts that are focused on a few topics where the goal is to get progress in the process.

Figure 54 – Quest of Idea development – quick thoughts that consist of inspiration, ideas and stimuli where the amount is crucial and the correctness of the content is not taken into consideration in order to maintain a creative process.

Figure 55 – Quest of Acquisition of knowledge – slow and in-depth process where the subject is analysed, investigated, developed and innovated through a wide variety of thoughts.

Figure 56 – Quest of Reflection – focus on few topics and working in depth at a slow pace that allows reflection processes along the way.

skills based on the dependency relationship between proceed and depends (Schatzki, 2016b; Weitze, 2014).

The first pedagogical link of learning activities in the internal and external design grammar of the metacognitive scaffold is based on the following conceptual pair:

Reflective practice (meta-strategy) – achievement

One of the unique reward systems in computer games is the opportunity to obtain achievements. An achievement can be defined as independent goals or subgoals. Achievement is available in several variants, with some of them merely requiring specific actions, such as completing a specific quest, while others are more time-consuming. The latter can be seen as a kind of meta-result that guides the students in particular directions or initiates more extended quest series.

Idea maker (300 points) – create min. 100 idea suggestions for your project
What is the purpose (500 points) - create a function analysis
Masters of dungeons (1000 point) - Complete all the dungeons/missions of the game
Finding the road (100 points) - Description of 5 bearing marks
I am listening (500 points) - Hold min. 2 feedback meetings with the other groups
Surf the net (400 points) - Prepare a protocol for the literature search
Volume studies (1000 point) - Create volume studies
Reach level 3 (300 points) - By Friday week 5
Reach level 4 (500 point – By Monday week 6
Reach level 6 (1500 point) - By Friday week 6

Figure 57 – List of achievements.

The use of a Game-Based Learning design based on quest and level instills an indirect motivation that can create a positive momentum towards reaching a final goal, but also a negative effect by creating a loop effect where the launch of the new quest can become a form of procrastination. The use of a reward system based not only on quest activities but also on achievements has an embedded intention of preventing the student from playing or cheating the system. To achieve something, the student needs to have a holistic focus on the learning process. The teacher can use specific “achievement set-ups” that set limits and requirements in the process where reflection is the key to finding a solution. In different quests and missions, achievements need to be accomplished to fulfil a course or semester period. Also, achievements often follow a form of time progression – for example, the students need to achieve level x by a specific date.

In this sense, the students' written materials play a vital role as it is through digital, graphic and written communication that the students can systematically maintain new acknowledgements. Written processing of analytical research processes means that the students will be able to work with the meaning of the consequences specific choices have led to. In doing so, the written material becomes the tool that supports meta-strategic considerations and the very argumentation of content coherence and interrelationship – how to proceed, depending on what has been learned.

The educational game design must thus be built around learning activities that deliberately make it difficult for students to make progress unless they reflect on a metacognitive level on the significance and consequences of the given challenges. The game, therefore, contains a scaffolding of the development of meta-strategic competences by supporting specific learning activities in the internal design grammar where the students work through writing and graphics.

The next educational link of learning activities in the internal and external design grammar of the metacognitive scaffold is based on the following conceptual pair:

Reflective practice (reflection) – game over

The work of developing meta-strategic skills makes the principle of "game over" particularly interesting. The principle of game over supports a sequential learning, where the step-by-step approach facilitates students' work. The sequential learning process is thus intended to be facilitated through the game mechanism's ability to modify and decrease the time. The idea is that it will create a learning process where the students' thoughts are continually shaped and reshaped through experience, thereby creating new knowledge and a more in-depth understanding of their professionalism. The game over principle is therefore not only about creating learning activities where the student can "die" but also about creating the possibility that disruptions and obstructions can have a direct impact and influence on the project. Thus, Dewey's concept of temporal conception (see sections 4.2.5 and 6.2) can be regarded as a form of "game over" when the students' projects are disturbed, and, because of that, take some unintended turns.

The game over principle can also involve the risk of having to start again, which forces the need for analytical processing of the learning activities through reflective practice. The possibility of "dying", and thus being forced to start again with an activity, thus triggers a series of reflection processes. The motivation to win the game indirectly pushes the students towards working on a metacognitive level through a reflexive discussion on how to solve the task – for instance, by asking: how many ways can it be done? Also, what methods are the most appropriate for creating useful knowledge? When crafting and farming in particular is coupled with the "game over" principle, it creates strategic planning of, for example, the idea-generating process. It could be establishing defining rules to ensure a professional approach to brainstorms, or rules about how the outcome makes sense regarding the breadth and complexity of the projects. These metacognitive discussions are essential for maintaining a professional quality of the work, and reduce the temptation to finish and hasten towards the final goal.

PHASE 3

Analysis through interventions

CHAPTER 9. RESEARCH STRATEGY

The experimental phase is used for examining and testing the prototypes while listening to students' and teachers' voices to obtain feedback and suggestions for improving the prototype. The research perspective at this stage is thus based on the experiments being followed and documented through several iterative processes. The investigation phase will thus examine, test and experience the developed educational design while collecting data.

9.1. CRITERIA OF QUALITY WITHIN AN EDR PROJECT

Where quantitative research primarily argues for proper research through the concepts of validity, reliability, generalisability and objectivity, Tracy (2010) points out that within social research there is not the same consensus around such a simple conceptual presentation and that the criteria for quality must be understood as far more complex. As Tracy (2010) writes, *"we need to remind the resurgent postpositivists that their criterion of good work applies only to work within their paradigm, not ours"* (Tracy, 2010, p. 839). This does not mean that qualitative scholars should not base their work on quality criteria, as rules and guidelines help to assess when something is proper research. It should only be on the premise of qualitative research and not by adopting concepts from a positivist research paradigm. Tracy (2010) presents eight different criteria of qualitative quality that together constitute the basis for assessment of good research practice. Each of the eight criteria can be achieved through a variety of methods and is flexible concerning the objectives and preferences of the individual study. The eight criteria of qualitative quality within social science, and thus also Educational Design Research, comprise the following: (1) worthy topic, (2) rich rigour, (3) sincerity, (4) credibility, (5) resonance, (6) significant contribution, (7) ethics, and (8) meaningful coherence (Akkerman & Bronkhorst, 2013; Barab & Squire, 2004; diSessa & Cobb, 2004; Nieveen et al., 2006; Tracy, 2010).

In the following Section, the criteria of rich rigour, sincerity and ethics are further elaborated in relation to describing the method used for data collection – this is seen in the light of Educational Design Research and mixed methods. The criteria of a worthy topic, credibility, resonance and significant contribution are, in the conclusion, a part of the final reflections and discussion.

9.1.1. ETHICS

The project's insider position imposes high demands on the ethical considerations regarding the project's execution (Brinkmann & Tanggaard, 2010; Costley et al., 2010; Godfrey-Smith et al., 2015; Lehmann-Rommel, 2000). The students gave verbal consent allowing the documentation of the process to be carried out at the beginning of the project. The students agreed that documented data from videos, sound and writing can be used for publication and dissemination (Kvale & Brinkmann, 2014).

The study was conducted based on voluntary participation by both teachers and students. Although all semester groups were appointed to participate, students had the opportunity throughout the course to choose not to participate. At the beginning of the project the content and procedure of the game were explained to them and they were thus familiar with the experimental and unpredictable character of the set-up and the research process. As the project intervened in the student exam project, they also had the opportunity to stop playing at any time during the course. Also, teachers regularly coordinated their teaching so that students did not miss out on any crucial academic knowledge or learning goals (Kvale & Brinkmann, 2014).

When working with interventions, there is always a risk that the intended ideas and thoughts are not working out as expected. Thus, when doing interventions in an educational context, it always raises several ethical considerations related to the students being subsequently examined. The chosen period of interest within the semester is thus selected as it is not vital to the students' final grades. This means that if the ultimate consequence of the intervention is that the project cannot be implemented because the developed learning design is not working as intended, then it has no decisive consequences for the rest of the semester, including the students' opportunity to achieve their learning goals. The breakdown of the semester into phases thus enables the teachers to intervene and offer the students a replacement project that they can continue working on.

However, from a research perspective, it is not a goal in itself to show that the design works, but rather the purpose is to document and elaborate on what happens when using Game-Based Learning in higher education. A situation where the learning design is not working as intended, or the students make a conscious choice not to play the game, is also a research contribution. An unfavourable outcome will thus contribute with a deeper understanding and clarity of the mechanisms that impede the incorporation of Game-Based Learning. This perspective is also an essential argument for the whole idea behind Educational Design Research.

The students have provided ongoing feedback on their experience of participating in the project, both during the course and after the completion of the course. Critical students have been heard and are given a voice in the project's analysis (see chapter 11). This means that the project groups who, especially in the first iterative courses, chose not to participate, or quickly stopped playing, have been invited to the focus group interview and design workshop, where they have been allowed to explain their views (Kvale & Brinkmann, 2014).

In addition, it has been important that the students have been anonymised throughout the project to prevent my insider knowledge influencing the analysis of the collected data. The issue of anonymity is thus, in this project, not only a matter of protecting the interests of the students and ensuring that they cannot be identified and recognised. Therefore, for ethical reasons, a number of choices have been made regarding the degree of transcription as well as the coding of data (see Section 9.3).

9.2. DATA COLLECTION

According to Tracy (2010), high-quality qualitative research is characterised by rich rigour in relation to descriptions and explanations of data (Tracy, 2010), contrary to quantitative research where precision is more likely to be appreciated. The use of the PhD project's overall research strategy is based on Educational Design Research, which often contains intricate teaching designs where it may be necessary to collect large amounts of data. Because it is rarely possible to use only one method, it is seen that Educational Design Research comprises primarily mixed-method studies (Akkerman & Bronkhorst, 2013). The use of a mixed-method approach contributes to large amounts of data allowing for a rich rigour of rich descriptions and explanations of data (Kelly, 2006).

The mixed-method approach thus generates data through several types of data sources, including observation, reflective conversation, focus group interviews, workshops and a descriptive analysis of quantitative surveys. Also, the data units are mixed and integrated early in the process (Moran-Ellis et al., 2006). In doing so, the project lives up to the rich rigour criterion in that the data collection methods are at least as complex, flexible and multifaceted as the phenomena being investigated. As Tracy (2010) describes it, "it takes a complicated sensing device to register a complicated set of events" (Tracy, 2010, p. 841). The quality of qualitative research is thus very much about effort, piles of data and time in the field as this increases the likelihood of a rich rigour in the project. Tracy (2010) points out that the demonstration of rigour is also a matter of preparation of the data material for conducting the analysis (Tracy, 2010). The considerations about the amount and type of data that are meaningful to collect, as regards being able to answer the formulated research question, point directly to the quality criteria that Tracy (2010) calls "credibility". This concept deals with the importance of the data collection concerning a project's trustworthiness, verisimilitude and plausibility regarding the findings. Thus, the criteria for credibility are based on whether it can be argued that the analysis is based on a certain degree of multivocality, partiality and thick description (Tracy, 2010). Tracy (2010) writes: *"Because any single behaviour or interaction, when divorced from its context, could mean any number of things, thick description requires the researcher to account for the complex specificity and circumstantiality of their data"* (Tracy, 2010, p. 843). The challenge is to be able to visualise the findings of the analysis rhetorically, which means that the researcher in many situations has to take tough decisions about which parts of their data need to be shown and not just talked about (Tracy, 2010). For this PhD project, this means that the analysis will include a large number of voices from the students. In addition, there will be an increased focus on whether all three iterations are represented in the analysis. This means that the credibility of the project is created by the students where, through data from three iterations, they independently confirm the trends that are projected in the analysis.

The data collection is thus focused around a pragmatic mixed-method approach as the primary epistemological foundation (see Chapter 3 and section 3.6). The mixed-method approach will contribute to multiple types of data, which opens up different facets of problems that can be investigated in depth. The project is thus based on four different data types that are integrated through a complementary mixed-method approach (see below). For example, descriptions from the reflective conversation as well as graphic visualisations of the quantitative data are included in the interview guide for the focus group interview.

Observation (see Section 9.2.1)
Reflective conversation (see Section 9.2.2)
Focus interviews (see Section 9.2.3)
Surveys (see Section 9.2.4)

The PhD project is thus based on both qualitative and quantitative data collection. It is noted that the size of the project's population is relatively small. The quantitative data collection will, therefore, only be considered as a descriptive contribution with a specific focus on describing the changes over time. The purpose of the quantitative data is thus to gain knowledge about how the students use and experience the game as seen throughout the entire period of the project (see Section 9.2.4). The quantitative data thus support the qualitative data, which are the primary source of data in the project.

As mentioned in Chapter 2, the data collection is based on the fourth semester at ATCM, UCN technology. The data collection has been an ongoing process for a year and a half, with three iterations having been carried out. The first two iterations lasted for seven weeks out of the entire 20 weeks of the semester, while the third iteration was a compressed course lasting for three weeks. The professional content was identical in all three iterations.

Qualitative approach

The qualitative approach thus attempts to collect and analyse data through an iterative process in which theoretical assumptions are modified based on the observations during the collection phase. The data collection is, therefore, primarily characterised by exploratory observations and conversation in open interviews about the study with the perspective to understand and explain. Also, both teachers and students participate in design workshops where they contribute with insight into, and ideas on, how to develop the educational game design further.

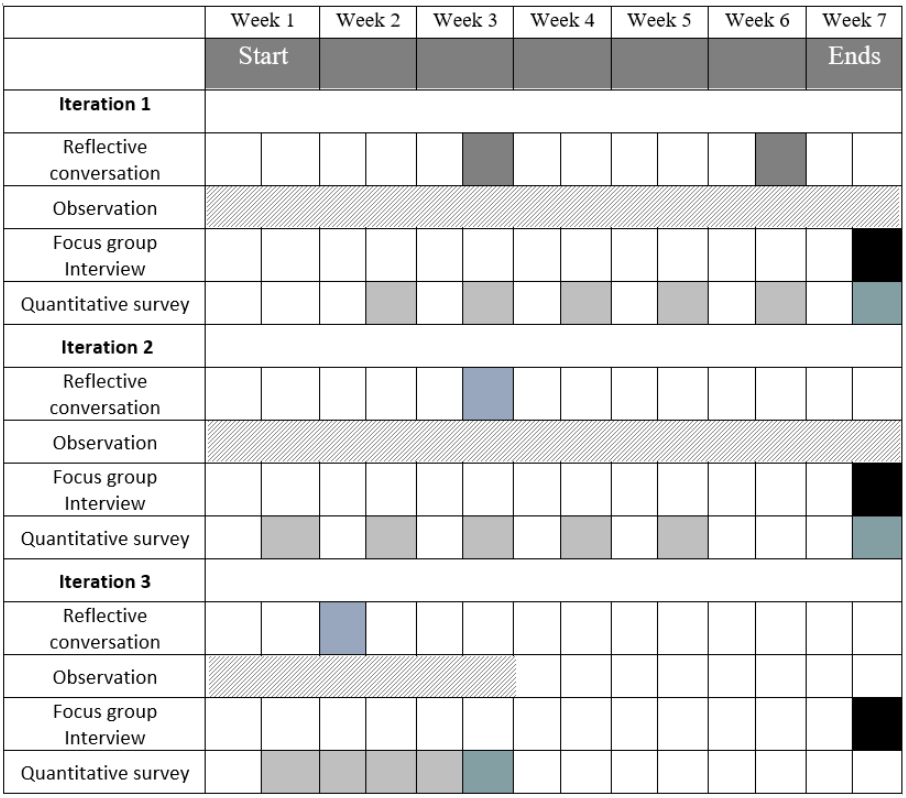


Figure 58 – An overview of the periods of data collection

The qualitative approach to data collection is focused on the students' reflexive experiences, thoughts and emotions related to the use of Game-Based Learning as a facilitating framework in their semester project. The data processing is not confirmed by the students, and the ethical considerations continue beyond the data collection phase. Therefore, the analysis rests on transcribed material containing "fill words" so that the text appears loyal to the students' oral statements. The analysis is also based on several data types that together inform and reinforce each other. Equally, the main conclusions of the analysis must be found across groups and the three iterations (Kvale & Brinkmann, 2014).

Due to the project's insider perspective (see Section 3.5), providing the students with anonymity, both to the outside world and me as a researcher, receives a lot of attention (Brinkmann & Tanggaard, 2010; Costley et al., 2010; Godfrey-Smith et al., 2015; Lehmann-Rommel, 2000). The students, therefore, have not been asked to name themselves at any point during the course. This also means that all transcripts are done without name recognition. This is further elaborated in Section 9.3.

Quantitative approach

The quantitative approach, on the other hand, aims, through four identical questionnaires, to continuously collect data about the actions and events related to the application of the gaming principles during each iteration. At the end of the course, the student is asked to fill out the questionnaires one last time, but now with the focus of evaluating the entire course. The purpose of the quantitative data collection is to clarify various indicators that are interesting to investigate further from a qualitative perspective.

A complete overview of the collected data

The table 1 and 2 shows the type and amount of data collected, along with the number of respondents who participated in each data collection session. The table also indicates how many standard pages the transcribed data make up. In particular, the audio recordings from the design workshop contain longer passages that are not immediately relevant to the project and therefore not transcribed. Thus, there is no clear correlation between the length of the audio files and contributions to the subsequent coding process.

As described in Section 3.6, the various data collection methods interact with each other as part of the integrated mixed-method approach. The following sections describe each data collection method in more depth. The chapter ends with a description of how the abductive analysis of the collected data is conducted in this PhD.

9.2.1. PARTICIPATORY OBSERVATION

Based on the "participatory observation" method formulated by Søren Kristiansen and Hanne Kathrine Krogstrup, data were continuously collected, through pictures, statements, observations and notes (Kristiansen & Krogstrup, 1999). Participatory observation is about observing people in their natural surroundings. It is essential to understand that the very presence of the researcher will compromise the "natural" aspect of the study. The researcher speaks and interacts with the people being observed, which provides access to the dynamics and conflicts that occur, for example, through processes of change (Kristiansen & Krogstrup, 1999).

The method allows for an in-depth perspective of the context observed rather than a static snapshot. Participatory observation uses fieldwork as the qualitative data collection method. In this PhD thesis, all observations collected through the process of testing the game design are kept in a journal. The journal of observation subsequently informs the interview guide related to the focus group interview. The role of the researcher is thus to interpret the students' actions and comments in order to understand them through writing notes down to describe each observation. These observation notes help the researcher to understand how the students understand the use of the educational game design as well as how that understanding shows through their behaviour (Kristiansen & Krogstrup, 1999).

Data collection		Reflective conversations		Focus group interview		Survey
First iteration						
	Number of Participants	Number of hours	Number of standard pages	Number of hours	Number of standard pages	General response rate
Testing of the game design – 6 weeks	15 Students	2 hours 30 min	52 pages	3 hours	65 pages	86.9%
	2 Teachers	1 hour		2 hours	12 pages	
Second iteration						
Testing of the game design – 7 weeks	30 Students	2 hours 20 min	54 pages	6 hours	75 pages	87.1%
Third iteration						
Testing of the game design – 3 weeks	55 Students	3 hours 40 min	83 pages	8 hours 30 min	197 pages	89.1%
	3 Teachers	1 hour		1 hour	23 pages	

Table 1 – A list of all the collected data during the three iterations

Data collection		Reflective conversations		Focus group interview		Survey
	Number of Participants	Number of hours	Number of standard pages	Number of hours	Number of standard pages	General response rate
Preliminary study workshops	57 Students	63 hours	288 pages			
Workshop – Design of iteration 2	30 Students	3 hours 20 min				
	7 Teachers	7 hours	23 pages			
Workshop Design of iteration 3	4 Teachers	8 hours				

Table 2 – A list of all the collected data during the design workshops

Since this is a research process that spans several weeks, it has not been possible to be present all the time. In addition, there was numerous occasions when the students were working on their project or receiving a PowerPoint presentation that had no direct relevance to the focus of the PhD project. Therefore, the participatory observation has the character of being an ongoing data collection where daily contact with the students is maintained by being present in the class at selected times. Likewise, the teachers of the class are focused on describing their observations and experiences about the application of the learning game. Thus, the purpose of the observation was not to contribute directly with data that could be included in the subsequent abductive coding process, but rather to inform the interview guides compiled.

9.2.2. REFLECTIVE CONVERSATIONS

Both EDR and using an insider position demand great sincerity in terms of self-reflexivity, vulnerability, honesty, transparency and data auditing (Tracy, 2010). Reference is thus made to Chapter 8 describing the issue of the insider's position in this PhD project. Researchers in Educational Design Research not only observe interactions but they also "cause" these interactions. As this PhD project is based explicitly on an insider perspective, it is essential to generate data with a minimum of interference from the researcher.

The project thus has an awareness of using methods to ensure that students can speak freely without the influence of the researcher's biases, goals and foibles. Through reflective conversation where the researcher is not present, it is possible to access the students' experiences without having to ask any questions.

During the test of each iteration, the students have "reflective conversations" where they have the opportunity to talk, describe and explain the status of their experience of working with the game design. The conversations are framed through a series of reflection cards (see Appendix B) that have formed the framework for the students' dialogue. Besides being theoretically grounded, the content of the reflection cards arises out of the participatory observation. The reflective conversation is conducted without the researcher's participation, so the students have a safe space to bring thoughts and problems into the conversation without interference. The reflective conversation is recorded with a Dictaphone and subsequently contributes to the formulation of questions for the focus group interviews.

9.2.3. FOCUS GROUP INTERVIEW

All project groups complete each iteration by participating in a focus group interview. The qualitative focus group interview is about understanding social phenomena from the perspectives of the students and teachers by describing the world as they experience it. This form of interview seeks to gather descriptions from the participants in order to interpret the meaning of the phenomena described.

The qualitative interview is conducted as a semi-structured interview, which is regarded as a free and open dialogue. However, it is necessary to be aware of the asymmetric relations of power that are evident in the qualitative interview. The interview is initiated by the researcher, who defines the situation regarding the choice of topic, questions and answers that are followed up. A detailed description of the interview guide can be found in Appendix B.

The interview is a means of obtaining selected narratives and descriptions, which are subsequently subject to interpretation and reporting – this means that the interview is experienced as an instrumental dialogue. The interview often follows a hidden agenda to get the desired information. Last but not least, the interviewer has a monopoly on the interpretation of the statements the conversation entails. This relationship of power, therefore, sometimes results in a counter-reaction, where the participants deliberately withhold information or perhaps even ask counterproductive questions.

The knowledge created through an interview is actively created or produced through the questions and answers exchanged between the interviewer and the participants. Stories are an effective way to make sense of social reality. The knowledge of the interview is, therefore, a narrative at its beginning. The interview is thus characterised as being a scientific study when the pragmatic formulations of the questions create usefulness for the research question.

Through a semi-structured interview guide, the purpose of the focus group is to facilitate the students' discussions of their experience of working with Game-Based Learning. This means that the basis for the interview guide has been open questions aimed at getting the students to partly discuss and partly to give full descriptions of their experiences. The following starts to questions are examples of how these open questions are formulated.

Try to discuss how…
How would you characterise…
What meaning has…
What happened in the situations where…
How do you experience…
On what criteria did you decide…
Can you describe how you experienced…
In what way did you experience…
Can you give as detailed a description as possible of a situation where…

The interview is thus conversation based in order to gain access to the knowledge that cannot immediately be measured and weighed. Thus, the knowledge gained in a particular situation will not necessarily be transferable to other situations. The interview is therefore related to the current context, which plays a role in a subsequent interpretation process.

Each focus group interview was held group-wise with the members of the individual project groups. The reason for this was to gain an in-depth insight into each group's learning process. Likewise, the quantitative surveys showed that there was considerable diversity in the student responses within each group, which facilitated discussions where opposing views were met. Each interview lasted for about one hour.

9.2.4. SURVEY AS DESCRIPTIVE QUANTITATIVE DATA

The use of Educational Design Research often entails complex teaching designs where it's necessary to collect large amounts of data where a single method is rarely sufficient to answer the research question itself (Brinkmann & Tanggaard, 2010; Lehmann-Rommel, 2000). According to Greene (2007), it is the combination of different data sources that contributes to a more complete and comprehensive understanding of the educational design and the participants' experience of it (Greene, 2007). The integration of the different data types thus provides an improved insight when data and analysis, through an iterative process, inform design elements in the next iteration (Bazeley, 2018). Based on these arguments, quantitative data are collected through questionnaires to supplement the qualitative data. Thus, where the qualitative interviews seek to obtain a rich description of how the students have worked with the learning game in their process, the quantitative data collection has a specific focus on describing the changes over time. The purpose of the quantitative data is thus to gain knowledge about how the students use and experience the game seen throughout the entire period of the project (Kvale & Brinkmann, 2014; Watt Boolsen, 2008).

Within humanities research, two types of quantitative statistical analysis exist – descriptive and inferential – with both aiming to provide answers to questions about social phenomena based on quantitative data collection. Descriptive statistics are about summarising and describing the data set, while inferential statistics through randomised studies aim to make predictions.

In educational research, it can be challenging to talk about randomised controlled studies as teaching situations often contain many types of variables (Agresti & Finlay, 2014; Brinkmann & Tanggaard, 2010; Lehmann-Rommel, 2000;). According to Alan Agresti and Barbara Finlay (2014), one should, therefore, be extremely cautious about using inferential statistics within the humanist paradigm: *"Much social science research uses observational studies, which use available subjects to observe variables of interest. One should be cautious in attempting to conduct inferential analyses with data from such studies. Inferential statistical methods require probability samples that incorporate randomisation in some way"* (Agresti & Finlay, 2014, p. 24). Therefore, since inferential statistical methods require probability samples that incorporate randomisation in some way, the PhD project is based on a descriptive approach to the quantitative data (see Figure 59). Also, when it is possible to find the actual values of the parameters studied, i.e. the entire population is known, there is no need to use inferential statistical methods (Agresti & Finlay, 2014). The PhD project's data collection contains the total population of individuals who are of interest in the study, as the significance of the context for the results is vital.

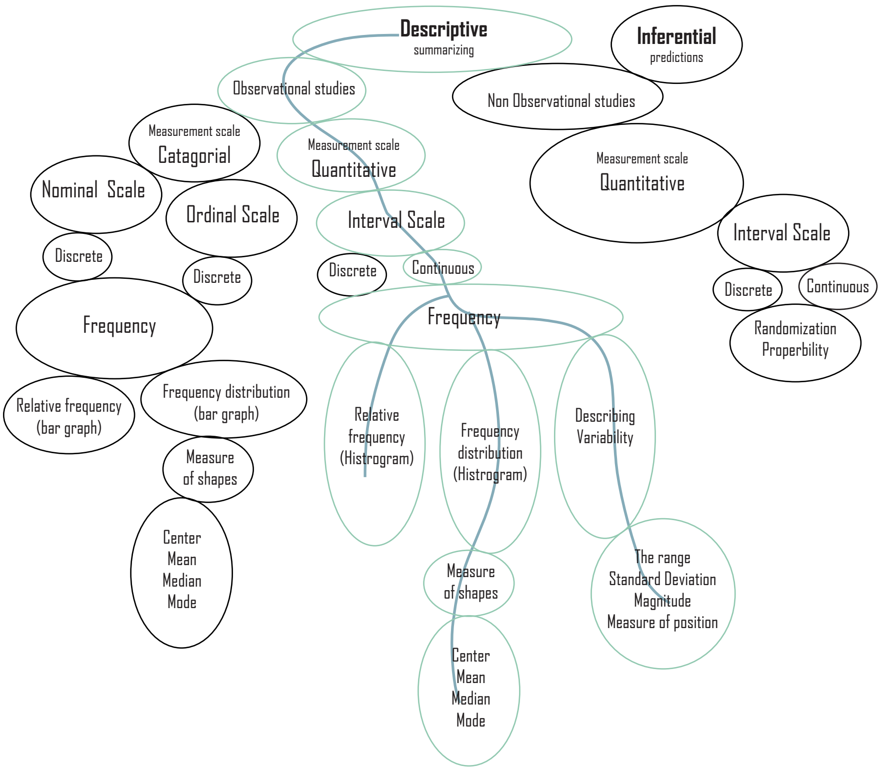


Figure 59 – An overview of the choices made for the quantitative data collection.

The quantitative analysis is based on the third and last iteration. This demarcation is partly because there is no comparable basis between the three iterations as the testing of the game takes place during a different number of weeks (see illustration 58). Further, it is chosen that the results of the questionnaires from both iterations 1 and 2 are not included as separate presentations, as the number of participating students is considered to be so low that it is not meaningfull to conduct a quantitative analysis. The results from iterations 1 and 2 thus only contribute valuable knowledge in order to prepare (1) a question guide for the focus group interviews, and (2) new design perspectives in relation to the design workshops (Kvale & Brinkmann, 2014; Watt Boolsen, 2008).

The students received four identical questionnaires over three weeks in order to see any change within the students' perception or their game behaviour during the intervention. Also, the students received a final and evaluative questionnaire at the end of the intervention. The purpose of the final questionnaire is to get a general assessment of the students' experience of working with Game-Based Learning (Kvale & Brinkmann, 2014; Watt Boolsen, 2008).

Physical questionnaires were used to ensure a high response rate, as it makes it possible to collect all the questionnaires at once (Goodman et al., 2015; Kvale & Brinkmann, 2014; Watt Boolsen, 2008). Also, all students answered the questionnaire at the same time, which can be a challenge with digital questionnaires. Since the quantitative data are supposed to help us see how the student behaviour changes over time, this choice was significant. The quantitative approach thus aims, through four physical and identical questionnaires, to continuously collect data of actions and events related to the application of the gaming principles over a period. At the end of the course, the students were asked to fill out the questionnaires one last time, but this time with a focus on evaluating the entire course. The purpose of the quantitative data collection is to clarify various indicators that are interesting to investigate further from a qualitative perspective. The physical questionnaires also allow for a high degree of anonymity, which is essential because of the insider perspective on which the PhD project rests.

In the same way as in the qualitative data collection, the students were not asked to give their names when filling out the quantitative questionnaires. The students used a self-selected alias in connection with the quantitative survey. In addition, all questionnaires were physically delivered and thus not sent out by mail (Kvale & Brinkmann, 2014; Watt Boolsen, 2008).

The response rate for each round of quantitative data collection can be seen in the table below (Kvale & Brinkmann, 2014; Watt Boolsen, 2008).

1. collection	2. collection	3. collection	4. collection	Final collection
87,3	90,9	83,6	83,6 %	89,1 %

Figure 60 – The response rate for each round of quantitative data collection.

Design of question

The quantitative questionnaire consists of a total of 31 questions (see Appendix C) based on the three main areas, i.e. Motivation & Autonomy, Exploration & Analysis, and Reflective Practice, defined in Section 1.4. The questionnaire is built around questions that investigate the extent to which Game-Based Learning has supported specific elements within the three main categories. The use of a large number of questions is chosen to create many perspectives from the quantitative data that serve to identify which issues could be interesting to follow up in the qualitative data collection. Thus, initial analyses of the quantitative questions have had an impact on both focus group interviews and design workshops. Questions that directly ask about to what extent the students think about Game-Based Learning is deselected since the PhD project is not aimed at evaluating a given game design. For example, data collection is not intended to elucidate whether the model works, but rather to describe and understand what happens in a teaching situation based on Game-Based Learning. Continuous and diverse visualisations of the quantitative data have revealed how specific questions have had a more significant impact on the analytical process than others. That's why only the following questions have been selected for the final analysis.

Motivation & Autonomy	
1.3	On a scale from 1-10, to what extent has the idea of achieving new levels generally, motivated you?
1.4	On a scale from 1-10, to what extent has the idea of achieving new quests generally, motivated you?
Reflective practise	
2.5	On a scale of 1-10, to what extent have mission/dungeons helped you to reflect on the professional content?
Exploration & Analysis	
3.8	On a scale of 1-10, to what extent have quest and levels helped you to facilitate the design process?
3.11	On a scale of 1-10, to what extent have the learning game helped you to focus on doing analyses?
3.12	On a scale of 1-10, to what extent have the learning game helped you to focus on creating ideas for the project?

Figure 61 – The selected quantitative question for analysis based on qualitative observation data.

The questionnaire contains a Likert scale with numerical values from 1-10. It cannot be unequivocally argued that the students have the same subjective view of the numerical values. The assessment on a scale of 1-10 will thus be equated with a scale ranging from, for example, "disagree" to "agree". The scale used is thus based on a subjective definition of the distance between the levels. It is of no significance to the analysis of data, as they are only being processed descriptively by describing the percentage distribution of frequency. Thus, the PhD project is based on a descriptive approach, which involves summarising the dataset through graphs, tables and numerical values such as the average and percentages. The main purpose of descriptive statistics is to reduce the data to more straightforward and more understandable forms without distorting or losing information (Agresti, Finlay 2014).

Thus, the tables presented in the analysis describe the data by showing the relative frequency given in percentage (the number of responses within each possible category). The descriptions will also describe the centre of the data - a typical observation, as well as the variability of the data - the spread around the centre. Histograms are used to show the total frequency distribution, as well as a dot diagram showing outliers. Gradient curves are used to show development over time.

The quantitative data are also analysed through the use of Cohen's D to assess and measure the effect size. Cohen's D is chosen because the method can be used on even small studies with samples of n = 50, which are applicable in this study. The interpretation of Cohen's D is often based on some general guidelines where the following scale makes it possible to say something analytical about the found value of Cohen's D.

A Cohens D at 0,2 = small effect

A Cohens D at 0,5 = medium effect

A Cohens D at 0,8 = large effect

Despite descriptive visualisations as well as Cohen's D calculations, this study does not immediately relate to the concepts of validity and rehabilitation that typically apply in quantitative research. Due to the number of participants in the project, it is considered that it is not meaningful to speak of validity in the quantitative data, as a small change in the number of people could have a significant impact on the results. This does not mean that there has not been a sensitivity in asking the right questions or using directional interpretation and calculation models in the project. Rather, with referring to Tracy's (2010) eight quality criteria, the quantitative data were used to support the qualitative analyses, which help to navigate and code the qualitative data.

This means that graphs and Cohen's D calculations are seen as units that can be coded together with the qualitative data. With this, the coupling of quantitative and qualitative data follows Bazely's (2018) understanding of a mixed-method process that involves bringing methods together through techniques such as weaving, merging, conversing, blending, morphing and fusing data (see Section 3.6) (Bazeley, 2018).

9.3. ABDUCTIVE ANALYSIS STRATEGY

The data collection is focused around a pragmatic mixed-method approach as the primary epistemological foundation. The PhD project is, therefore, based on both a qualitative and quantitative approach. The following section describes the project analysis approach, which is based on an abductive coding strategy.

The project's data collection focuses on the students' reflective experiences, thoughts and feelings in connection with the use of Game-Based Learning as a facilitating framework in a semester project. Thus, the primary focus will be qualitative, in which the quantitative data are processed descriptively and used as a supplement. Thus, the focal point of data collection aims to collect and analyse data through iterative processes, where theoretical assumptions are continuously modified through the three iterative phases. Therefore, data collection is primarily characterised as exploratory observations as well as conversations in open interviews with an understanding and explanation perspective.

The purpose of the analysis is the construction of theoretical ideas based on empirical data through a continuous pragmatic process of puzzling pieces together (Timmermans & Tavory, 2012). The theoretical constructs of the analysis thus occur through a dialectic between theory and empirical finding (Timmermans & Tavory, 2012). Timmermans and Tavory (2012) describe the analysis process as follows: *"Asserting that unexpected theoretical formulation and categories emerge in relation to data locates a social practitioner within a meta-theoretical debate about the relation between data and theory"* (Timmermans & Tavory, 2012, p. 168). In doing so, they point to a pragmatic analysis process where coding strategies are the focal point. Here, grounded theory in particular has been a widely used qualitative methodology within social sciences such as education and sociology (Ong, 2012; Timmermans & Tavory, 2012). Grounded theory has traditionally been built around a controlled methodological and step-by-step approach, where the categorisation of data is central while preserving an inductive interpretation perspective. Grounded theory is therefore based on an open and emergent coding of data where the category formation occurs as a result of the inductive approach (Charmaz, 2014; Ong, 2012; Thomas, 2010). Brinkmann (2014) states: *"What we call data are always produced, constructed, mediated by human activities, or 'taken' as Dewey wanted us to understand through his pragmatism"* (Brinkmann, 2014, p. 721). This perspective means that grounded theory's inductive foundation is challenged as data will always be constructed rather than given (Brinkmann, 2014; Haig, 2008; Timmermans & Tavory, 2012).

Consequently, critics have attempted to use ground theory's methodological approach to promote alternative approaches without necessarily buying entirely into the inductive premise (Timmermans & Tavory, 2012). In particular, the issue of coding through a theoretical lens has been a point of contention. Therefore, several researchers have argued that *"grounded theory is epistemologically much closer to what pragmatist Peirce called abduction: a central concept in his theory of logic and inference* *that denotes the creative production of hypotheses based on surprising evidence"* (Timmermans & Tavory, 2012, p. 168). If grounded theory's systematic is considered in the light of a pragmatic and abductive approach, coding becomes much more of a tool that makes it possible to work with what Brinkmann (2014) calls "abductive breakdowns" of the data material. What is being coded, and how, becomes secondary, and it is instead about creating a process of inquiry and reasoning. He writes, among other things:

> *I have since become sceptical not just of coding but also of the very idea of data as such. The concepts of coding and data often go together as twins. Qualitative researchers who talk about data tend to want to code them and those who do coding usually want to solely code data. (Brinkmann, 2014, p. 720)*

Brinkmann thus argues that data lead to theory and that data "speak for themselves" (Brinkmann, 2014). Other researchers have justified the lack of theoretical breakthroughs in grounded theory projects with incomplete or inaccurate application of grounded theory principles (Timmermans & Tavory, 2012). As Timmermans and Tavory (2012) write, induction contains a practical dilemma in that it is challenging to generate new theory without being sensitive to existing theory (Timmermans & Tavory, 2012). This means that analysing through an inductive approach has been criticised by several researchers for not being able to offer any "new findings" contained within the logic of the argument (Brinkmann, 2014; Kolko, 2009; Timmermans & Tavory, 2012). The desire to form new theories is also something that concerns the research field of Educational Design Research, as one of the central points being discussed.

Alternatively, a deductive approach where a theoretical framework guides the analysis is also challenged by theories often being created with little connection to substantive social life (Brinkmann, 2014; Timmermans & Tavory, 2012). Brinkmann (2014) frames this dilemma by talking about the inductive collector and the deductive framer (Brinkmann, 2014). Another point of view could, therefore, be to understand the coding process as abduction, where the coding process alone is a tool for creatively understanding and brooding the patterns of the phenomena (Brinkmann, 2014; Timmermans & Tavory, 2012). Based on a pragmatic understanding inspired by Peirce, Brinkmann (2014) describes abduction as a *"form of reasoning that is concerned with the relationship between a situation and inquiry. It is neither data-driven nor theory-driven, but breakdown-driven"* (Brinkmann, 2014, p. 722). Another argument for applying a pragmatic abductive analysis strategy is the association between abduction and Design Thinking. The process of design synthesis is based on the same fundamental premises that characterise the abductive analysis process.

As the methodology of the PhD project is based on Design Thinking (see Chapter 8 and Section 3.4), the subsequent analysis of the individual iterations will advantageously be based on cultural coding of patterns that later act as an argument for the best explanation (Kolko, 2009). Kolko (2009) describes it as follows: *"It is the idea of putting together what we had never before dreamed of putting together that flashes the new suggestion before our contemplation"* (Kolko, 2009, p. 21). Thus, in the same way as the initial design process, in which the theoretical basis was reformulated into current principles, the coding of data will, in an analytical context, create breakdowns in existing understandings, thereby leading to new realisations. Examples of some of these breakdowns can be found in Section 10.1.1 of the analysis, where quests and levels are discussed as a catalyst for motivation, and in Section 10.1.2, where the development of the students' autonomy challenges the common understanding of whether a learning game is something that needs to be played through in order to reach a learning outcome, as well as in Section 10.3.1, where the concept of "game over" is reinterpreted into a higher education context, and where the concept of "dying" is understood as creating disruptions in the students' project.

As Timmermans and Tavory (2012) explain it, abduction seeks a theory where induction seeks facts (Timmermans & Tavory, 2012). Since the PhD project rests on a pragmatic epistemology that rejects a research process that is said to lead to facts, an abductive analysis approach that seeks to develop new theory or models is a logical choice.

The abductive process

The abductive analysis process relies on elements from both induction and deduction (Timmermans & Tavory, 2012). Abduction is thus a form of reasoning based on a creative inferential process that produces new theories based on the surprising element found in the data (Brinkmann, 2014; Timmermans & Tavory, 2012). The abductive method looks at theories and data as developing entities and thus, according to Haig (2008), becomes a method for theories in the making (Haig, 2008).

Through its coding process, the abductive analysis seeks to engage in imaginative thinking about intriguing findings. Through iterative loops in the data collection, the goal is to create inferencing creatively, and a double-check of these assumptions (Timmermans & Tavory, 2012). Thus, the abductive analysis process works from the premise of moving back and forth between data and theory iteratively, as is known from the traditional grounded theory (Timmermans & Tavory, 2012). The essential difference between abductive coding and grounded theory is the importance of existing theory that helps to make possible empirical anomalies visible:

> *Abductive analysis constitutes a qualitative data analysis approach aimed at theory construction. This approach rests on the cultivation of anomalous and surprising empirical findings against a background of multiple existing sociological theories and through systematic methodological analysis. As such, it requires a fundamental rethinking of the core ideas associated with the grounded theory, specifically the role of existing theories in qualitative data analysis and the relationship between methodology and the theory generation. (Timmermans & Tavory, 2012, p. 169)*

As described in Section 3.1, knowledge creation from a pragmatic perspective is focused on the discovery of anomalies and breakdowns that can contribute to the development of new understandings, theories and models (Caldwell, 1983; Godfrey-Smith et al., 2015; Kjær, 2010; Lehmann-Rommel, 2000; Timmermans & Tavory, 2012). Abductive reasoning is about more than just describing patterns of data, and is, therefore, looking for plausible explanations of phenomena (Haig, 2008).

The inquiry concept is used to describe how the analysis phase attempts to frame the creation of breakdowns in one's understanding through an explorative approach (Brinkmann, 2014). Haig (2008) describes it as follows:

> *Sets of data are analysed to detect robust empirical regularities or phenomena. Once detected, these phenomena are explained by abductively inferring the existence of underlying causal mechanisms. Here, abductive inference involves reasoning from claims about phenomena, understood as presumed effects, to their theoretical explanation in terms of underlying causal mechanisms. (Haig, 2008, p. 1019)*

Haig's (2008) description points in the direction of putting pieces of related information together in order to make a story (Thomas, 2010). Coding data in a pragmatic and abductive understanding is, therefore, more than just recording and categorising. It is a kind of doings that create the mentioned breakdowns, through the series of events being merged into a story (Brinkmann, 2014; Thomas, 2010). According to Thomas (2010), the analysis process must question (1) which elements are woven together, (2) how the elements fit together, (3) how/whether they contradict, and (4) whether paradoxes arise in the process (Thomas, 2010). The coding process, as it is known from grounded theory, can thus advantageously support finding the "sequence of steps" (Thomas, 2010). The abductive coding differs in that it consciously seeks to challenge and question data by combining the individual categories – a process similar to Feyerabend's (1993) suggestion that science creation occurs through the use of counter rules and hypotheses that contradict well-established thinking. Thomas (2010) also points to Kuhn's (1970) concept of the "awareness of anomaly" (Thomas, 2010).

Findings anomalies and the unexpected

The risk of traditional coding is that only ready-made categorisations are created (Timmermans & Tavory, 2012). The ability and opportunity to discover new theories depends on the ability to frame, modify and extend the empirical data within an existing theoretical framework. In this understanding, the theoretical framework becomes crucial as in-depth knowledge of multiple theorisations is the key to being able to see the missing link or anomalies in an area of study (Timmermans & Tavory, 2012). Haig writes, for instance: *"Some phenomena are detected that are surprising because they do not follow from any accepted hypothesis or theory"* (Haig, 2008, p. 1020). Theoretical insight can also stimulate innovative and original theoretical knowledge creation, especially in the light of a research design based on the application of Design Thinking (Timmermans & Tavory, 2012). In this regard, Timmermans and Tavory (2012) argue that the prerequisite for an abductive analysis is that the research process is based on methodological approaches that allow the coupling of theory and empirical.

> *While such anomalies are opportunities to develop new theoretical insights and modify existing theories, researchers need to foster an environment that allows doubt to develop. This conducive environment is predicated on a series of pre-established steps through which the researcher revisits the phenomenon – in other words, a method. (Timmermans & Tavory, 2012, p. 175)*

Thus, through intensive coding, the aim is to link empirical data with existing theories so that it is possible to identify changed circumstances and thereby find new dimensions of the problem. The abductive analysis process requires the researcher to access it with the deepest and broadest theoretical base possible and from there develop the theoretical repertoire through empirical findings (Timmermans & Tavory, 2012).

9.3.1. ABDUCTIVE CODING OF THE QUALITATIVE DATA

The methodological assumptions that apply to grounded theory can thus stimulate abductive reasoning (Timmermans & Tavory, 2012). The foundation of data processing is the following four main features: the selection of relevant parts of the data material, the degree of transcription, the coding procedure and the writing-up process. The individual steps are described in the sections below.

1) Selection of data: All interviews and reflective conversation are transcribed to ensure a broad base for the coding process. This also applies to the audio recordings from the pre-study workshops. Also, interviews and workshops with the teachers are transcribed.

2) The level of transcription: A prerequisite for the coding process is a transcript of interviews, reflective conversations and audio recordings from design workshops. A transcript is a form of meaningful summary that, through text, describes what was said/done. Transcripts are constructed translations from spoken to written language that involve several assessments and decisions. A large part of the audio recordings is transcribed, as it supports the inductive interpretation of the analysis process. A comprehensive manuscript of the interviews allows the researcher to code all data and not just focus on the obvious statement in the coding process.

Based on Kvale and Brinkmann (2014), the following criteria for the degree of transcription have been selected: a) the purpose of the transcription is the interpretation of meaning; b) emotional outbursts, laughter and spontaneous sounds are marked in the transcription; c) “fill” words are included in the transcript so that text appears in accordance with the audio file (Kvale & Brinkmann, 2014).

3) Procedure for coding: The coding process for this PhD process, based on an abductive approach, focuses on an open category formation within the three (Motivation & Autonomy, Exploration & Analysis, and Reflective Practice) defined main areas of the project. Moreover, it is both an inductive and deductive perspective. An example of how one of the PhD project’s findings arose inductively is the situation where the students suddenly stop playing. In the first iteration, this is an anomaly, where there is no consonance with the presented theory. A deductive conclusion to this finding could be that the narratives of the learning game are not sufficiently motivating. This conclusion would imply a new design process with a focus on fixing the problem and remaking the game in order to keep the students playing. In an inductive perspective, this anomaly is instead explored and, instead of finding a solution to the problem, it becomes a clue for alternative explanations as to why students stop playing. Especially the students’ argumentation of how it is the project that takes over becomes crucial to understanding the meaning of game thinking in higher education.

The coding process thus has a sensitivity towards the possibility of spontaneous categories emerging detached from the theoretical assumption. This means a focus on categories that emerged through an explorative data-driven inductive approach to students’ narratives while the design principles of the project are used as clues.

The coding process is based on the frequency of specific descriptions of the students’ experiences. The design principles have guided this coding process from a theoretical basis. The delimited but complete sentence structures from the transcribed material are coded. In some cases, longer fragments of a conversation are coded as a unit. In addition to the qualitative interviews and reflective conversation, the descriptive quantitative material has been added to the individual categories, in the form of graphs and tables (Charmaz, 2014; Kvale & Brinkmann, 2014).

Figure 62 – Pictures showing the abductive coding process.

The coding process has been done exclusively physically and manually. The reason for this choice is the argument of getting a complete overview of all categories, which can be difficult within a digital map and file structure. This overview makes it much easier to observe and discover interesting patterns continuously over time through an embodiment created by the physical coding process.

Because of my insider profile, it has been vital to ensure that the students are fully anonymised throughout the whole research process. Therefore, students are not assigned a specific numbering in the transcription that makes it possible to identify the individual student. The analysis has, therefore, been focused on the importance of the number of statements. Based on that, representative statements have been selected where the following criteria have been weighted high: (1) comparable statements from different students, (2) overall tendency in the different project groups, and (3) statements repeated in all three iterations. To ensure clarity around these three criteria, each transcribed interview is assigned a colour code.

Similarly, in the abductive coding, no distinction is made between whether these are data from focus group interviews or reflective conversations, respectively. Data collected via observation are not part of the coding as it was solely intended to inform the interview guides compiled.

4) Writing up: Through an investigation of the found categories, new theories have emerged through an abductive resonance by making a comparison with existing theories. The analytical reflection is created through sketching techniques describing interesting patterns and contradictions. The sketches act as a kind of memoir that summarises the reflections and thoughts that together create an abductive resonance. Through an axial coding of the found categories, coupled with the outlined sketches, several statements are identified. These statements provide a framework for writing up the analysis (Charmaz, 2014).

CHAPTER 10. ANALYSIS OF THE DEVELOPMENT PROCESS

The following chapter analyses the data collected from both design workshops with the participation of the teaching team and from focus group interviews with the teachers. As previously mentioned, the theoretical structure of the PhD project's educational game design has primarily been developed by me as a researcher, while the teachers have been involved in the preparation of the quest structure and content.

The data of the design workshop and interviews thus contributed to the analysis with concerns and thoughts regarding working with Game-Based Learning from the teachers. Also, the data describe the teachers' concerns about some of the educational challenges they have experienced in the previous semesters. Likewise, the data show the development of the teachers accepting Game-Based Learning as a learning approach that allows open learning trajectories. The purpose of the analysis is thus three-dimensional, with this chapter aiming to elaborate on the following three different perspectives:

- The development of the teachers' understanding of working with Game-Based Learning.
- What design aspects from the workshops subsequently contribute to changes in the developed game, including the teachers' reasons for these choices.
- The teachers' educational reflections on the content and purpose of the fourth semester, what it is that the students need to learn and what significance this has in regard to working with a game of thinking.

Figure 63 – Pictures from one of the design workshops with the teachers.

It is, therefore, difficult to accurately distinguish among these three perspectives in the collected data and thus the following analysis, since the educators' knowledge of their understanding of the concept of Game-Based Learning may be the element that brings about a concrete change in the design. Likewise, specific expectations of what kind of competency goals the students need to achieve may be the condition that both directly and indirectly sets the requirements for the design and content of the educational game. The following analysis will thus include both elements that seek a deeper understanding of the teachers' experience, as well as elements that point directly to the design process. Thus, it is a conscious choice to let these two perspectives inform each other in the analysis, as in practice it is difficult, and perhaps even meaningless, to separate them.

The analysis is based on the transcribed audio recordings from the design workshop, as well as data material from the two focus group interviews with the teachers. Based on the above three perspectives and an open and axial coding process of the collected data, the analysis relates to the following concepts (see section 9.3).

Table 3 – A list of all categories emerged from the coding process.

Category	Definition	Workshop	Interview	All
Learning conditions	The teachers are talking about the students learning condition and how these make the teach-ing situation difficult	8	9	17
The content of the semester	Teachers describe the content and objectives of the semester, including educational challenges	4	19	23
The landscape of doings and sayings	The teachers describe and elaborate how the professional activities at ATCM can be understood as a land-scape of doings and sayings	5	7	12
Planning and management	The teachers talk about the importance's of being able to plan and manage the semester project	5	9	14
Depth created through iterative processes	The teachers talk about how depth in the student's projects is created through iterative pro-cesses	9	8	15
Sequential quest structure	The teachers discuss the im-portance of dividing the content of the semester into a sequential quest structure	6	8	14

Temporal conception	The teachers discuss how the game affords temporal concep-tion through disturbances and obstructions	7	17	24
Analytical competence	The teachers talk about the importance of the students having specific analytical com-petences	5	20	25
Confidence	The teachers talk about how the game gives students confidence in the learning process	0	9	9
Resistance	The student expresses discom-fort, concern, or a lack of moti-vation regarding playing the game	4	8	12
Point	The teacher is questioning the use of point within the game	11	0	11
Open-ended or closed	Discussion about how the semester project are either open-ended or closed	5	14	19
Gaming concepts	The teachers are talking about the use of gaming concepts and its meaning to the students learning	9	12	21
Collaboration between teachers	Discussions about how devel-oping the game strengthen collaboration between teachers	1	15	16
Coding the teaching situation	The teachers talk about how the students are trying to decode the learning situation	5	10	15
Motivation	The teacher expresses an am-bivalent attitude about how the game creates motivation	7	3	10
Farming	The teacher talks about how collecting and combining differ-ent sources of materials creates learning	1	7	8

Through an axial coding of each of the categories, the following notions are developed.

"The content of the semester."
"Open-ended or closed."
"Depth created through iterative processes."
"Planning and management."
"The concept of games."
"Collaboration between the teachers."

Each of the notions from the axial coding is briefly described and defined in the paragraphs below. Further, each notion will constitute a framework and hence the heading for the chapter's analysis of the teachers' concerns and thoughts about working with Game-Based Learning, as well as an analysis of the design perspectives from the workshop.

The content of the semester – This section addresses the teachers' views on the learning explicitly and thus the pedagogical approach that is necessary for students to meet the semester's learning objectives.

Open-ended or closed – This section discusses the teachers' concerns about the relationship between the game's possible closed framing and a desire for students to acquire the learning objectives through open-ended learning processes, as well as what requirements this relationship imposes for future game design.

Depth created through iterative processes – This section discusses how specific design choices are created directly from the teachers' reflections on how to create depth in student learning through iterative processes.

Planning and management – This section discusses how specific design choices are created directly from the teachers' reflections on the importance of students being self-initiating in their process and thus behaving autonomously.

The concept of games – This section discusses how specific design choices are created directly from the teachers' reflections about the rhetoric that characterises games.
Collaboration between the teachers – This section deals with the teachers' experience of increased collaboration and understanding of each teacher's discipline created through the development processes needed when working with Game-Based Learning.

10.1. THE PREPARARTION OF THE FIRST ITERATION

The first iteration or version of the educational game design is based on the PhD thesis's theoretical desk research and pre-study. The first version was developed by me as a researcher. For a more in-depth description of the development process where theoretical design principles are turned into a coherent educational game design, see Chapter 7. However, it is noted that the quest structure and its content in the first iteration have evolved continuously. The condition for the development of the first design version is described in the following statement. It is a quote from the first design workshop with the teachers, where I myself describe the process:

> **Example 1**
> *"... In the beginning, all the types of quest that I somehow imagined were going to play a part in the game, and then I placed them (red. quest) in relation to the semester. The order was as I thought it should be, but as they then moved forward, I began to swap it (red. quest) around, waiting for something and advancing something. Or, some new types of quest emerged that I might not have thought about where included. So it was not; it was not a static course. You could not say that the game was in place when they started; in no way was it. It evolved. This is the result of where it landed, what they ended up getting."*

Thus, the theoretical structure and framework of the learning game were determined in advance, while the content and sequences of the individual quest in the first iteration evolved continuously as the students completed the game.

10.2. THE PREPARATION OF THE 2ND AND 3RD ITERATION

The following analysis focuses on data collected in the design workshop with the teacher, where the second and third iteration of the educational game design were developed.

10.2.1. THE CONTENT OF THE SEMESTER

The first chapter deals with teachers' views on the educational challenge that is currently the situation for the four semesters, including the learning potential that the interdisciplinary semester project embraces. The teachers talk about how the interdisciplinary semester project is based on holistic thinking about the academic topics, where the students must be able to demonstrate an ability to combine many different disciplines in an integrated design process.

> **Example 2**
> *"For me, it is mostly about saying that in the first weeks of the project, you work in a holistic way, so that you get an understanding of why, for example, energy design is linked to constructions and static processes*

and design in itself. So you get the overall understanding that none of these can stand alone."

Example 3

"So how do they learn to collaborate and structure it in a complicated context, a professionally complicated context? And the pedagogical approach we create there, we use something that may be weekly documented, but holistic methods, integrated design principles, and perhaps a little weakly grounded in the semester, in the semester plan. But that's what we do."

The teacher points out that the ability to collaborate and structure a project through many different phases is difficult as *"the students are to a greater extent coming out of their comfort zone"*. The development of a building from scratch requires being able to work through creative processes. The teachers thus question whether the students can translate the project's academic criteria into creative sketches.

Becoming an "architect"

The unique thing about this particular semester at ATCM is that the students for the first time in their educational programme have to deal with the function of an architect in their projects. This means that they must create and design a building concept that will later form the basis of developing drawing with construction details. Thus, the learning game speaks to an understanding of teaching with a focus on the students developing an understanding of the architectural domain through experiencing and following the same procedural footprints of an architect on their own.

Example 4

"So they work, continuously, throughout the course, to gain an insight into what the engineer is doing [...] The fourth semester is the first time that they get an insight into an architect's work [...]. But this is the first time that they have an insight into what the architect is really doing. And it is not because they have to be architects, but they have to understand why architects are so dedicated for their ideas. Their concepts. And it was not clear to them before. Now, I am actually not quite sure they reach that realisation in the design phase either. In their optics, the architect will always be just one who draws some doodles, but what the engineer says is law."

This speaks to the design principles that deal with the development of a learning game with a focus on "learning as becoming" rather than "learning by being told or doing". Here, the teachers describe how their teaching focuses on the methods and tools that the students have to work with to develop a design of the building. In particular, it is the description of how a building design is created from an analytical approach that cannot be defined as a linear process from A to B that according to the teachers challenges the incorporation of a learning game.

Example 5
"I think it is important that they get this understanding of the whole process as an iterative process, so that it not only becomes academic elements. So we have just as much focus on the methods, and it is important that they understand this when working with architecture and design, you might say. Yes, we start somewhere, and that is perhaps by looking at the reason, but there are some other parameters that we have set up from the beginning, either some requirements for the building or some other legal requirements, area requirements and so on. But exactly how the building and the volume are created, that we do not know until we actually get to work with all these analyses, and they must have this understanding. That it can ONLY be created from an iterative process. It does not come from day one. You cannot just walk the straight way from A and then all the way through. It may be that we go from A to D, but then maybe we should go back to C again."

Thus, the learning process of the fourth semester is open-ended through many types of activities that mutually influence and enrich each other. This perspective is essential for the teachers, which means that they consistently question whether this is compatible with game thinking. This perspective is unfolded in the next section.

10.2.2. OPEN-ENDED OR CLOSED

The teachers' concerns about working with Game-Based Learning are particularly aimed at translating the content of the semester into a quest structure containing x number of quests. In the following statement, one of the teachers expresses concern about maintaining this open learning process if the academic content is to be defined through several professional topics within the semester.

Example 6
"Well, if I step back and look at it all from above. If it is so, that if we open up and then say that here we have themes, within each topic. It is, after all, tremendous control of any development. And it is all down to elements of topics, down to the themes, down to, and then I ask, is this the checklist we are heading back to?"

The teacher thus questions whether the quest structure will lead to a form of checklist that the students can follow. Also, he has difficulty seeing how a learning game consisting of quests at the same time creates innovative development in the student projects. It opens up a general discussion about how big or how little the "teacher control" can be while still maintaining the students' independence in their project.

Example 7

"So we sometimes discuss what creates independent dynamics. So how much do we have to go in and control them [...] when we set it up, is it too controlling or disruptive? And that is sometimes the schism we stand with."

Another challenge the teachers point to is whether the control within the learning game prevents reflection processes. Throughout the course, the teachers keep expressing a persistent argumentation about games being based on behavioural approaches that are not compatible with a problem-oriented learning approach. If the students blindly follow a determined quest structure because of a rewarding system, are they then being brought to the edge where they have to reflect on the next answer of their challenge? One of the teachers argues: *"What I am a little scared of in the learning game is whether they are so controlled, whether you make them reflect."* Despite this concern, he continues to point out that the students so far have tried to decode the teachers' intentions, rather than working independently on their projects: "*Yes, but if I am a little cheeky, now I have heard the other two talk. Then they lie down, the students, they just lie in our hands and let us carry them through. Because basically, they cannot see the end when they start up."* The teacher follows with a description of a situation in the class where the students show increased awareness of a particular topic after the teachers have indicated its importance. The teacher thus raises the question of whether there is an educational difference between decoding a game and decoding a teacher.

Example 8

"Because it is about whether they decode the game, or they decode what we say as a teacher, it is exactly the same [...] there is just something that they have to relate to, or else they relate to us. And it is funny and now [teacher 3] was laughing yesterday when we were talking about it. This year they have coded us because we have focused a lot on constructions."

An analysis of the data material reveals several contradictory arguments concerning the degree of controlling the students' progress in their projects. Teachers, on the one hand, are busy creating learning processes that bring students into unfamiliar territory, but at the same time, they keep the students to a very tight schedule, while also ensuring that the students do not follow trajectories too far away from the teachers' intentional and presented academic content.

Example 9

"Because they need to go beyond learning, they also have to make momentum in the decision-making in order to keep the schedule [...] And sometimes some of the groups run; they run out of some tangents where they have trouble finding their way back without guidance. Then we are about to start managing them a little. And that is because we also

know that we put them out in open seas, and then we have to try to see if we can set the sails right."

The teachers, therefore, argue that some control is necessary while expressing a concern that the learning game is too controlling and locked into its structure. The essential discussion thus deals with whether the application of Game-Based Learning can contribute to high teacher control while the students are working problem-oriented and open-ended.

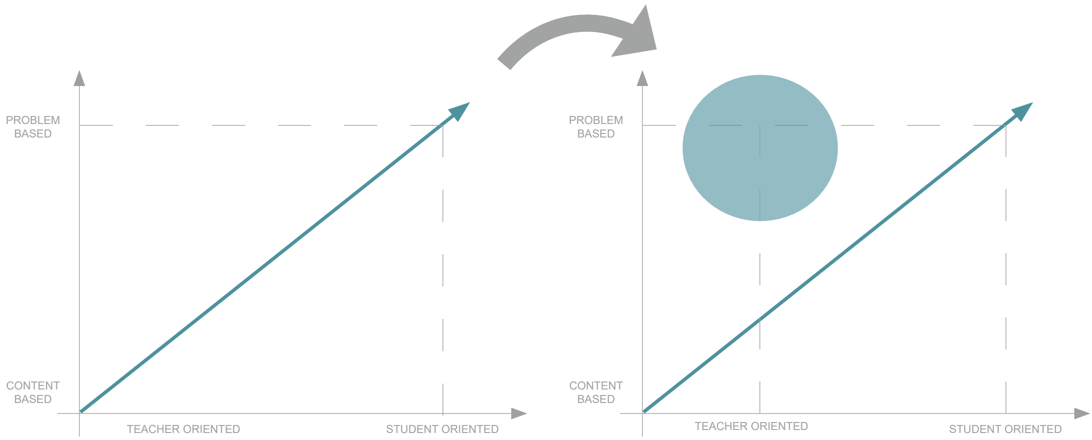


Figure 63 – Game-Based Learning can contribute to high teacher control while the students' work is problem-oriented.

The data also reveal how the teachers are particularly concerned with whether Game-Based Learning contains and supports some form of scaffolding reflection processes: *"But it could actually be very interesting to look at reflection and scaffolding – and then hide it, you might say, in the process of the learning game. And then you can build it up somehow; it could be pretty interesting."* Here, the teachers' argument is that being able to feel safe within the process is a critical factor for developing reflection. The assessment is that because the students have difficulty in understanding the very open and iterative processes, the safety that Game-Based Learning offers is essential.

Example 10

Teacher 1 *– "No, but it requires a sense of safety for the students. Because if they do not have that confidence, then we start talking motivation and frustration and that stuff. And it seems like, at least, that they are completely comfortable in knowing that they are on the way [...]. So things come to them so that in the end, they reach the goal we have been given them or the part goal. Is it misinterpreted?"*

> ***Teacher 2*** *– "No, and I do not think it is a bad strategy, on the contrary, because they are not used to seeing this process. They have never seen the whole process before. Now they have seen it in four semesters, they have had some different kick-ins."*
>
> ***Teacher 1*** *– "They have to trust that when the teacher enters, or the teachers, or the team agrees, then they are carried from there to there. And maybe that is where you can say that if we return to the game, it helps to support them in that process."*

The teachers thus discuss whether the structure of Game-Based Learning can help the students feeling confident enough to adopt a more investigative and reflexive approach to their projects because they are supported along the way. In the final interviews, the teachers changed their attitude about the concerns they expressed in the design workshops. Early in the process, they saw the quest structure as a narrowing framing of the students' process that could be reminiscent of a sort of checklist. In the later interview, their rhetoric changed into understanding the quest structure as a step-by-step approach that helps the students to be creative, open and reflective. In addition, they observed how the students had shown a changed interest in working with unknown academic topics and methods throughout the game, which ultimately contributes to new learning perspectives in the projects.

> **Example 11**
> *"But I think it manages them really fine. I actually think you could see that at least in the last semester. Their volume studies get better and better. And there I just think the game does it really well, because they know if they are going to create a building then they need to work with creating a volume. They are still so familiar to practise that they know at some point there should be windows in that volume, but you can say that the game asks them to concentrate on a volume. Then you open up something new, and now we have to look at the windows. So you can say the step by step helps them along the way. I think it really does something really good for them. Because otherwise, they would continuously concentrate on where the window should be while doing volume studies. And it can be unfortunate for a creative process."*
>
> **Example 12**
> *"Because then they think of a solution in the process and beyond. So in that way you can say that the game somewhere opens up the process for them, and, seduce is the wrong word, but they let the game lead them, and it opens up some things that they might not have opened up to before. So that way, new learning perspectives come in."*

Example 13
"Yes, you do not want to admit it as a teacher, but they code you and so in that way we are controlling them in the same way as a game. Because they try to code us, and then say that is what they want. It is there, and then we get what we want. Now it is just the game that has defined those points. So I think I have changed my understanding a little bit."

According to one of the teachers, the confidence that the learning game entails through its structure means that there has been a lower degree of frustration during the semester.

Example 14
"And we may also have something completely different, this time. We do not have all the background noise, so we do not have all the complaining about how bad the teacher is. It is like it has been pushed away, but that is because they have had something else to focus on, I think."

The following chapter discusses how in-depth and consequently reflective thinking can be strategically designed through Game-Based Learning.

10.2.3. DEPTH CREATED THROUGH ITERATIVE PROCESSES

One of the challenges is getting students to work iteratively through deepening and reflective processes. The compiled desk research showed that the idea of games being characterised as a form of magic circle is challenged by the computer game World of Warcraft. In WOW some of the reflective and analytical activities are not associated with the gameplay but instead with activities outside the game, i.e. outside the magic circle. In the design workshops, the teachers are concerned about whether it is possible to design these mechanical stops where the students are pulled out of the learning game with the aim of having a meta-strategic discussion of where they are going academically. One of the teachers describes this in the following quote:

Example 15
"Well, try to look here. What is important is to be able to see those deepening processes. How do we create the pockets where we pull them out of the game, away from the game. Discussed in some recesses. Back in the game."

Here, the teachers discuss the need for students to be able to move back and forth in the structure of the game. The development of a building means that the students need to create an iterative process between their design and the analytical concepts.

Example 16

Teacher 3 – "If it is so that I now have level 4 here, and then I imagine there are many more. Then I would like to draw such a conclusion that everything refers back to values [...]"

Teacher 2 – "That is what I say if it (red. quest) comes as a repeat. Then it will be the same. We will have to pick it up. Without going back."

Teacher 3 – "Yes, and that is exactly what it is. To create value, along with it, it provided a design perspective. A concept. But I might as well leave it there [...]. It then gives a new concept."

It is thus crucial that the students do not perceive the quest structure as a linear framework where they do not stop or fail to jump back to previous levels. One of the teachers speaks about how the game needs to be able to force students into iterative loops through the gameplay's structure and setting: *"Could there be some depth in forcing them back?"* As a result of this discussion, several new reflection quests are added to the game in the second and third iteration to support students' immersion in their projects. In addition, a new mission is developed in the third iteration, in which the students must prepare a strategic coding of all their analytical material, in order to discover new links, contradictions or challenges they have not yet found answers to.

10.2.4. PLANNING AND MANAGEMENT

Another issue the learning game entails is the students' ability to plan and structure their projects. The structure of the game makes it difficult for students to draw up a schedule for the project. As they do not know the content of the individual levels and the scope of the assignments, they find it difficult to see how they will meet the overall deadlines of the semester. The students themselves point out in their design workshops that some clear markings of how much progress they need to make regarding specific important dates are necessary. When testing the first iteration, it turns out that the students are working slower than expected, which causes them to fall behind in relation to the general semester schedule. In addition, on an inspirational tour planned by the teachers, several groups do not have the necessary missions as they have not achieved enough levels. Thus, there is a design challenge in securing the learningprocess. One of the teachers also points out that the students have difficulty in dealing with an open and iterative process as the game prevents them from defining a schedule.

Example 17
"They also have, they really have a hard time, now when you say planning, so they really want to plan, and they really have a hard time with this, such as planning a process that cannot be planned. Because it is two steps forward and five back[...]. And then they'd rather just say,

now this is what we have [...] so the schedule becomes at some point more important than the product they are looking for or they do not have the courage to just wait, and then it may be that you only stay a few days behind, but then you catch up."

The teachers here are divided in their attitude about whether the learning game must allow the students to work with their traditional planning and management tools. One of the teachers argues that because the first phase of the semester deals with the development of a building, unnecessary frustration is created when the teachers maintain the requirement for the use of planning and management tools.

Example 18
"But they have also been frustrated in the process by having to make a schedule for such a period. They do not know where they really are going, nor do they know how long things will take, nor can you schedule them. You cannot schedule a design process, it is really really hard, and then they end up making some decisions based on something with some time instead of some of the other elements."

Teachers agree to let the game guide the student planning through a link between the achievement system and the level structure. The following discussion shows the thoughts the teachers have regarding this problem, where the concerns about the controlling nature of the learning game fill in the argument.

Example 19

Teacher 1 – "but vice versa, it is time, because the different levels are…"

Teacher 4 – "Yes, well there is no need to spend time on that."

Teacher 2 – "Yes it (red. the game) leads them on their way."

Teacher 4 – "yes there is no reason for them to spend time getting frustrated that they are behind in a fictitious schedule anyway, in the process. There are many other things that they needs to do. There are many new things ahead."

Teacher 2 – "Yes."

Teacher 4 – "and they have made a thousand schedules, they probably should, they have learned. "

Teacher 1 – […] "I am so indifferent, [teacher 3] could just observe that the learning game guided the first three weeks [...] [teacher 3] said *that scheduling for the first three weeks, I do not have to deal with it because the game controls it. And we do not see any schedule either, but conversely, that may not be necessary either because they follow a game where you work through it. So you can say in that way the game goes in and takes over a little bit, now you said to go to B and then back to C and so on ..."*

Based on this discussion, the learning game's achievement system is changed to include several milestones that help define how far the students need to be concerning specific dates that align with the semester schedule.

10.2.5. THE CONCEPTS OF GAMES

During the design workshop, there is one question that is repeated over and over again, namely whether it is necessary to use keywords and concepts from computer games to describe activities within the learning game – is it possible to take the game out of the game? In the following quote, a teacher questions one of the game concepts: *"May I be allowed to tease you a bit and then ask why it is called dungeons?"* The concern over maintaining gaming rhetoric in the educational learning game is that of creating some frustration and irritation, especially in the older students who are not digital natives when it comes to computer games.

Example 20

Teacher 1 – "and this is where we are challenged."

Teacher 2 – "we can lose a lot here (red. students)."

Teacher 1 – "and therefore we may be challenged a little by the concepts."

Teacher 2 – "I agree."

Teacher 4 – "Also, because if there is someone asking me for an explanation of what a dungeon is, then I might have a little trouble with it."

Teacher 3 – "Could you soften it up?"

Researcher – "well you could easily call it a scenario, mission…"

Teacher 1 – "well it also has its strength."

A part of the challenge is that none of the four teachers themselves are gamers or have any experience in playing computer games. They are therefore completely foreign to the gaming concepts themselves and therefore experience vulnerability in answering any questions from the students about the game's rhetoric and significance: *"But then I do not have all those expressions and all such things from the gaming world."* The discussion between the teachers means that several of the game's concepts are changed to words that match a language used, according to the teachers, in the traditional rhetoric of a project – for example, "dungeons" is changed to "missions", and "achievement" is changed to "milestone". Further, the questionnaires in the second iteration are changed so that the students have the opportunity to tick off how many hours they play computer games for, their age and previous profession. The result of the division into these categories shows that contrary to the teachers' expectation, the craftsman aged over 25 who does not play computer games is most positive about using

	Mean	**Median**	**Variability**	**Low** (1-3)	**Middle** (4-6)	**High** (7-10)
All	5,6	6	1,8	12,5	56,3	31,3
Under 25	5,4	6	2	20,7	48,3	31
Between 25-30	5,8	6	1,3	0	63,6	36,4
Over 30	5,8	6	1,3	0	75	25
Craftmans	5,5	6	1,5	11,1	63	25,9
Student	5,6	6	2	16,7	41,7	41,7
Under 10 hour	5,4	5	1,9	11,5	61,5	26,9
Over 10 hour	5,6	6	1,3	11,1	55,6	33,3
Never	5,9	6	1,7	15,4	46,2	38,5

Table 4 – The students' experience of the extent to which levels have been motivating

	Mean	Median	Variability	Low (1-3)	Middle (4-6)	High (7-10)
All	6,0	6	1,6	8,3	45,8	45,8
Under 25	5,6	6	1,8	13,8	44,8	41,4
Between 25-30	6,5	7	0,8	0	45,5	54,5
Over 30	6,6	6,5	1	0	50	50
Craftmans	6,4	7	1,2	0	48,1	51,9
Student	5,3	6	1,8	25	41,7	33,3
Under 10 hour	5,8	6	1,7	7,7	46,2	46,2
Over 10 hour	5,8	6	1,2	11,1	55,6	33,3
Never	6,5	7	1,3	7,7	38,5	53,8

Table 5 - The students' experience of the extent to which quest has been motivating.

the educational learning games. Tables 4 and 5 below show the percentage distribution of the students' answers to the question of (1) the extent to which the concept of levels has been motivating, and (2) the extent to which the idea of achieving new quests has been motivating.

The fact that none of the teachers themselves are familiar with the experience of playing computer games thus has a bearing on the attitude they have towards the learning game. There is a scepticism about the game's competitive elements, as well as the hidden and indirect reward mechanisms. Several of the teachers say that they would never be able to capture a game thinking themselves, including working that way:

> ***Example 21***
> *"[…] And the gaming part, and that is just a personal reflection. It will never be something that drives me, and I think there are also some of the others in the class who do not have that drive either. "*

Example 22
"[…] Like you said yourself, and I feel even with those who play the game. It becomes play, and we may not take it very seriously and thus I just think that you do not get down to that deep level of reflection because you are continually driving, or chasing points. Because now it just gets a little fun instead of being something that we need to use."

Example 23
"To say it as it is, you cannot motivate me."

Teachers are particularly concerned about how to ensure that it is not playing the game that becomes the primary focus of the students. They repeatedly talk about the need for the game's content to be rooted in a professional context: *"How is this grounded in a profession? Thus how does the profession take over? Instead, it is Game-Based Learning that has taken over."* One of the teachers also questions whether it should be called a game at all.

Example 24
"So can you have a game in the hidden, without discovering it? So they might just think it is a course of instruction."

Common to the design workshops is that the teachers keep challenging the game mechanism that characterises Game-Based Learning by brainstorming whether it is possible to incorporate gaming mechanisms indirectly and concealed in learning designs.

Example 25

Teacher 4 – "I would be glad if we tried to test it without points."

Teacher 2 – "Yes."

Teacher 4 – "Because then we let go of the game thinking, so that no one stops because it is too silly and they can´t take it seriously."

Teacher 2 – "yes it could be very interesting."

Teacher 4 – "So we can control them, in the same way, but without necessarily getting points for it. But will they then do all those little tasks?"

Teacher 1 – And can we call it something other than, that is, it should be called something.

Teacher 4 – "it is just the way we do it in fourth semesters, and then do not tell them what it is all about. And call it something straightforward."

The game's allocation of points in particular raises a concern about the students making decisions based on game priorities rather than academic depth.

> ***Example 26***
> *"Can the points cause them, just as you said, to make quick decisions and not get into an immersion?"*

> ***Example 27***
> *"Where are the qualities of each level, and each decision for progress? Is it speed, or is it deepening?"*

One of the teachers, in particular, expresses a definite attitude towards Game-Based Learning as what constitutes an increased motivation in the students: *"For me, it is a bit of a declaration of failure that it is Game-Based Learning that should motivate."* In the last interview, however, the same teacher is far more positive and explains in the next quote how he has changed his mind over the three iterations.

> ***Example 28***
> *I have. I probably have, yes. I have. Understood this way, that especially this year I have been able to see how good a tool it is when we are not present as much as we would like. Everyone I have talked to has stated that it was a tool that helped them work independently. Some of the way. So that scaffolding, the step by step that really much of our basic education is built around, helps to support the fact that we keep building up a new layer – or step by step. So in that way, I actually think it worked. I have sometimes been a bit critical because I may have thought it was too controlling. But I also think that, as I have told you, when [teacher 3] and I teach then we are also controlling, then it is us they code, now it is just a game.*

Despite a great deal of scepticism at the beginning, the teachers are far more positive after the third iteration. This change is influenced by the fact that the teachers in the last iteration are much more integral to the design process and thereby take ownership of, for example, the quest design according to their field of study. In the next section, the teachers' thoughts about the importance of everyone in the team who is actively involved are elaborated.

10.2.6. COLLABORATION BETWEEN THE TEACHERS

The teachers point out that a prerequisite for Game-Based Learning being successfully incorporated into a larger semester project is that the team actively participate in designing the game and to some extent are familiar with the game mechanisms.

Example 29

"We could see, not this semester, but the previous semester, where not everyone had given input for these assignment descriptions, The teacher of engineering, for example. That it was not, it did not have priority in their final products. So it takes really great collaboration from all of us so that we get the tasks, I almost have to say, at the right times in the right order."

In the following discussion between two of the teachers, it is emphasised that the teachers' conversion of their professional field into a game design entails several positive conversations about the order and depth of the academic elements. These discussions provide a more enhanced understanding of how the individual teacher supports the students' learning, and in this way how the teachers through joint planning can strengthen each other.

Example 30

Teacher 2 – "I think it was really nice what we did at the beginning of the semester, that we just put all those cards out on the table and discussed, well where to put it."

Teacher 4 – "and we placed all these dates on, according to deadlines for the different things, we have never done that before."

Teacher 2 – "but it could actually be desirable to say that we lacked actual construction and the engineering element because it could be desirable, especially with the engineering element, to have a teacher in engineering. There must be something about the course in engineering that could work well there. So you could try to make it again for the start of the semester. Put out all the cards and see all the professionals join."

Teacher 4 – "well that would change."

Researcher – "So somehow make silent obviously? The silent knowledge of when to do things suddenly becomes clear because now there are some physical cards that you move around."

Teacher 2 – "but if you want interdisciplinarity, well then it is also important to know, well what you are talking about. What does the course in engineering really have to focus on, because then I can support it."

The tacit knowledge of the teachers becomes explicit through game development, which results in an experience of safety in the teaching situation itself. The argument is that the pre-planned game design gives a unique knowledge of the entire semester's sequence.

Example 31

Teacher 4 - "well, it is a bit like we have been talking about, the fact that we can [...] they are safe in it, but so are we, or at least I have been this time. Because I know exactly what there is in those envelopes, I have helped plan it all. So I dare release them, I would say."

Teacher 2 – "I actually think it is important for teachers to know what is in the envelopes. That is how it was going to be because it has been really reassuring. At least for me, as a teacher."

A prerequisite for the teachers to participate actively in game development is a particular experience and knowledge of the semester. The teachers point out that it will be challenging to prepare quests and quest structure as part of an overall game strategy unless there is in-depth knowledge of the entire content and purpose of the semester.

Example 32
"But it also requires that you know the semester and that you know the content and courses of the semester because when we started, we had to find out the words and exactly where to place them, which order worked best [...]. So it requires that you know the course."

The development of educational game design is in itself an iterative process that requires multiple runs and formation of experience before the optimal combination of professional content and game mechanisms is in place.

10.3. SCHEMATIC OVERVIEW OF THE ITERATIVE CHANGEs

Based on the above analysis, the following table summarises the changes within the game created through the design workshops with both the students and the teachers. The specific changes in the quest structure are detailed in Appendix D.

Iterative changs in version 2 of the learning game	
New placement of quest in the levels	Individual quests have been moved back and forth in the level structure, based on the data collected through the first iterations. In addition, new quests have been created based on the feedback from the students and the wishes of the teachers. These changes appear in Appendix D.

Several quest dependencies are added	Selected quest dependencies are added to ensure coherence between the indi-vidual quests related to the semester project
The term “dungeon” is changed to “mission”	The concept of a dungeon is replaced by the term “mission” to reducing gaming rhetoric in the learning game.
The game has been added group quest	New group quests are introduced to support the students collaborating on the activities of the learning game. These aim to ensure that the quest with a focus on reflection and discussion points appears as group work.
The term “achievement” changes to “milestones”	The concept of achievement is replaced by the concept of milestone, to reduce the importance of gaming rhetoric in the learning game.
Increased focus on start-up	The number of weeks has been reduced in the project phase so that the students must work in a more concentrated way. The data collection, therefore, focuses more on the early weeks of the project phase in particular. At the beginning of the semester, entire working days are blocked, so the students have the opportunity to work explicitly with the learning game. In addition, several new questions are added to the questionnaire. These questions focus primarily on the start-up of the project. These questions are only added to the final questionnaire.
Several of the technical professional quests are advanced in the quest struc-ture	Quests with a focus on technical aspects are advanced in the quest structure to ensure greater professional depth within the more technical topics. This decision is made to support the students in working increasingly with integrated building design.
The subjects “technical installations” and “engineering” have contributed with new quests	It has been a goal that everyone in the team actively participates in the development of the learning game so that all topics in the semester project are supported by the learning game. Therefore, especially the teachers in engineering and technical installations have developed a set of new quests that represent their professional fields.
Bazar quests have been removed	These quests are no longer included in the learning game as the students pointed out that they were not meaningful to their project. Neither of the groups contributes to the content of the bazar

New types of achievements have been added	The list of achievements has been changed to support the students' scheduling in the project more efficiently. The focus of the new achievements is to help the students figure out when to reach certain levels and thus not fall behind according to the semester schedule.
Reduction of missions, as well as ad-vancing the remaining missions in the level structure	Several missions were deleted as they did not contribute sufficiently to the students' academic. In addition, the remaining missions are moved to the first levels, so the students begin with their analysis earlier in the process.
The quantitative questionnaire measures on an individual level	Three new categories are added to the questionnaire to support the desire to explore the importance of the students' background, age and experience with computer games related to their perception of the learning game.
Iterative changes in version 3 of the learning game	
The number of quests and levels is reduced	Students only work with the game for three weeks compared to six or seven in the previous two iterations. In contrast, they do not have any scheduled lessons – the game alone facilitates their learning process. The teachers visit the classroom regularly, but only for guidance.
Further reduction in the number of missions. "Mission of code" added	There has been a further reduction in the number of missions due to the reduced time. The purpose is to create space for adding a new mission focusing on strategic coding of the students' analytical work.
Reflection workshops, as well as reflection quests, have been added	Reflection days where the teachers guide and assist the students through reflection activities have been added to support the students stepping out of the "magic circle" and taking a meta-perspective on their project. The students then return to the game. Several new reflection quests have been added to the game in order to increase the focus on reflection.
New placement of quest in the levels	Individual quests have been moved back and forth in the level structure, based on the data collected through the first and second iterations. In addition, new quests have been created based on the feedback from the stu-dents and the wishes of the teachers. These changes appear in Appendix D.

CHAPTER 11. ANALYSIS AND FINDINGS

This chapter presents a synthesised analysis of the students' experience of working with Game-Based Learning. The purpose of this analysis is to create a meaningful coherence that shows (a) how the described goal is achieved, (b) that the project focuses on the described dimension of the content, (c) that methods and the representation of practices correspond well with the espoused theories, and (d) that findings can be linked to literature based on the research focus presented (Tracy, 2010). According to Tracy (2010), this does not mean that a project cannot appear messy, disturbing,or unexpected in the process.

The analysis is thus structured through the following three main sections, Motivation & Autonomy, Reflective Practice, and Analysis & Exploration, as the three through-going themes that bind theoretical perspectives with the design process and that ultimately give the analysis structure.

The analysis has been prepared through abductive reasoning, as described in Section 9.3, where this Section presents a summary of the synthesised results and the findings. The analysis of the empirical data focused on the students' experiences is primarily based on the third and last iteration. The quantitative data include only the third and last iteration.

The analysis is supported by representative statements from the students derived from the transcribed data. As described in Section 9.1.1 and 9.3.1, it has been important, because of my insider profile in particular, to ensure that the students are fully anonymised throughout the whole research process. Therefore, students are not assigned a specific numbering in the transcription that makes it possible to identify the individual student. As described in Section 9.3.1, the analysis has, therefore, been focused on the importance of the number of statements. Based on that, representative statements have been selected where the following criteria have been weighted high: (1) comparable statements from different students; (2) overall tendency in the different project groups; and (3) statements repeated in all three iterations. To ensure clarity around these three criteria, each transcribed interview is assigned a colour code.

Similarly, in the abductive coding, no distinction is made between whether these are data from focus group interviews or reflective conversations, respectively. Data collected via observation are not part of the coding as they were solely intended to inform the interview guides compiled.

Each section of the analysis thus starts with a schematic overview of how many units have been found within each of the categories that characterise the specific section.

11.1. MOTIVATION AND AUTONOMY

The section Motivation and Autonomy examines the importance of the application of Game-Based Learning for students' motivation and thus autonomous behaviour. The table below presents a description and definition of the categories found in connection to the subquestion of Motivation and Autonomy. The table shows the occurrences for each category according to the three iterations as well as a total sum. The schema ends with a list of the statements found through an axial coding of the categories (Charmaz, 2014).

Motivation and Autonomy					
Category	Definition	Iteration 1	Iteration 2	Iteration 3	All
Point	The students talk about the importance of the allocation of points in relation to motivation	9	28	67	104
Level	The students talk about the significance of the division of curriculum into levels, regarding motivation	7	14	24	45
Resistance	The student expresses discom-fort, concern, or a lack of moti-vation regarding playing the game	7	0	10	17
Meaningful	Experiencing the game content as meaningful in relation to the project	13	19	36	67
Playing the game	Starting to cheat, rearranging quests, creating new rules, etc.	3	0	8	11
Quest/mission	The students talk about the importance of quests and missions in relation to motivation	6	12	21	39

Fun-failure	The student talks about how the competitive element of the games motivates them	29	10	26	65
Autonomy	The students, based on the game, describe how they have taken responsibility for their project	1	0	12	13
Motivation	The students express discomfort, concern or a lack of motivation regarding playing the game	21	11	24	56
Evaluation	The students express their opinion about the game	15	18	39	72
Turns away from the game	Starting to follow and create their trajectories	13	17	56	86
The meaning of the educators	The students talk about how the role of the educators has influ-enced the motivation for the game	25	27	25	77
The following concepts are developed based on an axial coding of the categories. "Quests and levels as a catalyst for motivation." "Moving towards an autonomous behaviour." "Fun-failure creates persistent behaviour." In the following sections these statements will thus address the following sub-research action: A1 – Examining the importance of the use of Game-Based Learning for students' motivation and including their development of an autonomous behaviour.					

Table 6 – A list of all categories emerged from the coding process for Motivation and Autonomy.

The chapter will explore, in the first section, the significance of the game mechanisms quest and levels influence as a catalyst for motivation. The next section examines how the learning game reinforces the development of autonomous behaviour in students. Section 11.1.3 concludes with an analysis of how fun-failure affects student motivation, including the development of persistence regarding depth and being longer in the assignment.

11.1.1. QUESTS AND LEVELS AS A CATALYST FOR MOTIVATION

The idea behind the educational game is the vision of quest and level strategies supported by reward systems, and the use of cultural artefacts can stimulate motivation and autonomous behaviour. In the compiled desk research on Game-Based Learning, quests and levels are repeatedly described as motivational game mechanisms. However, the analysis of the collected data shows that the students do not unequivocally share this general view, which supports the criticism of Games-Based Learning solely resting on simple game mechanisms. In the data, the students point out that quests and levels are motivating when the activities have a direct impact on their project. It is thus not "questning" and the accumulation of points to achieve new levels that provide motivation, but rather the results of the activities and how they are perceived as meaningful in relation to the specific project. The quantitative data support this trend as the students indicate that quests contribute to increased motivation to a greater extent than levels (see Table 7).

	Mean	**Median**	**Variability**	**Low** (1-3)	**Middle** (4-6)	**High** (7-10)
Level	5.6	6	1.8	12.5	56.3	31.3
Quest	6.0	6	1.6	8.3	45.8	45.8

Table 7 - The students' experience of the extent to which quest and levels have been motivating.

The reason for this difference can be justified by the particular quest being perceived as meaningful to the learning process, whereas the students consider levels to be an instrumental tool. The following two quotes (out of 39) represent examples of the students describing how their motivation stems directly from seeing the activities of the quests contribute to the progress of the project:

> ***Iteration 2 – example 33***
> *"I am not motivated by the game at all, I have to admit, or levels for that matter. The design process motivates me. So for the progress that it forms, that is, the entire design until we decide on the final design. This is what motivates me because I also know that we need to continue in the programme."*
>
> ***Iteration 2 – example 34***
> *"So I want to say that I do not think that reaching new levels and collecting points and such, I do not think it motivated me to say that now we really have to work with this. It is still the process of the project or activities that motivates me to keep working on things. It is more so*

that you can see that something happens when we work with the game, then we arrive at something."

Although the feeling of motivation is primarily stimulated by the learning game being experienced as sense making, the data collected show examples that levels are also linked to motivation through inquisitive behaviour. It is a curiosity that is linked to a desire to reach new levels and thus get new tasks that can inspire further development of the project. A student describes how he is busy collecting points to gain access to new assignments:

Iteration 2 - example 35
"It actually motivates me more than I had expected. I had thought that it did not matter what levels you were in, but you are still curious to be allowed to see what is in the next envelope. So you count (red. the points) to see what it takes to be able to…"

The data of the PhD thus indicate that there is no evidence of quests and levels being intrinsically motivated, but instead, the motivation is stimulated through a holistic construction of the project concerning its professional academic content and context. It is, therefore, especially when the quest structure contributes to an experience of progress and coherence that the motivation arises.

Based on this, the collected data show that students discuss along the way how a specific quest is relevant and meaningful to the project – what Schatsky would describe as a discussion about "the way things matter". When activities (quests) are divided into levels, it provides the students with the ability to review the next step. It creates a form of flow where the students actively and critically select activities based on relevance criteria in order to reach new levels. The students thus adopt an autonomous approach to their learning process by criticising the significance and consequences of the tasks. Thus, based on a relevance criterion, they continually have reflective conversations about the context of the doings and sayings that a quest represents in regard to their understanding of the profession's practice they work with.

Where the amount and variety of quests contribute to the students compiling their learning trajectory, levels are used as the management tool that helps them navigate through the complexity of the project. In the following two examples (out of 45), the students describe how levels set a framework for the activities to create a link between the project's progress and the students' prioritising of quests:

Iteration 2 - example 36
"At first we talked about making all of them, but then we quickly realised that there were some who demanded more than others and then we also found that there were many. So that is why we had to say okay, what do we think is most relevant now that we still have to knock all this through?

So it became a priority. The levels it was run through, but it became a bit of a priority what we thought was most relevant, but also what we had time for."

Iteration 2 - example 37
"Levels, well, are what make up the timetable, guide how much progress we need. Because we have a goal of reaching a certain level at a certain time. So, therefore, in this way, you ensure the progress as you would otherwise have prepared through a timetable."

One of the design criteria for the developed prototype is that the game can be described as "successive phases" that have an emphasis on varied colours of quest activities organised as sequential structures. The data show that the students can combine and puzzle individual quests, which contributes to the creation of sequential structures as a form of "aesthetic experience". One student (out of 67) explains how the connection between the individual quest activities in the early process of the project suddenly becomes essential and creates a coherent experience:

Iteration 3 – example 38
"You could see that just as you opened level 1, 2 and 3, okay there is actually a meaning to the quest. It starts like giving a context. Also as (name) says, some of the quests require something first, so you have to make some first. Because if you did them (red. quest) in the previous levels, it would make sense in the future."

One of the students who labels himself as a gamer describes in the following how he experienced the learning game as a journey from A to B through the project as he knows it from traditional computer games. He argues that the learning game allowed the students to create a personal learning trajectory:

Iteration 3 – example 39
"But that is what I have actually thought about afterwards. Also, if you play a little computer, well then you can see how it makes sense. It is very much like playing because you can see that you have to go from A to B, you can do it in a variety of ways, and then you can choose your own. I do not know; it just suited me really well. Because you know roughly what is going to happen. But you can still choose what you want yourself. So some things are decided and yet not. I liked that at least."

The students speak in this context about how levels contribute to a natural workflow with the activities they would usually have dismissed. Level thinking thus allows the students initially to consider only smaller parts of the process, which forces them to consider activities they would not usually see the purpose of. This breaks the students' normative behaviour and forces them to consider types of tasks that they cannot immediately see the relevance of. One of the students says that the division into levels meant that they could not avoid soft activities (red. activities with a predominantly humanistic and aesthetic character).

> ***Iteration 2 – example 40***
> *"We had quickly dismissed it (red. quest) and taken everything we thought was fun. Dismissed all the soft ones but now you are just forced to do it in a particular order."*

The relationship between quests and levels can be found in the point allocation triggered by the game's various activities. The dynamics of the game are thus dependent on the students being motivated by the selection of a quest to accumulate points to obtain new levels. Again, the students (104 statements) express how awarding through points was not in itself motivating, but rather a means of gaining new perspectives on their project. The point assignment, through quests and levels, therefore, influences which activities they are solving, causing the students to break with normative thinking. One student describes how collecting points created *"a guided path to what quest we should do"* (iteration 1). Another student explains that they had opted out of certain activities if they did not depend on a certain number of points to open up new levels.

> ***Iteration 2 – example 41***
> *"It also does not really motivate me personally, those points, but it still requires us to do a certain amount of work that we can really use in the end. But there were some deselections in the activities that we would have chosen if we hadn't had to reach the points.*
> *The students point out that point allocation acts as the driving force for exploring the many quests, as the accumulation of points triggers new levels and thus new quests that ultimately contribute to better learning."*

> ***Iteration 3 – example 42***
> *"That is because, I think, even though it is a game, it is about getting a lot of points and stuff. Then it is still something that we will need later, and it provides something worthy and a better product. We will benefit more later by getting more points."*

> ***Iteration 3 – example 43***
> *"Well, in my head, for us the only reason we went for the points was really to be able to open new envelopes and get some new tasks that could be exciting. We also felt we could learn something."*

The point allocation of the game influences the students' choice of activities. The individual quests are weighted by the teachers in relation to each other based on criteria such as relevance, timeliness, importance, substance, etc. This difference in the value of the quests is used by the students as a catalyst in their discussion and argumentation about which quests they qualify as being relevant to their project. The following two quotes describe what considerations the students make based on the points assignment of the quests.

> ***Iteration 2 – example 44***
> *"Yes, maybe it also seems more relevant to decide from points because those who are most relevant are probably indicated in the sum of points. Then we created the ones that give the most points, even if it is the most relevant content."*

> ***Iteration 3 – example 45***
> *"Yes, in that way. I think if there was one of the quests that gives 50 points and there is a quest that gives 400 points, then I think for sure the quest to 400 points. Because there is some substance in it or something that is somehow important to the project."*

If a learning game is to contribute to increased motivation, it is crucial that game mechanisms such as quest and level strategies supported by reward systems constitute a holistic context that is meaningful to the context. In particular, it is the students' opportunity to select and combine the individual quests cross-cutting through a curious behaviour that seems crucial to motivation.

11.1.2. MOVING TOWARDS AN AUTONOMOUS BEHAVIOUR

Based on one of the sub-research actions, it is important to understand how the learning game, through quests and levels, affects student motivation during the project. In the responses of the descriptive quantitative data, there is an immediate tendency that the students do not maintain an experience of quests and levels as the driving force. The students' responses to four identical questionnaires during the three weeks show a declining trend in the importance of the extent to which quests and levels contribute to motivation (see Tables 8 and 9).

When asked about the significance of levels as a motivating factor, the mean is 6.8 for the first measurement, which drops to 2.4 for the last and fourth measurements, which is a decrease of 64.7% (Cohen's D of 3.07). The percentage decrease is highest towards the end of the phase (see Table 10).

The same trend applies to the question related to the meaning of quest as a motivating factor (see Table 10). For this question, the mean is 6.8 at the first measurement, and drops to 2.7 at the last and fourth measurement, which is a decrease of 60.3% (Cohen's D of 2.44). The percentage decrease here is also highest towards the end of the phase.

However, it is essential to note that the students' final assessment of these questions measured after the end of the course is not below the value of the second measurement.

Level	Mean	Variability	Low (1-3)	Middle (4-6)	High (7-10)
Measurement 1	6.8	1.9	2.1	43.8	54.2
Measurement 2	5.1	2.3	22	46	32
Measurement 3	3.9	2.4	41.3	41.3	17.4
Measurement 4	2.4	1.4	77.1	22.9	0
Final Measure-ment	5.6	1.8	12.5	56.3	31.3

Table 8 – The students' experience of the extent to which levels have been motivating.

Level	Mean	Variability	Low (1-3)	Middle (4-6)	High (7-10)
Measurement 1	6.8	1.7	4.2	37.5	58.3
Measurement 2	5.3	2.1	20	46	34
Measurement 3	3.8	2.2	41.3	50	8.7
Measurement 4	2.7	1.7	66.1	31.3	2.1
Final Measurement	6.0	1.6	8.3	45.8	45.8

Table 9 – The students' experience of the extent to which quests have been motivating

Also, the students indicate that quests contribute to motivation for longer than levels.

Table 10 – The table shows the critical percentage difference between each measurement, as well as the difference described through Cohen's D

The explanation of the quantitative tables can be found in the qualitative data where the students explain this tendency. The students talk about how the learning game,

	Between 1 and 2	Between 2 and 3	Between 3 and 4	Between 1 and 4	Between measurement 1 and the final assessment
Levels					
Critical difference in percentage increase (+) or decrease (-)	-25%	-23.5%	-38.4%	-64.7%	-17.6%
Cohen´s D	0.92	0.49	0.79	3.07	
Quest					
Critical difference in percentage increase (+) or decrease (-)	-22%	-28.3%	-28.9%	-60.3%	-11.7
Cohen´s D	0.79	0.69	0.59	2.44	

especially at the beginning of the project, supports their process. The students describe how the learning game helps to gain structure early in the process, which creates a good start for the project. It also points to an experience of getting into the academic content of the project faster than experienced in previous semesters.

> ***Iteration 3 – example 46***
> *"It helps to get some structure and helps to give some ideas and guidelines to follow. And it really worked fine in the beginning. So it has really helped to provide a good flow even if you are stuck. Then you could look at the next tasks."*

> ***Iteration 3 – example 47***
> *"So it worked very well that you had something to work from. Many times we have been several weeks into the semester without knowing what the hell we are going to do."*

> ***Iteration 3 – example 48***
> *"And plus it is the start of the semester, it is hard to get started. And then the game actually got us going because of the points in it."*

At one point, the project takes over as the primary motivating factor that supports the notion that the idea of achieving new levels, in particular, makes sense to the students as long as they are uncertain about the direction of their project. Once they can define the way and thus the content, they no longer need to achieve new levels.

Iteration 2 – example 49
"But it is also because we like Game-Based Learning because it is a good start, after all, it is an insanely good start to all that, but as soon as you are ready to go, we know what to do."

Iteration 3 – example 50
"It may be a bit related to the fact that in the beginning, there are more of the tasks that you have to do and the further you come, the more selective you can be. Then you are not so guided by it anymore and therefore not so motivated."

Iteration 3 – example 51
"It helps with a good start, where you follow it a lot at the beginning and then as time goes by, you might walk away from it more and more. But if you look in the envelopes to see what is in there, then some of it (red. activities) you work with. Some of the parts made you much more selective as time goes by, but I also think that it is when you get into your own project."

The qualitative data show that the students maintain the quest thinking for longer, but more as a form of inspiration. In addition, they open up envelopes from levels they have not earned enough points for, to have a look at the quest inside to find inspiration as a form of verification of the thoughts they have for the project as it takes form.

Iteration 3 – example 52
"So in that way, the priority disappears over time. And when we hit a bit of a drought period where we had finished some of all these parallel tasks (red. activities not initiated by the game, but by the student) we returned to the game a little bit to get some inspiration to move on again."

Iteration 2 – example 53
"I think it was when the shape of the building was born. There we had a break. And then we got a challenge, and then we tackled it (red. the game) again."

Iteration 2 – example 54
Now we use the game to look, you know, to see if the cards will give something to our project.

Thus, there is a tendency for students to find themselves in an autonomous role as the difficulties and uncertainties of starting up the project disappear. Several of the students talk about how the learning game at the beginning of the course controlled the process, and as the projects start to take form, it is more and more the students themselves who control the game.

Iteration 2 – example 55
"But then we use the cards more to see what we can use in our task instead of, maybe, at the beginning where we just played it to see where it led us. There has been like it (red. the game) controlled us, and now we control the game."

The students point out that they move away from the game as the motivation for the projects pulls them in – their desire to find their learning path. One of them talks about how they are working more and more towards higher independence in their process:

Iteration 3 – example 56
"Yes, exactly, so that you discover some things, and then you actually start working more and more towards an independent process."

Iteration 2 – example 57
"But I also think that now that we have got, we have at least decided on a form for the building, and I think as soon as we have that shape. I think so much energy will come from ourselves, that we really just want to go our own ways and not follow the quests so much. Because now we are just engrossed in having it, and that is that."

Thus, a clear trend is seen in the qualitative data as the students' motivation for the learning game decreases as they develop an autonomous behaviour and approach toward their project. Thus, the quantitative data cannot be explained by a logic that students do not perceive it as meaningful and motivating to work with Game-Based Learning unless the learning game is limiting the students' ability to adapt and change the activities concerning their projects (see Figure 64). This is also supported by the fact that on the questions about quests and levels as motivation-enhancing elements, it is seen that the students' low assessments at the end of the course do not match their final assessments (see Tables 7 and 8).

11.1.3. FUN-FAILURE CREATES A PERSISTENT BEHAVIOUR

The desk research points out that much of the motivation generated by Game-Based Learning stems from the game's natural competition element and the idea of fun-failure. However, the collected data show considerable variability in whether students state that the desire to win and receive rewards is what drives them through the game. Thus, it seems to be a very personal question, which is shown by the considerable variability in the quantitative data on the question of "how much has the idea of achieving new levels generally motivated you?" The variability also appears across the groups (see Figure 65). The students who indicate that they were motivated by the desire to win say that their motivation for the project was nurtured by consistently achieving small victories.

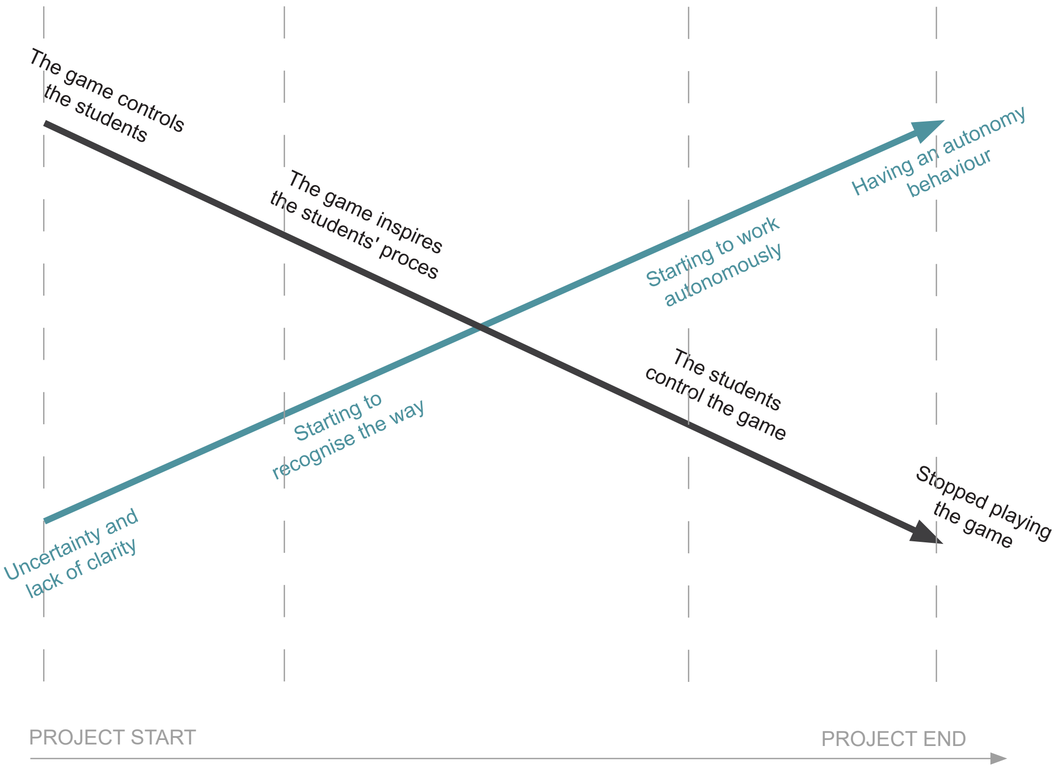


Figure 64 – Illustrates how an increased autonomy results in the students dropping out of the learning game.

> ***Iteration 1 – example 58***
> *"Yes and get fast, you know, get those small victories all the time."*

> ***Iteration 3 – example 59***
> *"So it probably does, at least in the beginning, because you can have some points or what to say. At least I am reasonably competitive with something like that. It kind of sets fire to me, that is like, okay we need some points."*

Other students are more driven by the excitement of the unknown element of not knowing the content of new levels. Thus, the learning game stimulates a natural desire to explore and examine the academic elements and the interrelationships of these subjects.

> ***Iteration 3 – example 60***
> *"hen it was also exciting that you did not know what was in the new envelopes and such."*

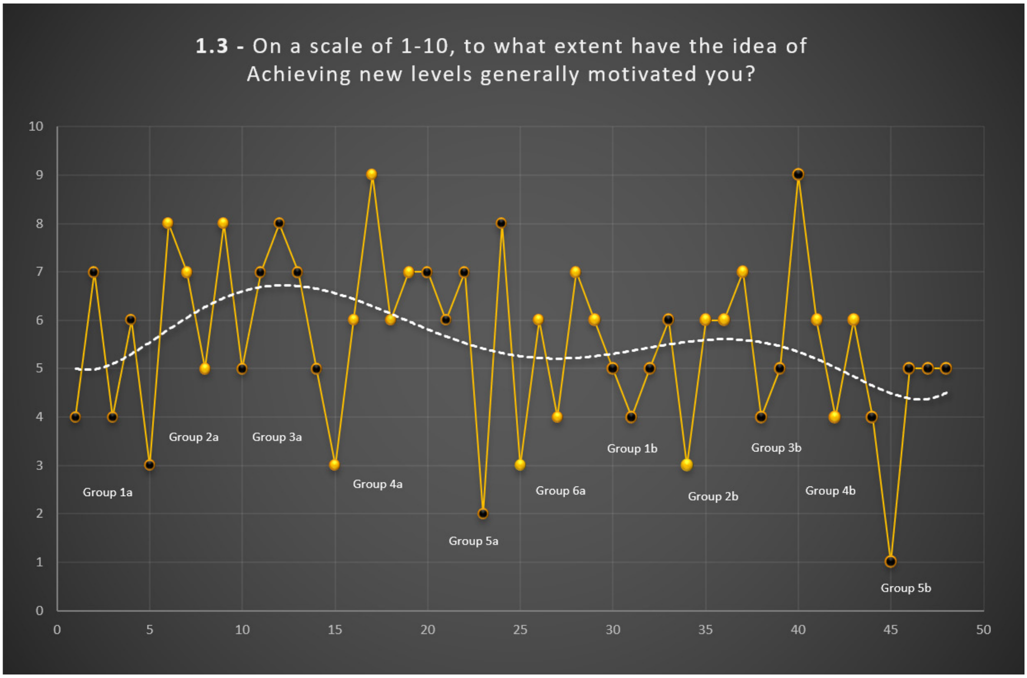


Figure 65 – The dot diagram shows the personal answers, including the deviations regarding the mean with a variability of 1.8.

Iteration 1 - example 61
"I also think it was exciting not knowing what was coming, that is, the secret where you continually think "now what's coming in the envelope?" It was exciting."

In addition to a general motivation related to the desire to work with the semester project through a learning game, the data material also shows a motivation that leads to increased persistence towards the activities. There is consensus among the students (65 statements) that the game's scoring system, in particular, contributes to greater persistence in the scope of their project material. In the following quotes, students describe how they see that there is a correlation between the number of sketches, models and shapes they created for their building and the point allocation. So basically, the more points they got, the more project material they had to work from.

Iteration 3 – example 62
"We would not have created so many sketches if we had not got those points. We would have created like 50, and then that was that, and we were like "now we cannot anymore". But these points, they forced us to do something more."

Iteration 3 – example 63
"Yes, because when we started sketching, we had an idea of what the "body" was going to look like, but still, we were still drawing because you got points."

Iteration 3 - example 64
"But the approach has been different because we wanted to get some missions and get the points to get levels. So we also spent time reaching different forms, and the motivation was probably "the more forms, the more points we got". That is why we worked insanely to do many sketches and Lego models. Because the idea was that we got more points out of it."

The idea of farming and crafting elements requiring finding objects or ideas as a prerequisite for achieving a more distant goal contributes positively to a sense of motivation by creating an aesthetic experience. Combining crafting and farming activities with quests in particular is thus a way of controlling the learning objectives through sequences of explorations that tie it all together.

The students themselves point out that it was the learning game that was absolutely essential to this trend. The students argue that they would not have created the same amount of sketches or text if they had not received points for their efforts along the way. On top of that, they can see that they did work longer with each activity, which gives them a feeling of depth in their understanding of what they are working with.

Iteration 3 – example 65
"Yes, it is probably better. If you have to make 100 sketches, then you do not do it. Then you maybe do 25 or something like that and would not bother to create anymore. But if you get points, you get closer to the 100."

Iteration 3 – example 66
"Well also, when you got points, for example having 100 words, well then you got x number of points. Well, then you can just write something more, and then you get more in depth with things and get more of a background understanding of what it is."

Iteration 3 – example 67
"So you are quite keen on actually beating the others. Thus, reaching the highest level. So in that way, it motivated you. You always had to get a lot of points, which is why you pushed to do the assignments where you got, let's say, 10 points to write 200 words, well you just wrote some extra. And researched it and spent a little more time on it to get a few more points."

This means that the learning game's quest and level strategy supported by a points system creates a kind of fun-failure approach with increased student persistence, which gives greater depth and breadth in the project material. However, the data show that it is not only points that trigger extra effort. In the next example, a group of students discuss how they choose to work a little extra to reach one of the game's deadlines that triggers an achievement.

Iteration – example 68

Student 1 – "I think it was good, let's just talk about that achievement that you had to finish by a certain date because then you got x, so some more points. It also made you stay here longer in school."

Student 2 – "Yes, exactly, yes, that is right."

Student 3 – "Yes, where you actually worked a little more because you were motivated because you wanted to have it."

Another critical factor that students point out is the intensity they experience in their group work while working with the learning game. In the following example, one of the students describes how the game's competition elements lead to a high and serious work ethic that results in an efficient and productive working process.

Iteration 3 – example 69
"When we were here, so it was somewhere pretty serious, and if you just had to reach the two normal pages, as fast as possible, well, I think it was more that it was a little intense. So now that video is done and then next, and now that task is done and then hurry to get points written, what is next. There was a lot of such efficiency during that time."

Several of the groups also point out in the focus group interviews that they are surprised by how much material they produced in the first phase of the semester when they were working with the learning game.

Iteration 3 – example 70
"Yes, there we had approx. just as much material as we had in the rest of the project, so at least in PowerPoint, it filled in just as many slides."

Iteration 3 – example 71
"I do not even know that, because of the bulk of all our documents and all that stuff. They are actually in the design phase. It is also clear that there are many ideas on the table, but we can still see that half of our document is from the design phase."

The high intensity that the learning game creates has a positive effect on the students' motivation and willingness to work with this phase of their project – a phase that many of the students have not previously found interesting. One of the students describes in the interview how he has subsequently thought that the class's absence seems to be significantly smaller while working with Game-Based Learning, which he attributes to the game's novelty value and generally to being allowed to work in a new way.

> ***Iteration 3 – example 72***
> *"I know it is hard to come up with such a generalisation, but I think it seemed that there were fewer people who had been absent at that time. Now we can also say that for our own group. I do not remember many days of absence at all. So it was something like, it is new, and it was interesting and people were jumping into it. And showed up or what to say."*

Game-Based Learning can contribute to increased motivation and autonomous behaviour when quests and levels are used in a way that is meaningful to the professional context. Increased autonomous behaviour is especially strengthened by the game system being based on a flexible approach that allows the students to organise their learning trajectory themselves. In addition, the game supports the notion that the students on their own initiative have control over how and how much the learning game is used in their project process. The use of reward systems contributes to increased motivation and persistence when students find that the amount of project material has a bearing on the quality and depth.

11.2. EXPLORATION AND ANALYSIS

The section exploration and analysis examines the importance of the application of Game-Based Learning for students' ability to explore and be analytical within their projects. The identification of problems, academic thinking, data and knowledge collection, evaluation and assessment, asking questions, discussions and argumentation are some of the elements that characterise the "cognitive scaffold". The activities of the cognitive scaffold are, in particular, based on principles that create depth in the learning process through an experimental and investigative approach. Thus, through the activities of the cognitive scaffold, the PhD project aims to create an authentic representation of a given practice by presenting the students with assignments and challenges focused on specific practices within the profession. The table below shows the description and definition of the categories found in connection to the sub-research action of exploration and analysis. The table shows the occurrences for each category according to the three iterations as well as a total sum. The schema ends with a list of the statements found through an axial coding of the categories (Charmaz, 2014).

Table 11 – A list of all categories that emerged from the coding process for exploration and analysis.

Exploration and Analysis					
Category	Definition	Iteration 1	Iteration 2	Iteration 3	All
Idea generation	The students talk about a different method for de-veloping ideas, and what significance it has for the project	15	23	39	77
Facilitating	The students talk about what influence the educa-tional game has on their ability to facilitate the lear-ning process	20	64	77	161
Visible process	The students talk about how working with the educational game resulted in a visible pro-cess	0	11	12	23
Start-up	The students talk about how the educational game affects their processat the beginning	5	11	36	52
Speed	The students talk about how they usually rush tow-ards a final goal	11	13	17	41
Meaningful	Experiencing the game content as meaningful in relation to the project	13	19	36	67

Cognitive reduction	The students talk about how the quest and level structure delimits the aca-demic content into smaller parts	0	6	11	17
Normativity	The students experience a change in their normative behav-iour	42	36	103	181
Persistence	The students experience an increased persisten-ce regarding working in depth and with more time on task	3	4	21	28
Trajectory	The students talk about how they follow a different path in their project	7	44	50	101
Management by objectives	The students describe how they are concerned with being goal-oriented in their project work	13	12	10	35
Open process	The experience of parti-cipation in relation to the content and method	2	21	33	56
Overview	The students talk about how educational games provide them with an in-creased overview	3	11	14	28
Time mana-gement and planning	The students talk about the importance of being able to plan and manage their projects	22	16	13	51
Grinde, farme, crafte	The students talk about how they collect and com-bine different sources of materials	5	1	16	22

Completion	The students talk about the degree of completion of different tasks within the project	3	8	14	35
The following concepts are developed based on an axial coding of the categories: "Quests and levels as a catalyst for motivation." "Predefined or open learning trajectories." "Inquiry as a learning strategy." "Changing the normativity through games." "The concept of crafting and farming." In the following sections these statements will thus address the following sub-research action: A2 – Investigation of the importance of Game-Based Learning for students' development of an explorative approach, and thus analytical skills, for their project work.					

The chapter will discuss, in the first section, the significance of the game as a catalyst for guiding the students along complex learning paths. The next section examines whether the learning game creates open-ended or closed trajectories. Further, the perspective of using inquiry as a learning strategy is discussed. Then there is an analysis of how the learning game is changing the student normative behaviour towards a more explorative and analytical approach to the semester project. The last section focuses on the principle of crafting and farming related to the development of persistence regarding the depth and breadth of the project.

11.2.1. FACILITATING PROGRESS THROUGH GAME THINKING

The initial pre-study proved that it is difficult for educators to motivate students to be interested in an explorative approach to the academic representation. One of the reasons is that the students lack the skills to actively and independently investigate and explore their professionalism. They lack the necessary skills and tools to facilitate and initiate their learning process. The educational game design thus aims to help the students be able to create progress in their projects through an explorative and analytical behaviour. When asked about the extent to which quests and levels help the students to facilitate their learning process, there is seen a mean of 6.2, where 49% of the students are given a score of 7 or above.

Mean	Median	Variability	Low (1-3)	Middle (4-6)	High (7-10)
6.2	6	1.7	6.4	44.9	49

Table 12 - The students' experience of to what extent quest and levels help the students to facilitate their learning process.

In the qualitative data, the students describe how the learning game "has provided some tools that I did not have before". They explain how at the beginning in previous semester projects they were searching in the dark, where using the learning game in this semester creates a feeling of being able to start up the semester project much faster.

> ***Iteration 3 – example 73***
> *"Yes, it has been good to work with something fixed instead of the other semesters, where we often had maybe two to three weeks teaching, just constantly, and then you do not know where to start. You just sit and listen. Instead this time, we could get started right away."*

> ***Iteration 3 – example 74***
> *"In many of the other semesters, we have often been sitting for a week or two before we really figured out what we were supposed to do. We got started pretty quickly with this one."*

The students point out that in particular the confusion and uncertainty they experienced in previous semesters were less as they quickly gained a sense of progress in their work. One of the students explains that *"it was nice to have a clue or define indicators, something, or some guidelines"* (second iteration). The game mechanisms thus support the idea that the teachers can define a clear framework for the semester projects. This means that the students, through the learning design's internal design grammar, receive methodical support that helps them get started.

> ***Iteration 3 – example 75***
> *"But honestly, there has been a good red thread throughout all that Game-Based Learning, compared to when we did all the analysis work, and then we came up with some concept that actually eventually led to forming the building. And that was the goal of the first three weeks that we should create a form of the building, and opening these envelopes has helped us all the way through."*

> ***Iteration 3 – example 76***
> *"And we might maintain better concentration […] Well, well, we have to, like you talk about, out and be frustrated, but there must be some*

foundation we can cling to when we are frustrated. Because losing courage is not a bit right."

In the following example, one of the students makes a direct comparison to the experiences he has as a gamer. He talks about how a mission in a computer game is telling a story. According to him, the learning game is telling a story about how to design a building through quests and missions.

***Iteration 3 – example** 77*
"Well, I have some experience with playing computer games, and to me it has been a bit like computer games I usually play. The missions are used to tell a story throughout the game. I also felt like this helped to tell a story about how to make this building and how to get the ideas for it. So I liked that."

When the qualitative data are compared to the students' responses in the questionnaire, it is seen that especially at the start of the semester the learning game helps the students to facilitate their process (see Tables 13 and 14). A significant decrease of 53.1% (Cohen's D of 1.83) is seen during the period in the student assessment. Compared to the first measurement, however, only a difference of 3% is seen in the students' general assessment of whether the learning game functions as a facilitating tool.

The students chosen path will, over time, reflect possibilities for achieving specific learning based on the dependency relationship between the two concepts of proceed and depends. Here the students describe how the learning game works as a form of stimulus that helps to create a connection with how they are going to proceed, depending on what they have already learned. Especially during the periods or breaks in the project that the students previously described as time-wasting actions, the learning game has made inspiring contributions for valuable activities for the project.

Iteration 3 – example 78
"Therefore, I think the game actually helps a lot to move on. And that is why we go back into the game. It is actually the game that gets us further in our project. It helps us move forward and open our eyes."

Iteration 3 – example 79
"So you can say that those periods where we just sit and do not know what to do, then we just open a new envelope or something, to see if it could give inspiration for some new tasks. So in that way it has helped."

Iteration 2 – example 80
"Yes, we had the game constantly push a little when we did not quite know what the hell we were going to."

Level	Mean	Variability	Low (1-3)	Middle (4-6)	High (7-10)
Measurement 1	6.4	1.4	2.1	47.9	50
Measurement 2	5.5	1,9	14	56	30
Measurement 3	4.1	2.4	39.1	37	23.9
Measurement 4	3	1.9	64.6	27.1	8.3
Final Measure-ment	6.2	1.7	6.1	44.9	49

Table 13 - The students' experience of to what extent the learning game functions as a facilitating tool.

	Between 1 and 2	Between 2 and 3	Between 3 and 4	Between 1 and 4	Between measurement 1 and the final assessment
Critical difference in per-centage increase (+) or decrease (-)	-25 %	-23.5%	-38.4 %	-64.7 %	-17.6 %
Cohen´s D	0.92	0.49	0.79	3.07	

Table 14 - The students' experience of to what extent the learning game functions as a facilitating tool expressed though cohens D.

There is thus a clear tendency that it is primarily at the beginning of the semester that the students experience the most significant effect of the learning game. As their project takes form, they become more and more able to actively and independently investigate and explore their professionalism. This argument is confirmed by the students when asked directly to what extent they have experienced that the learning game gives a good start to their projects. For this question, 83.6% of the students indicate a minimum score of 7.

Mean	Median	Low (1-3)	Middle (4-6)	High (7-10)
7.8	1.4	0	16.4	83.6

Table 15 - The students' experience of to what extent the learning game gives a g ood start to their projects

One of the reasons why the students experience less confusion at the start of the project is that the content of the semester is divided into quests placed on different levels. The fact that the student only needs to consider smaller parts of the process at the beginning helps them to reduce the complexity of the project. It provides the opportunity to work at a specific competency level at an individual pace. One of the students says that because they do not have to understand it all at once, they do not leave a lot of unfinished tasks behind.

> ***Iteration 1 – example 81***
> *"It is good enough to have the closed assignments so that you have no idea what is coming afterwards, so you do not just say we will do this sometime in the future. You may have to go through this to get to this, to be able to do it and that and that."*

> ***Iteration 3 – example 82***
> *"You got the task served in smaller chunks, but then you had to puzzle it out together[...] but the tasks themselves, when we did them, I think it was a driver because it was something you just have to think about. And you have to make some decisions, and you have to work based on the decisions you made at an early stage. And that is what I think is exciting in that way."*

Another important factor is that the structure of the learning game causes the projects to start right. As one of the students says, *"after all, we started doing analyses"* (third iteration), assuming that in previous semesters they have done the analyses at the end of the semester. In particular, there is a consensus (coded statement: Normativity 181, Facilitating 161, Trajectory 101) about the learning game helping the students maintain an analytical approach.

Iteration 2 – example 83
"Because you cannot skip all the analysis that is a requirement at the beginning of the game. Something you would have passed over."

Iteration 3 – example 84
"I think it is good that it is built in such a way that in the first levels it is very much about analysis and something like that. It is built in the right order at least. It makes good sense compared to the way you want to work with it; I think it was cool."

Iteration 2 – example 85
"In fact, I think it worked well. It leads us in a direction and a more process-oriented direction than we would have otherwise."

Thus, the analysis shows that Game-Based Learning helps to create progress in the project by giving the students a good start in their process, including initiating an analytical and explorative approach to the academic material early in the process.

11.2.2. PRE-DEFINED OR OPEN LEARNING TRAJECTORY

One of the sub-research actions to the research question was about an investigation of how Game-Based Learning can support the students' development of an explorative approach, and thus analytical skills – in particular, the vision that Game-Based Learning creates learning trajectories that (1) form a progression where different episodes of activities overlap and build on previous ones, and 2) can be seen as a broken space-time path through bundles of practices and arrangements that create a personal trajectory (see Sections 4.2 and 4.2.5). This means that the educational learning design is not dictated by the academic topics and disciplines the students are working with. The students must have ownership of both process and product. In the empirical data, the students are evident in describing how they have a feeling that it is their ideas and thoughts that draw the projects concerning which academic topics and disciplines they are going to work with. One of them puts it very accurately: *"So it is our thoughts that is the project here"* (Iteration 1). Others talk about how the game leaves room for the group's opinions and attitudes to influence the structure and content of the game.

Iteration 3 – example 86
"After all, we have used it as a guideline, so it had a big impact on how we have created it. And at the same time, we have taken our own, the opinions and attitudes about what you should start doing, doing it alongside. Yes and maybe instead of some of them. The quest at least showed us the path forward to our results."

Iteration 3 – example 87
"No, but I think it has been very good to have such a starting point, where all groups they start in such a way that they are given the same material, but you end up with different projects."

Iteration 2 – example 88
"I think the combination of these two things, that is, with having some self-thinking and then having these guidelines, it is good.."

One of the explanations for this argument is that the students define the scope of the quest activities. One of the students describes it as follows: *"You also create your own tasks with these quests. You often create the scale of your task yourself, so they are more fun to solve"* (second iteration). Accordingly, both quests and missions are focused on process-related activities, which means that it is the students who must set the professional direction.

Iteration 3 – example 89
"So, after all, there was no limit to how many of it, how much of the activities we had to do. So I do not think it has been, so of course, we have been running after being in that box during Game-Based Learning, but if we wanted to turn the building a different way, then we could easily do it. Nothing was stopping us."

The explorative and analytical approach to the project is created by the learning game enabling the students to follow several different learning paths. One group describes how they returned to the material of their analysis after harsh criticism of their building design. By combining the material from solved quest again, they found a new way through their project.

Iteration 3 – example 90
"Well, first of all, we came up with a form for the building and then we are told that it is terrible, but we can go back and take some of the old sketches we have, and combine them and then come to a new form. And then it is like, you think, okay, it is exciting enough, there is something in this."

The focus on farming and crafting in the learning game creates activities where ideas, knowledge, thoughts and reflections are collected and subsequently combined. It prevents the students from leaving an analytical and explorative state of mind. For example, several students point out how they feel that their collected material can be combined in many different ways depending on the direction of the analysis.

Iteration 3 – example 91
"Yes, so you have a good base, also in relation to the analyses you have

created through the game. Because we could take our analyses and plant the result directly in another building and combine... Because we started doing the analyses and then the design studies. And the design studies suited our analyses, so that is why we could combine those designs. And then create a new building, but based on the same analyses, really. So that is why it made insanely good sense that we did all these tasks because we could combine them."

In doing so, the activities in the learning game strengthen the depth and breadth of the students' projects. In the following quote, a student describes how their focus on collecting points led to them repeating multiple tasks more than once, contributing to more perspectives and nuances of their process.

Iteration 3 – example 92
"Because we could do multiple forms of the same task and then earn the points again and again. And it was also a way where you just get a slightly broader perspective on this task because you just like having multiple angles on it, and you make a new attempt at the same task and earn an additional 100 points. And that way you get some depth in the task as well."

The composition of the game mechanism thus contributes to the student experiencing a significant influence on the content, and an experience of creating unique learning trajectories based on an analytical and explorative behaviour. When quests and missions are built around primarily process-oriented tools and methods, then hunting for points creates repetition effects and hence a telescoping that provides new perspectives and depth of learning activities.

11.2.3. INQUIRY AS A LEARNING STRATEGY

Based on the research question, this Section examines the impact a designed Game-Based Learning approach has on students' ability to make innovative use of their professionalism through inquiry processes. This means investigating how the students' ability to identify problems, their power of innovation, academic thinking, data and knowledge collection, evaluation and assessment, asking questions, discussions and argumentation, etc. can be acquired through Game-Based Learning. The analysis has previously argued that quests and missions set the framework for a learning process in which students can perform a more extensive range of doing and saying within their profession in order to carry out intentional actions. Another important perspective in an analytical and investigative learning process is the ability to flexibly handle professional-oriented methods and tools, including following them, interpreting them, ignoring them, considering them, etc. Establishing an inquiry process requires the ability to investigate and assess the significance of the analyses of the project. Several of the groups described in the qualitative data how they discuss the consequences of the analyses through activities in the missions and quests. In addition, the development of a shared language makes it possible to work critically with the results of the analyses in accordance with the project's visions.

> ***Iteration 3 – example 93***
> *"So it has helped us to think about what it is that we are doing and why and how we should approach it. Where before, we just had the knowledge that we got from the teachers and what we were supposed to do with it. What should be there for the examination?"*

> ***Iteration 3 – example 94***
> *"So the quest forces us to think a lot about things and put words to the things we want. It's been difficult wanting to work in reality and put it on a drawing".*

The students' general argument is that in the previous semesters they have experienced difficulty finding the purpose of working analytically and investigatively. This results in a random workflow in which the analyses are decoupled from the project.

> ***Iteration 2 – example 95***
> *"So in semesters one and two, especially, it was just to go in and find Byg-erfa and then just strip it for headlines, BUM, it was an analysis, next. Without really thinking about why and how and what is underneath."*

> ***Iteration 2 – example 96***
> *"At least I can say for myself, and I did not know what the hell I was going to use analysis for and what analysis was."*

> ***Iteration 2 – example 97***
> *"Well, that is because, in the third semester, we probably did some analyses just to make them, because we knew we had to bring some. But we created it the day before the exam and so it was backwards."*

The learning game's repeated focus on activities that motivated an analytical and investigative approach means that the students in general analyse far more. When the students answer the question regarding their experience of the extent to which the learning game has helped them to focus on creating analyses, a value of 6.6 for the mean is seen. Further, 57.1% have given a rating of 7 or above (see Table 16 and 17).

The students argue that the structure of the learning game leads them to work more analytically. For example, one of the students says, *"It was very investigative"*, and refers to the content of both quests and missions. In the following quotes, the students try to describe how the learning game activities entailed a project that was pervaded by an analytical approach that ensured a well-documented project.

Mean	Median	Low (1-3)	Middle (4-6)	High (7-10)
6.6	7	8.2	34.7	57.1

Table 16 – The students' experience of the extent to which the learning game has helped them to focus on creating analyses

	Mean	Variability	Low (1-3)	Middle (4-6)	High (7-10)
Measurement 1	6.7	2	8.3	47.9	64.6
Measurement 2	6.2	2.2	14	56	56
Measurement 3	4.4	2.6	39.1	37	30.4
Measurement 4	3.1	2.2	64.6	27.1	12.5
Final Measurement	6.6	1.6	8.2	44.9	57.1

Table 17 – The students' experience of the extent to which the learning game has helped them to focus on creating analyses over time

Iteration 3 – example 98
"Well, it has clearly given us, as you say, some background knowledge on why you do some things. So it has given a little more substance for reflection, i.e. afterwards. And also the fact that when we had to present our building and say how it was a little more well documented because we had been doing these analyses from the beginning."

Iteration 2 – example 100
"At least it has kept us in the analysis phase for a longer time, the learning game, than we would have been otherwise. We wanted to move further, and with level 3 to 4, we got something about building technology. But there were still many analyses."

Iteration 2 – example 101
"In the teachers' case, it is difficult to stand up at the board and just teach it. Whereas the appetiser cards (quest cards), they guide a little all the time. You have to do something, you have to puzzle with it, but you know what way to go. So, I do not know if it makes sense; it is so hard to put words to it."

There is a connection between the qualitative and quantitative data related to this problem, as a general assessment from the students is almost identical to the first measurement done early in the semester. During the semester, the students focus less and less on working with their analyses, while at the same time having a clear sense of how the learning game served as a supporting tool to maintain a focus on working analytically.

11.2.4. CHANGING THE NORMATIVITY THROUGH GAMES

Practice Theory uses the notion of normativity to express how a person shows a readiness to act in specific ways depending on the situation by adapting or reconstructing the environment. The notion of normativity thus has a vital bearing on understanding how Practice Theory interprets learning as being situated. Often these are teleoaffective structures that link doings and sayings to a practice (Buch & Elkjaer, 2015; Schatzki, 2016, 2017).

This means that the students' actions are linked together through specific normative systems that draw and form the learning path. It is, therefore, an interesting observation when the students express how the game led them on learning paths they would not, themselves, have created. One of them explains: *"Yes, I think it was the game that made us do it in a different order"* (first iteration). The students talk about how specific doings and sayings were set in motion much faster than they would have taken the initiative to do.

Iteration 3 – example 102
"I think we would have started with sketching and then we would begin to see how we can customise the functions of the building, whereas here, even though we did not have to draw, you still built up the function and then afterwards start sketching. So you knew everything in advance. What it was that you had to bring before you sketched and we might have done the opposite."

Iteration 2 – example 103
"Yes, and we might still have known about it, as we do now, but it would have been a different order in which we had done things, and there would have been many things that we would not have done so

thoroughly. And not at all been doing some things, not too ... All that which we probably had not taken the initiative to do."

The order of two different bundles of practices is notable – the sketching and drawing of a building and the analysis of the building. In the following conversation, the students describe how, because of the game, they start this semester analysing rather than going hard after finding the building design.

Iteration 1 – example 104

Student 1 – "Well it works fine enough, we get through it just, but it is definitely not the way we would have gone if we did not have these quests and missions to follow."

Student 2 – "No, we would have worked hard with the design and not so many analyses."

Student 3 – "Yes exactly, so we are actually a little frustrated without being too frustrated right now, you could say."

It is also interesting to note how the students describe how the reverse order causes them to experience less frustration than in previous semesters. Whether the learning process's activities are considered qualified and competent depends on the standards and procedures described through the students' existing practical competence and "know-how" (Schatzki, 2017). In the empirical data, the students describe several examples of activities that they would typically not consider to be a competent act according to their profession. This is supported by the pre-study, which also shows that the students reject important learning activities because they do not consider them to be part of the professional practice. The students thus point to several activities that they would have skipped if they were not an integral part of the learning game's quest structure. They thus speak in the following examples of how the game challenged their normative understanding of developing a project or designing a building.

Iteration 2 – example 105
"But I think especially the fact that we have been doing activities that we would not otherwise have done. At least I think so. There are many we would have just skipped or not even thought about doing if the game had not challenged us."

Iteration 3 – example 106
"Quite a lot of things that we had not done anyway. Much of that analytical work and stuff like that we would probably forget to start with."

Iteration 3 – example 107
"Yes, we have probably chosen some other things to go into than what we came through. So it has probably squeezed us into something we had not thought about doing. If we knew before we were going to make it and that then we probably would have just done the things we think we should do and then we would not have done all those things that we may have learned something from, and we did not think we could learn something from, I think."

The students explain how it is, in particular, the point allocations in the quest and level system that causes them to lower their guard. The structure of the game means that the students do activities they do not think are useful because it triggers points that help them to advance in levels. In the following quote, a student describes how he subsequently can see the value of the activities he had initially judged not relevant, as the entirety of the project starts to emerge.

Iteration 3 – example 108
"Even when it was a game. The fact that you got some points for doing something, then suddenly there was some sport in it. That you just had to reach as far as you could. And so there were some things where I at least thought like that, what do I need this for. But then when it was like that, you might have completed a whole level. You could see that what you did not really understand, it suddenly made sense. So we learned a lot, and you came up with some things that you might not have really tried before, so it really gave a lot."

Iteration 1 – example 109
"Yes, I think the things where you have to explore something, you know, the times when we got him Jan Gehl (ed. A theoretical perspective), where there was such a clip (red. YouTube movie), I think it was for an hour or so, we would never have sat down and watched, if it had not. After all, it was to get those points; there was a time when we had to see it, to get the points that we needed. So in that way, some of those who were not so exciting to actually make, it really turned out to be one of the most important things for us."

Another student describes how the division of the curriculum into levels means that there are tasks they cannot skip without not getting enough points for new levels. It means that their approach to the project work is less selective than before, where, among other things, the written parts gained a more prominent place.

Iteration 3 – example 110
"Because I can at least personally say that if I get all these envelopes delivered at once, then I am the first to open all of them to see if there

is anything I think is exciting. But if you are more forced to solve some of them, to actually be able to open the next envelopes. I do not know if you can say, motivate, but at least it can do so to solve some of these tasks that may not be the ones that just pop into my eyes from the start. Because otherwise, I would never have thought that I should sit down and write something, well, that is just the way it is."

Habits enable you to anticipate your own and others' actions in certain situations and thereby allow you to decode a possible learning path. Often these habits are governed by social norms of behaviour that change and evolve continuously over time (Buch & Elkjaer, 2015; Dreier, 2008; Qvortrup & Merete, 2013). The learning game thus aims to influence and develop new habits among the students as they open their eyes to new opportunities and learning paths. The data collected show that the students have changed their perception of their approach to the project work. For example, they describe how the next time they will be more open-minded, or that the game has broken down their habits and the way they usually work.

Iteration 2 – example 111
"So I think it was a bit silly, and if we did not have that game, then we would not have gone so much into things, and it is fine, and I have learned a lot and found new insights. And maybe not be so "square". I may still be at some point, but it opened up to it there, because otherwise, I would keep working at a strong pace."

Iteration 3 – example 112
"But still, Game-Based Learning has given a slightly different attitude to things and a different way of looking at it. And so that is why there are some wonderful experiences that you can have, that you probably would not have had if you had continued in the old way."

Iteration 2 – example 113
"That game has broken them down. Had we just driven on with our own shit then it would have been no, we do not bother, we cannot."

What determines whether there is a change in students' normative understanding of what is important to the learning process is the consequences and how they affect the final product. The pervasive argument is that because of the learning game, the projects have appeared in yet another more complex and varied form and hence contain more complex professional issues.

Iteration 3 – example 114
"[...] Then we would probably have made a building that was easy for us later on."

Iteration 3 – example 115
"Yes, we would have just said that this could be cool; we are probably making a building that looked like this. We had not got all this stuff, what it (red. location) looks like before and what could be cool to do about it. So now we have talked a lot about involving the story of the location and finding out what can we do, remedy the sins of the past as (name) says. It probably would not be something we would have done if we had not had these missions and such."

Iteration 3 – example 116
"I do not think we had made so many, I think we had made one each, and then we had taken one and then that is it. Like that right away. I think we spent a lot more time than we might have done. And it might also be a slightly simpler idea that we came up with than we ended up taking. Which maybe was a little easier to perform."

The barriers of the game mean that the students cannot limit their choices to a well-known academic territory. One of the students describes in the following example how he usually tries to be at the forefront by choosing solutions that he already knows are possible to carry out.

Iteration 3 – example 117
"I think at least that is how my head is screwed together, so I made some special solution that I knew we could find. Then I would immediately make some corbel of a tire that I already knew a producer had made because then you were perhaps a little at the forefront."

Thus, the data collected show that students through the learning game (1) have changed their usual workflows and (2) can reflect on how changes in their behaviour have challenged their existing knowledge base.

11.2.5. THE CONCEPT OF CRAFTING AND FARMING

The idea behind crafting can be viewed as activities that support the development of ideas or the acquisition of knowledge with a focus on innovative use of the curriculum,

Mean	**Median**	**Low** (1-3)	**Middle** (4-6)	**High** (7-10)
7	7	2.1	25	72.9

Table 18 – The students' experience of the extent to which quests and levels help the students to facilitate their learning process

as a result of this challenging the existing normativity within existing knowledge. The basic principle behind crafting and farming is thus all about slowing the game down and keeping the gamers busy (Gyldendahl-Jensen, 2016; Nardi, 2010). The game's built-in farming and crafting activities thus aim to reduce project work complexity through repetitive actions with little contingency. The collection of items contributes to solving complex tasks later in the process (Gyldendahl-Jensen, 2016; Nardi, 2010). Crafting/farming thinking is thus about creating quests and dungeons/missions based on activities that have a specific focus on tools for collecting material that can challenge the process or content.

The quantitative data show that the students largely believe that the learning game has contributed to an increased focus on idea development. With a variability of 1.3, there is a mean value of 7 where 72.9% have given a rating of 7 or above.

The entire structure of the learning game within each level is a series of quests aimed at the students collecting a significant amount of knowledge, ideas, thoughts, etc. In the following example, one of the students makes a direct connection between the learning game and the farming activities in World of Warcraft.

> ***Iteration 3 – example 118***
> *"Now I know that there are a lot of people, for example, if you play WoW and you run around and do quests then you make sure, while you run, to mine and collect flowers or something at the same time and then that way when you have nothing to do, and we did the same in the same way. When we have nothing to do, then you could make a sketch or gather some Lego or something else."*

This means that the many small breaks within the workflow of the project where the students get a little stumped or are not ready for the next step are filled with farming and crafting activities.

> ***Iteration 3 – example 119***
>
> *Student 1 – "We did that when we had nothing to do, I would say."*
>
> *Student 2 – "Then we played with Lego."*
>
> *Student 1 – "I think, sometimes, that Lego was used as a small break or pause."*

Thus, students are kept moving without necessarily working towards specific goals. This opens up new ways for ideas and thoughts that do not immediately make it into the projects. In the following quote, one of the students describes how an idea, created mostly for fun, later proves to be valuable for the project.

Iteration 3 – example 120
"It was actually because we moved forward with it (red. the idea), it was just a fun sketch that we had actually created, and it was also just to get points."

The students also use the word "grind" to explain how they accumulate points by continually being on the hunt for ideas and knowledge. The term "grind" is used in World of Warcraft to describe gaming activities that are repeated over and over to collect specific objects.

Iteration 1 – example 121
I also think that in some situations where we have at least grinded a little bit, made sure to get some extra points if you could. With the Lego, we did a little extra just to get points and such.

The amount of knowledge, ideas and thoughts that the students continuously accumulate through these quest activities is subsequently what forms a solid foundation for the project. The students describe in the following three examples how they are surprised by the amount of material they produced during the period. Further, they experience how the amount of ideas and knowledge later provides them with valuable knowledge that helpings them present their argumentation of the project.

Iteration 3 – example 122
But it did give us what to say for some solid foundation. So we really had a lot of analysis behind everything, and we really had a lot to choose from. So there was really a lot, so when we looked at it before the examination, we could almost be completely surprised at how much material there actually is from that period. So there was a lot of background knowledge about the whole project.

Iteration 2 – example 123
I think at least what surprised us in the fourth semester compared to the other semesters was the amount, the complexity of this project versus the other projects. And then the amount of work that has been accumulated.

Iteration 3 – example 124
It meant, after all, that we had a lot of tasks that we had not been critical towards or anything. We just did it, and two pages were written with a hot synonym dictionary because now we had to read into something. But since we have done so much, there is also a lot of what has then been the basis for further processing and that it has become the building that we have now designed.

	Mean	**Variability**	**Low (1-3)**	**Middle (4-6)**	**High (7-10)**
Measurement 1	7.1	1.8	0	33.3	66.7
Measurement 2	6	2.4	18,.	30.6	51.0
Measurement 3	4.7	2.6	30.4	32.6	37.0
Measurement 4	3	2	63.8	27.7	8.5
Final Measurement	7	1.3	2.1	25	72.9

Table 19 – The students' experience of the extent to which the learning game as a tool is helping them create new ideas for the projects

	Between 1 and 2	Between 2 and 3	Between 3 and 4	Between 1 and 4	Between measurement 1 and the final assessment
Critical difference in percentage increase (+) or decrease (-)	-15.4 %	-21.7 %	-36.2 %	-57.7 %	-1.4 %
Cohen's D	0.5	0.51	0.76	2.07	

Table 20 – The students' experience of the extent to which the learning game functions as a facilitating tool expressed through Cohen's D

When the qualitative data are compared with the students' responses in the questionnaire, it is evident that the learning game, especially at the beginning of the semester, helped the students to stay focused through farming or crafting activities (see Tables 19 and 20). A significant decrease of 57.7% (Cohen's D of 2.07) is seen in the student assessment. Compared to the first measurement, however, only a difference of -1.4% is seen in the students' general assessment of the learning game as a tool helping them to create new ideas for the project.

11.3. REFLECTIVE PRACTICE

The aim of the metacognitive scaffold to support the choices that draw and affect the development of personal learning trajectories is so clear that it allows the students to reflect on the relationship between proceed and depends. Through reflection processes, the presented activities in the game contain disturbances and consequences of choices that naturally push the students towards new pathways of knowledge. In doing so, the

Exploration and Analysis					
Category	Definition	Iteration 1	Iteration 2	Iteration 3	All
Theorising	The students talk about how the games help them focus on theory within the project	8	4	14	26
Obstruction and disturbances	The students talk about how the games entail obstruction and disturbances in the project	7	12	33	52
Roles	Talk about their roles in the project	1	6	15	22
Transaction	The students reflect on or express specific examples or situations where they learned something	8	1	12	21

Analysis competence	The students are able to com-municate specific analytical competences	19	19	53	91
Reflection	The students use the words and phrases think, thinking, reflection, giving it some thought, looking back etc.	15	21	59	95
Exploration / depth	The students talk about the depth in their projects as a result of an explorative behaviour	22	22	35	79
Iterative reflection	Examples of situations where the students link two or more activi-ties together	3	18	54	75
Metacognition	Exercise, Strategic, Thinking * Plan * Understand, Think, What, How, Why, Which, Consider *	12	21	34	67
Transferability	The students talk about how they can use the method behind the game in new projects	6	4	17	27

The following statements are developed based on an axial coding of the categories.

"Transformation of disturbed experiences."
"Iterative transaction."
"The depth of the learning process."
"Designing meta-reflection"

In the following sections, these concepts will thus address the following sub-research actions: A3 – Examining the importance of the use of Game-Based Learning in regard to developing a reflective practice and behaviour.

Table 21 – A list of all categories that emerged from the coding process for reflective practice

goal is to support the students in creating individual learning trajectories showing how they are going to proceed, depending on what they have already learned through inquiry processes. Table 21 present descriptions and definitions of the categories found in connection with the sub-research actions of reflective practice. The table shows the occurrences for the categories according to the three iterations as well as a total sum. The schema ends with a list of the statements found through an axial coding of the categories (Charmaz, 2014).

The chapter will discuss in the first section the significance of the students' transformation of disturbed experiences caused by the game. Next, there will be an analysis of how the learning game creates iterative transaction through the open-ended learning path, followed by an analysis of the empirical data revealing how the learning game is helping the student with creating depth within the projects. The last section focuses on how meta-reflection is created through the game mechanism.

11.3.1. TRANSFORMATION OF DISTURBED EXPERIENCE

As described in Chapter 3, routines can make students refuse to accept new facts and issues, which is problematic for the development of investigative and curious behaviour. A condition for maintaining a curious approach is the student engaging in experiments that provoke a wide variety of thoughts leading to a more sophisticated understanding (Dewey, 1933; Dreier, 2008). It is, therefore, interesting to analyse the impact of the learning game according to the students' learning trajectory when encountering obstacles or disturbances.

The students describe in the empirical data the project's growth in complexity, because of how early quest assignments led to disruptions and challenges later in the process. One of the students describes it in the following statement as running into problems that create necessary stops: "Also, just like how the game is developed, all of a sudden then you run into some problems that force you just to stop" (third iteration). In doing so, the activities of quests and missions become mechanical stops in the process that initiates reflection processes. The students talk about several situations where their choices turned into obstructions or consequences for the project.

> ***Iteration 3 – example 125***
> *"On the contrary, it has actually been more difficult because you had to make a statement or you had to make one, […] and then we quickly chose a statement, so that is why we just suddenly got a lot of obstruction for ourselves, you could say. So that has given us some challenges later, but it has been fun to work with."*

These reflective stops in the process are thus a consequence of the students being constantly challenged in their normative understanding of what activities make sense throughout the game. Where students previously showing that a behaviour was working effectively and flawlessly towards a goal has been crucial, they are now challenged by the game as it pushes them in new directions. The students in the following quote describe it as detours:

> ***Iteration 2 – example 126***
> *"Because now we are all former craftsmen, so we are thinking very concretely and that we have to reach from here to there as soon as possible and as best as possible. So we have probably been pulled out in some detours, on the way there. And it has been educational and exciting, but it has also given some grey hair behind the ears."*

In the next example, a student describes how the level structure works as a small obstruction as the students at the beginning of the game do not have a complete overview of the context or the tasks. It creates what Dewey would refer to as “temporal conception”, understood as how individual activities over time have an impact on overall understanding.

> ***Iteration 3 – example 127***
> *"So it has been a bit of an obstruction, in that we first found out what the next task was when we got there. So in that context, it has been a little difficult to plan this Game-Based Learning. But the professionalism or the benefits of it, I really think it was very good. Once you just got started with it."*

Because the students, through the game terminology, accept the premise of not being able to determine the meaning of a task immediately, there is a tendency for them to break with their normative behaviour. Thus, they make several choices early in the process, which later prove to be crucial for challenging the professional context. As one student says in the following statements, the game brings them to the edge where they can no longer apply known solutions as they usually do.

> ***Iteration 2 – example 128***
> *"It has also meant that we now have a building with a lot of professional things that we need to have solved, i.e. building technical things. Because if we did not have this game, and the whole design phase, coming out on the edge as we are now, then we would have worked as we usually do."*

> ***Iteration – example 129***
> *"But we learned so much more from the fact that we had those twisted buildings and collapses."*

Thus, the concept of “game over” manifests itself through the challenges and disruptions that the gameplay exposes students to along the way. A death in World of Warcraft involves processes of reflection aimed at developing new ideas by linking previous facts and suggestions from an experimental situation of proposed solutions. In this understanding, the students describe several examples of where they have to start again or take steps back in the process. Through reflective loops, they turn in these situations to the knowledge obtained from previous missions to explore new possible solutions.

> ***Iteration 3 – example 130***
> *"Because we also had, after our midterm evaluation, we got pretty bad criticism, or a lot of criticism of it, which actually made us go back and look at some of the missions that we had, i.e. the ones we had made and the analyses we had. To come up with how to hit the target audience differently and then we found a new main approach."*

> ***Iteration 3 – example 131***
> *"We came up with insanely many sketches. And the first form of the building was bad, and then we went back as the (name) says, and then we actually combined some of the sketches to get to the next form for the building. So it was a combination of our old sketches that really became our new headline."*

> ***Iteration 3 – example 132***
> *"My point of view compared to the fact that we had the missions. They were very good to reach the shape of the building which we ourselves thought hit perfectly. The others did not think so, why we should go in and find a new shape. We took the missions from earlier, that is, the material that we had made and brought in the new shape."*

As a result of this, a trial and error culture is supported by different practices and hereby creating an exploratory process. The consequences of a setback or game over in the project naturally create critical thinking and foster a need to understand and analyse the situation. Here the students need to link the experience of practical in-game activities with theoretical insight in order to understand what went wrong.

11.3.2. ITERATIVE TRANSACTION

In practice, the acquisition of new knowledge and thus learning is closely linked to Dewey's understanding of inquiry, which is the process that solves challenges by using thinking to change the direction and content of the experience (Buch & Elkjaer, 2015; Elkjær & Wiberg, 2013). When Dewey describes learning, he talks about it as a transaction that arises from the link between thinking and action in an inquiry process. Learning, and thus a transaction, occurs when the students, through analysis and process understanding, begin to understand their project as a whole.

In the data, students describe how fragments of their work begin to condense and consolidate into a whole. The sequential structure of the quest and level structure creates what can be called “iterative transactions”, where students, through iterative processes, continually shape and process their learning through reflection. In the following examples, the students use concepts such as puzzling together, culminating and merging to describe the process in which they begin to form a holistic picture of their learning and the professional knowledge they have constructed throughout the game.

> ***Iteration 2 – example 133***
> *"It has forced us to do the analyses, and we now need to puzzle it together, so that we can find the shape and location that we want. So now we can say that we are close to being able to reap the fruits of some of the previous work."*

> ***Iteration 2 – example 134***
> *"Yes, it is of course now that it culminates a little, all the analyses. We need to have some shape for it (red. the building), but I think it seems like we have gotten some good things that we can work with."*

> ***Iteration 3 – example 135***
> *"But it was intertwined continuously. Because after we had worked out all that with quests, we moved on to see how it fits. So it worked well all the way through."*

In this context, the concept of time is essential. It takes patience to be investigative and curious about a specific topic, and on top of that, a resilience to stay longer on the task, without being tempted to rush towards the goal. The pre-study shows that the students are quick to make decisions and select the solutions of the project. The empirical data show that the students are aware of the importance of a change in their behaviour where they, through the learning game, dare to work in depth with a topic. They talk about getting better at “taking the time” or “go smooth those feathers”.

> ***Iteration 1 – example 136***
> *"Yes, but it gives a little more time and maybe spend a little longer time at thinking about what new things once you could try. By making them (red. quest and mission), then you have to take the time to do it. Then it may also be that some new ideas arise, instead of, otherwise you might just drive a little faster."*

> ***Iteration 2 – example 137***
> *"You also have to go smooth on those feathers because it leads to a result when you start to puzzle it all together, so if you just follow the game, then it will come."*

Iteration 2 – example 138
"What I think is good is that when you start something up, you do not jump into the first and best solution. You sit down and look through more things."

The learning game thus supports the notion that the students are not tempted to take the first and best solution, but instead they stay longer in the process and spend time exploring and reflecting on different contexts of doings and sayings.

11.3.3. THE DEPTH OF THE LEARNING PROCESS

When the students in the focus group interviews are asked to reflect on the importance of the learning game concerning their learning process, a large number of the students point to the depth of their learning as the crucial difference.

Iteration 3 – example 139
"I think that because we were forced, but we could just as well choose from the tasks we took and that there was some relevance in it. [...]. So I do not know if you can say that it is only because we have used Game-Based Learning, but I think there is a little more basis for what we have delivered as we have just had to decide for some different things."

Iteration 1 – example 140
"Well, maybe I do not think you get as much depth as we have been now, but it is the fault of the game that we are."

Iteration 3 – example 142
"Yes, you are rather forced to go a little deeper with some things that you might otherwise skip."

Iteration 3 – example 143
"Yes, exactly, that is, I have been more deeply than I usually would. Definitely."

Their argument for this perspective is that the game mechanisms reward them for going deeper. The depth of an inquiry process characterised by being reflective, explorative and innovative requires a form of coherence and continuity. As described earlier, Dewey speaks of forms of organised thinking where there are the right balance and distribution of the three dimensions of thought – ease and speed, scale and variation, and depth.

The structure of the learning game contains a large variety of activities based on Dewey's three dimensions, thereby creating the foundation for a system of learning processes with great flexibility and diversity. Specifically, the more quests and missions the students solve, the more points they gain, which ultimately leads to a more considerable accumulation of knowledge, ideas and reflections.

> ***Iteration 1 – example 144***
> *"So it rewards you for going into depth, so you get a quick reward for going into depth with something."*

It is notably the mission of the learning game that contains a focus on doing analysis and hereby create reflection. The students highlight this as the reason for experiencing a greater depth in their projects.

> ***Iteration 3 – example 145***
> *"So I feel that when there is a mission, it is a little like that there's more to it than when it is just a quest. And something like that. I do not know if it is just me, but I get the feeling, okay, now I just have a little extra time to give it that extra, because this is a mission, it is not just a quest."*

Also, the students' responses to four identical questionnaires indicate the extent to which the missions/dungeons have helped them to reflect on the academic content. The overall assessment reveals a mean of 6.3%, which is more than the value of the first measurement with a mean of 6.1%.

	Mean	**Variability**	**Low** (1-3)	**Middle** (4-6)	**High** (7-10)
1. measurement	6.1	2	8.3	47.9	43.8
2. measurement	5.3	2	20	48	32
3. measurement	4	2.4	41.3	41.3	17.4
4. measurement	5.8	1.9	14.6	41.7	43.8
Final Measure-ment	6.3	1.5	4.1	42.9	53.1

Table 22 – The students' experience of the extent to which the missions/dungeons have helped them to reflect on the academic content

The number of analyses and thus the increased depth of the academic content of the projects thus have a significant impact on the students' learning. It is a perspective that the students are aware of and thus links the fact that they have been analysing more than before to the acquisition of a broader academic content.

> ***Iteration 2 – example 146***
> *"You could say that the game generally helps us get broader professional content because we simply analyse more than we probably would have done."*

> ***Iteration 3 – example 147***
> *"Well, in the previous semesters we have been allocated a building. We have still been analysing it and created analyses of the function and stuff like that. This time I think it is a little deeper."*

> ***Iteration 3 – example 148***
> *"It was more elaborated, so we had created a concept based on our analyses."*

11.3.4. DESIGNING META-REFLECTION

The motivation to win the game indirectly pushes the students towards working on a metacognitive level through a reflective discussion on how to solve the task. In the empirical data, the students repeatedly point out how the game helps them to ask questions about their approach to the project – for instance, by questioning: How many ways can it be done? And what methods are the most appropriate for creating useful knowledge?

> ***Iteration 2 – example 149***
> *"It gave a lot, and I think it also gave a good understanding of why analysing things is so important, and not just quickly progressing to the final result, but actually thinking an extra time about what it is that we have done."*

These metacognitive discussions are essential for maintaining a professional quality of the work, and reduce the temptation to finish and hasten towards the final goal. The ongoing meta-discussions about how the activities of the game contribute to the project's progress and content reveal reflections of the students that relate to a general understanding of the process. In the following example, a student points out how he has become more aware of working in depth from the start to predict possible future complications.

> ***Iteration 3 – example 150***
> *"Well it's kinda fun to see it afterwards because it's always the way you can be clever, and it's just that it is easy to make some soft drawings on the paper, but in the end it creates many complications, so for me*

to see it, trying to see the project a little more to the end right from the beginning. Where at the time, it was easy to say, this we can certainly do. But it is just hard to see through all these complications."

Further, there are examples of the students meta-reflecting upon the significance and scope of the analysis. The learning game, thus, through its quest and learning structure, clarifies all the context of the learning activities, enabling the students to decode every single element in relation to a broader context. Where previously they have worked out analysis without knowing why and how it is characteristic of their response, the learning game has helped them to see “the big picture”.

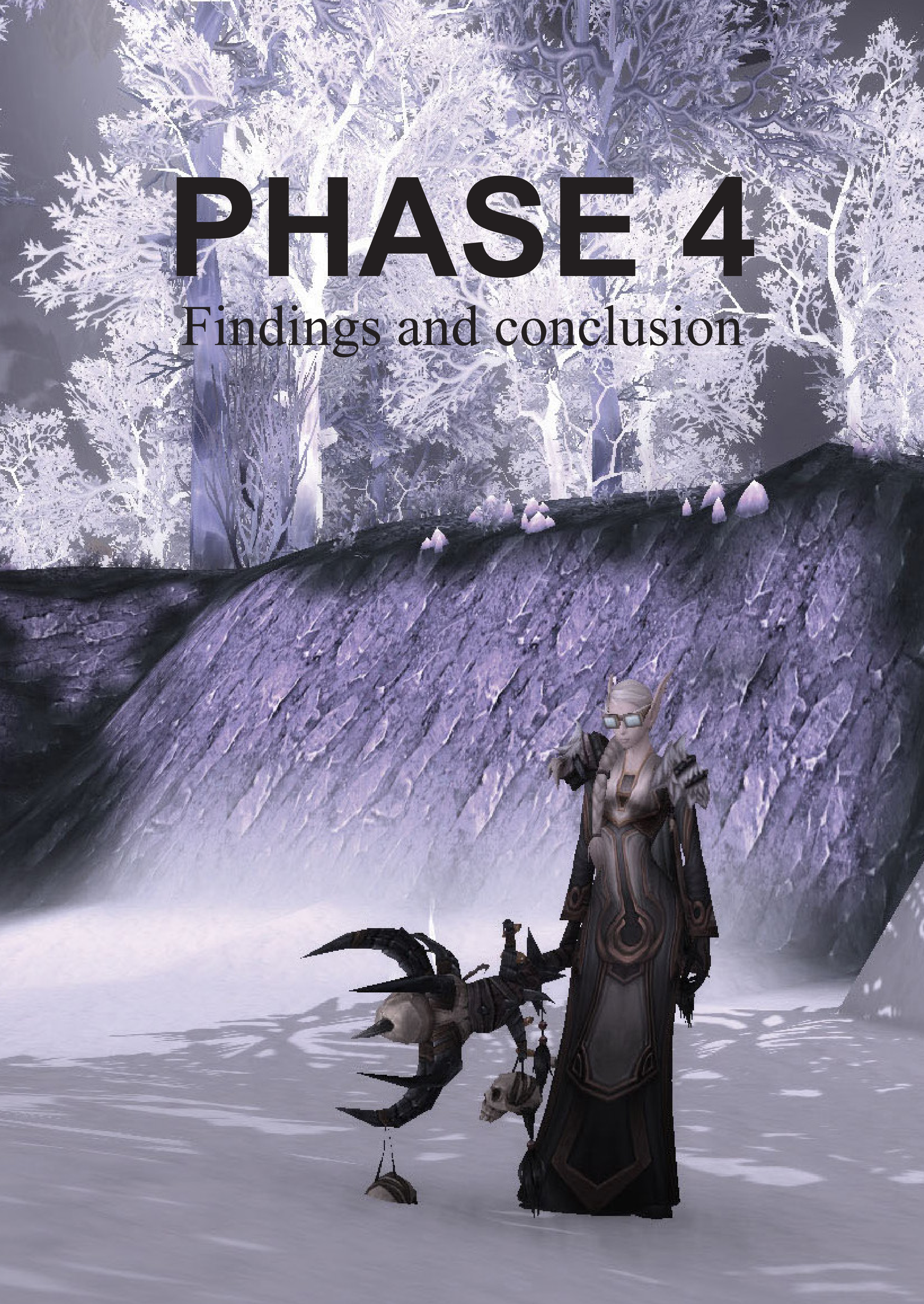
Iteration 2 – example 151
"Yes, I think so, we go much deeper into it now, you can also look at the extent of our analysis how big they are. So in semesters one and two, especially, it was just to go in and find Byg-erfa and then just strip those headlines, BUM, it was an analysis, next. Without really thinking about why and how and what is underneath. We are doing much more now."

Iteration 2 – example 152
"We could see the idea of analysing problems. Like in the first and second semesters, but the thing about doing an analysis, it did not make any sense at the time. It does so much more now."

This means that the quest and level structure in the context of an achievement system provides the students with the exact framework and direction for the project that allows them to discuss the learning activities on a metacognitive level.

PHASE 4

Findings and conclusion



CHAPTER 12. FINDINGS AND CONTRIBUTIONS

Within the pragmatic paradigm, this PhD project develops knowledge through the use of Educational Design Research. It uses a mixed-method approach to data collection and abductive reasoning to investigate the research question: ***How may a perspective of sequential learning and inquiry processes support motivation and autonomy, analysis and exploration, and reflective practice through the use of Game-Based Learning in a higher education learning environment?*** The theoretical analysis is based on Reflective Practice-based Learning understood and interpreted through Practice Theory as formulated by Dewey and Schatzki combined with existing game theory and a theoretical understanding of World of Warcraft.

Based on the findings, the PhD project argues that designed learning sequences and inquiry processes can support students more effectively through meaningful learning processes built around an explorative approach to traditional academic disciplines. By considering learning as a complex landscape of personal learning trajectories, the link between Practice Theory and game theory creates a learning process that supports motivation and autonomy, exploration and analysis, and reflective practice. The PhD project develops guidelines and forms theory and methods that contribute to the creation of learning designs based on Reflective Practice-based Learning and/or Game-Based Learning.

Initially, a meta-discussion on pragmatic transferability is presented to frame findings and contributions. Subsequently, these findings and contributions are elaborated and related to Reflective Practice-based Learning, Game-Based Learning, and the link between Educational Design Research and Design Thinking.

12.1. PRAGMATIC TRANSFERABILITY

The concept of "change" is essential when talking about pragmatic knowledge creation. Change and what elements or influences affect the result comprise the central question of a pragmatic research process. In pragmatism, there is no objective basis for creating evidence, and knowledge must be perceived as preliminary, and therefore, in principle, it is fallible (Godfrey-Smith et al., 2015; Kjær, 2010). How we understand these changes and interpret them into a generic model that creates transferability according to similar practices is thus the core of what pragmatic research is all about.

According to Akkerman and Bronkhorst (2013), it is essential that Educational Design Research not only advances general theory and impact but also demonstrates the value and impact of the design in the local context. (Akkerman & Bronkhorst, 2013).

This is in line with Tracy (2010), as she argues that the value of quality is changing parallel to the way knowledge is changing and being situated within local contexts and current conversations (Tracy, 2010). It is also in line with the pragmatic philosophy, where the focus is the project's transferability as something that mainly deals with the development of models that can inspire change in new contexts. According to pragmatism, the only way to acquire knowledge is through the combination of action and reflection (Tashakkori & Teddlie, 2010). Pragmatism therefore searches for, and plays actively with, situations where apparent contradictions exceed or affect each other, and creates changes within a given practice (Godfrey-Smith et al., 2015; Kjær, 2010; Lehmann-Rommel, 2000).

The conclusion of this PhD and its transferability to other domains is, therefore, about assessing unpredictability, differences, diversity and contingency regarding different and new contexts through theoretical reflections – in other words, finding the transcending contradictions between different contexts (Frega, 2011; Godfrey-Smith et al., 2015; Lehmann-Rommel, 2000; Tashakkori & Teddlie, 2010). The purpose of the PhD is to expand the capacity for problem solving and transformation of the environment in an open manner that is not limited by immediate practical preconceptions.

The claim of significant contribution is, therefore, based on the observed changes in the specific procedures in a given system. One of the key ideas in traditional research paradigms is replicability, but since Educational Design Research researchers cannot (or will not) manipulate the cultural context, it is difficult to replicate the results of others (Barab & Squire, 2004). Therefore, the local adaptability of a given theory must be considered. The goal is not to "sterilise" the naturalistic context from all "confusing" variables so that the generated theory is more valid and reliable as quantitative studies will argue for. Instead, the challenge is to develop flexible, adaptive theories that remain useful when used in a new, local context (Barab & Squire, 2004). In practice, this means that theoretical models that can be used as inspiration for other learning situations within similar contexts have been developed. The conclusion of this PhD, therefore, points towards some of the more significant design schemas and exalts them as being representative of the new theories generated by the research process of this PhD. Tracy (2010) argues that a study's contribution in terms of significance must be judged on whether it speaks to an existing discussion. Here questions like "Does the study extend knowledge?" and "Does the research improve the existing practice within the field of study?" are necessary. Research must build on existing theory by challenging known theoretical assumptions (Tracy, 2010). This perspective is supported in particular through Design Thinking, where the principles of theory derived from existing theory contribute to the development of new models that are subsequently tested in practice.

The following section will thus draw conclusions on three different aspects of the PhD: first, how the theoretical reflection elaborated in the analysis within the categories of motivation and autonomy, exploration and analysis, and reflective practice adds new perspectives to the field of Game-Based Learning; second, how the designed theoretical model of Game-Based Learning reveals new perspectives to the understanding of Reflective Practice-based Learning; and last, how a process awareness when using Educational Design Research affects the transcending contradictions of the methodology.

12.2. GAME-BASED LEARNING

As a contribution to the existing knowledge, this PhD adds new perspectives and changes to the current understanding of the pros and cons within the field of Game-Based Learning according to the challenges and opportunities related to using games in a professional and practice-oriented educational programme. The presented literature revealed a consensus about a lack of empirical research within the field, particularly concerning the development of meaningful learning trajectories through a dialogic approach mediated by Game-Based Learning. The desk research revealed many studies within Game-Based Learning reporting an increase in motivation while not being able to detect a significant effect concerning the acquisition of new knowledge and skills. However, this must be weighed against the fact that many existing learning games are built around a fixed narrative coupled with a gaming structure that does not involve the students through a holistic approach. The typical error when designing learning games is the use of a reduced set of game mechanisms that create simple game designs aimed at memorising the answers rather than learning through discovery, exploration, critical thinking and experience-based activities. The desk research revealed how vital design principles and game mechanisms like game over, farming and crafting, progress, dungeons and missions, etc. are missing in the literature. Most studies within Game-Based Learning only deal with the concepts of quests and levels. The overall findings from the empirical data in this PhD, however, illustrate that the most significant effect of using Game-Based Learning to increase explorative and analytical behaviour, as well as reflective practice, arises from using concepts such as game over or farming and crafting activities.

The empirical findings reveal how the principles from Game-Based Learning can support the students' learning processes and afford the development of generic competencies relevant for higher education. However, the PhD stresses that a holistic design strategy supporting the intended learning is needed to maintain the demands for higher education. The study offered in this PhD thus raises essential questions about how to understand and interpret complex phenomena of social learning within a game. By working with a more complex and sophisticated application of gaming principles, it is possible to design learning situations that facilitate academic activities like critical thinking, reflection and analysis. The framework for Game-Based Learning, addressed in this PhD, thus contributes to the existing knowledge through the designed model (see Figure 66) for how to work with Reflective Practice-based Learning through Game-Based Learning.

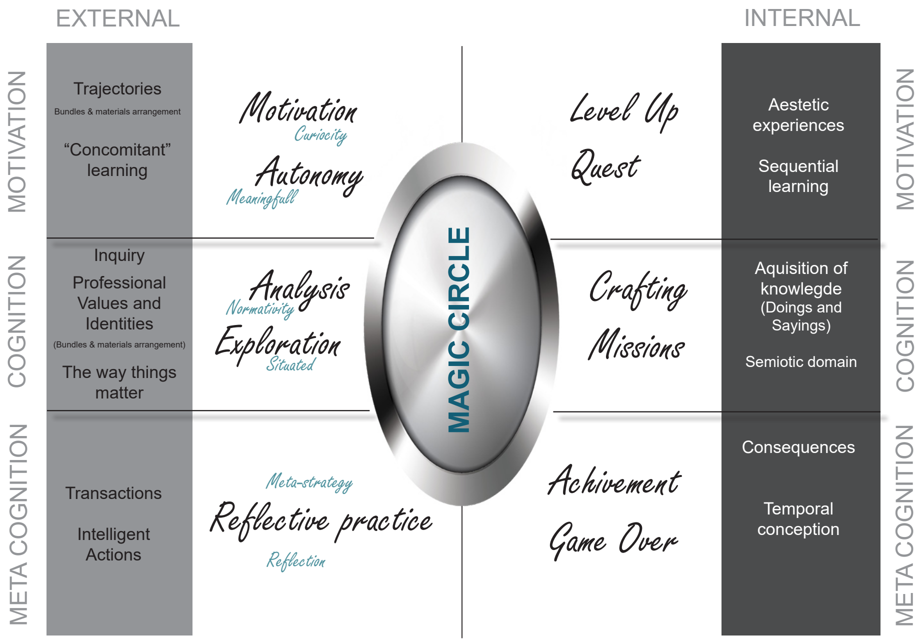


Figure 66 – The final model for Game-Based Learning in higher education based on World of Warcraft.

A successful blend of learning theory and game design is not just about a simple reduction of game principles, which will ultimately create an ineffective behavioural approach through the use of points and badges. It means that Game-Based Learning is not about learning the curriculum, but instead changing the learning conditions through a more complex system of gaming mechanisms that points towards a process-oriented approach. It means a focus on game mechanisms that trigger explorative and analytical behaviour in the students.

Therefore, more extensive empirical research is still needed, with studies focussing on the connection between learning and gaming principles.

Mowing towards an autonomous behaviour

The empirical data reveal a vulnerability related to maintaining a high degree of motivation and autonomy if the quest and level structure is weak in regard to creating meaningful learning trajectories. If the students receive quests that are too difficult to solve, too time-consuming or without relevance compared to the demand for their projects, the motivation drops. Thus, it cannot be concluded that a simple combination of quests and levels results in increased motivation and thus learning outcome. An increased autonomous behaviour is especially strengthened by the game system being based on a flexible approach that allows the students to organise their learning trajectory themselves. In particular, it is the students' opportunity to select and combine the individual quests cross-cutting through a curious behaviour that seems crucial to motivation.

Also, the game needs to support the notion that the students on their own initiative have control over how and how much the learning game is going to be used in their project. The use of reward systems contributes to increased motivation and persistence when students find that the sequential gaming structure has a bearing on the quality and depth that creates coherence in the project. Also, a clear trend is seen in the qualitative data where the students' motivation for the learning game decreases as they develop an autonomous behaviour and approach to their project. Both the qualitative and quantitative analysis showed that the students, especially at the beginning of the semester, experienced the learning game as meaningful. Thus, there is a clear correlation between how uncertain and confused the students are and their perception of how important the learning game is for the learning process. This effect needs to be considered in future gaming design if the purpose is to create autonomous behaviour through games (see Figure 67).

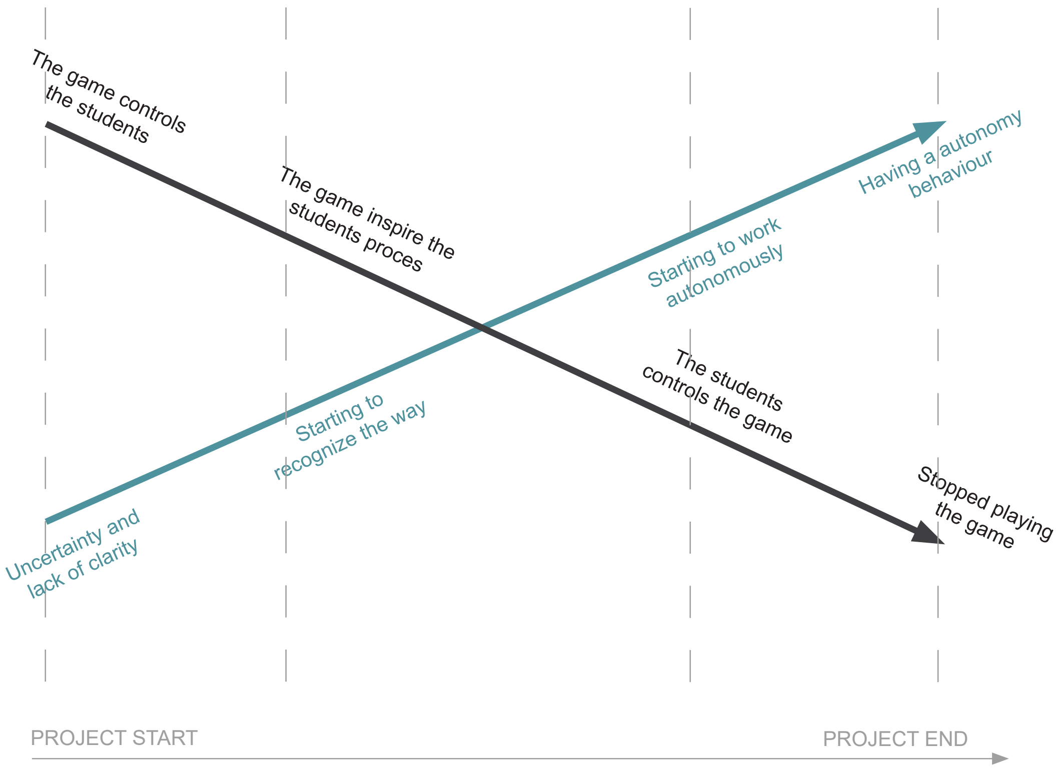


Figure 67 – Illustrates the correlation between increased autonomy and the students' opt-out of the learning game.

The empirical data thus point towards the notion that a balance between the degree of facilitation of the problem-based approach and the use of Game-Based Learning principles as guidance is necessary. If not, there is a potential risk of the educational game design resulting in a kind of instructional "recipe", and thus a weak problem-oriented learning process. The educational learning game's composition of game mechanisms in this PhD thus contributes to the students influencing the content, and thus an experience of being able to create unique learning trajectories based on analytical and explorative behaviour. The educational game design, therefore, seemed to be a form of catalyst for creating progress in the semester projects, where the students maintained a workflow, with a higher degree of energy, which afforded enthusiasm, curiosity and creativity in their process. Thus, the PhD project data show that Game-Based Learning helps to create progress in the project by giving students a good start to their process, including the fact that they can initiate an analytical and explorative approach to the academic material early in the process.

An important factor that, to some extent, conflicts with the existing normative understanding of game theory is the concept of winning. The analysis of the PhD project shows that the open-ended structure of the game allows the students to gradually shift their focus from playing to working with the project. The goal is thus not to win the game but to create enough autonomy to enable the students to independently and actively take responsibility for their projects. From a design perspective, this means that future development processes for learning games should give attention to and perhaps even confront the competitive elements and the concept of winning, as an underlying condition for game thinking.

Creating autonomy through game thinking

In particular, the changes in students' normative behaviours have an impact on their awareness of academic disciplines. Thus, educational learning games must address gaming activities that focus on becoming rather than learning by being told. In this PhD project, the students showed a change in their behaviour related to their particular understanding of the concept of analysis, but also a change in their understanding of the work domain of an architect. Thus, the data collected reveal that students through the learning game (1) have changed their usual workflows and (2) can reflect on how changes in their behaviour have challenged their existing knowledge. This is especially strengthened by the fact that the learning game supports the students not being tempted to take the first and best solution, but instead staying longer in the process where they spend time exploring and reflecting on different contexts of doings and sayings.

As a result of this, a trial and error culture is supported by different practices creating an exploratory process. The consequences of a setback or "game over" in the project naturally create critical thinking and foster a need to understand and analyse the situation through inquiry processes. Here the students linked the experience of practical in-game activities with theoretical insight in order to understand what went wrong. The empirical data revealed that farming and crafting activities through four central approaches created coherence and an organised mindset with the right balance and distribution of the three dimensions of thought – ease and speed, scale and variation, and depth. It was evident in the project through the students' descriptions of both intense and quick idea generations, coupled with in-depth discussions about the project's issues. Farming and crafting activities contribute to the students' understanding of knowledge as something that is constructed and not something that is given by a teacher, and thus an awareness of how learning is something that the students themselves must construct through active participation.

Splitting the learning process into smaller sequences resulted in the students managing the size and complexity of the task, and thus they were able to demonstrate a higher degree of curious, analytical and reflective behaviour. The students' subsequent reflections revealed how, through writing and graphical production, they connected the individual learning sequences into a whole through metacognition. Apart from a consolidation of what had been learned, the PhD project showed that, because of the game activities and structure, the students could follow and reinvent their process, which strengthens the development of meta-strategic competencies. The game's incentive structure is coupled with quest and dungeon activities that include writing requirements, and thus supported the development of student writing skills. Therefore, there is, through writing, a natural opportunity to discuss the project's academic content and direction as students because the game is presented to different angles and perspectives of the project. It creates conversations about how the depth of a text can be increased. The desire to obtain points to open new levels thus requires students' ongoing meta-strategic discussions about the context of the analyses concerning the building's conceptual thoughts and visions.

The empirical discussion in this PhD thus points to the fact that the learning game's effectiveness seems to be dependent on the students' opportunities to let their reflections and choices draw and affect the development of personal learning trajectories.

12.3. REFLECTIVE PRACTICE-BASED LEARNING

Besides working with aspects related to Game-Based Learning, another aim of the project has been to describe and document the processes that involve Reflective Practice-based Learning. The domain of Practice Theory has inspired the theoretical perspective through an understanding and interpretation of learning as "landscapes of practice" consisting of designed complex and personal learning trajectories.

The use of Game-Based Learning as a mediating tool indicates that the students lack of knowledge about concepts such as analysis, critical thinking, reflection, etc. prevents them from unfolding an explorative approach to their professional practice. When the game provided this knowledge through smaller learning sequences, the students became aware of these concepts and managed to change their normative behaviour.

This implies that a systematic approach based on designed learning sequences can strengthen the students' ability to work analytically and reflectively. The analysis thus demonstrated that the students, through sequential inquiry processes, increased the possibility of establishing a Reflective Practice-based Learning process.

Working with designed and personal learning trajectories addresses the learning condition related to 21st-century skills, provided that the teacher, as a designer, understands the need for a strong and embedded relationship between proceed and depends in the learning design. New design principles and schemas for designing learning trajectories are, therefore, needed to address the facilitation of the six core principles of Reflective Practice-based Learning in order to provide the students with the tools and method to navigate in an explorative and chaotic learning process.

Furthermore, this PhD confirms, through the empirical data, that two of the pedagogical core principles presented in the White Paper assumed to create proper conditions for Reflective Practice-based Learning affect the degree of learning. The students demonstrated that, through explorative behaviour, they managed to work with a high number of disturbances, resulting in reflective discussions about the practical and theoretical aspects of their professionalism. The explorative nature created depth in the students' projects while they were developing their analytical skills. Reflection thus occurs in the empirical data in situations where the educational activities within the learning game allowed the students to experiment and explore the academic field.

Some of the scientific questions asked in Chapter 3 are about the concept of "change" and how to understand it in the context of Educational Design Research from a pragmatic perspective. Two of the questions were: Do the changes make things better and who decides what is good? In this connection, it is, therefore, essential to address and listen to teachers' concerns about the behavioural elements of Game-Based Learning. The analysis of the empirical data in Chapter 10 shows that even though the teachers could both observe changes in the students' behaviour and acknowledge the importance of the game for this, it was not considered entirely a positive effect. The teachers questioned whether it is the "right" or perhaps even the most ethical way to make a change if it is based on the behavioural traits of Game-Based Learning.

However, the teachers' persistent argument about games being based on behavioural approaches and thus not being able to be combined with problem-oriented principles creates, in a pragmatic understanding, a form of impossibility that in many ways can be understood as a catalyst for gaining new insight. Only by putting together components that are not immediately connectable is it possible to discover something new and see reality from new perspectives. A counter-reply to this may be to understand the learning processes in higher education as something that to a very similar extent is guided by external motivation, in that the students aim to achieve a particular grade, pass an exam or satisfy a teacher. Game-Based Learning simply clarifies these mechanisms and allows the students to relate actively and reflectively to it. It is important to point out that at no time have the students been checked regarding their allocation of points. This means that the teachers have not helped to assess when a task has been sufficiently or correctly solved. The assessment through points is based solely on the students' judgment. There are also no clear signs in the empirical data that this has been a problem for the groups in between.

Another pragmatic perspective is that the purpose of experimenting with impossibilities is the opportunity to challenge transcending contradictions in a particular practice. Thus, one conclusion from this PhD project is not to translate every learning situation into a game. On the other hand, it is argued that the discoveries should be developed further, along with visible signs of the change caused by the game that have been clarified through this PhD project, to create new design principles that can contribute to the formation of new learning courses based on a high degree of exploration and reflection.

12.4. RESEARCH CONTRIBUTION

Judging the contribution of a research project is very much about reflecting upon whether the project's findings are relevant, timely, significant, interesting or evocative. This thesis seeks to meet this criterion by trying to challenge well-accepted ideas in game research through exploring models for how Game-Based Learning entails new opportunities for creating reflective, explorative and practice-based learning through personal learning trajectories in higher education (McConville et al., 2017; Sánchez, 2014; Tracy, 2010).

A large part of the reported research is focused around digital games or blended learning contexts (Dicheva et al., 2015; Melero & Hernández-Leo, 2014), where game types using physical objects facilitating contextualised learning are missed. The project thus contributes to the existing field of Game-Based Learning by showing how principles from digital games such as World of Warcraft can be transformed into a physical educational learning game. This means working with Game-Based Learning aspects without using technology and a traditional learning management system (LMS), by applying gaming principles to a physical non-virtual context. This approach thus contributes to existing research within the field of Game-Based Learning as it offers a model of game design elements in non-game contexts.

The literature review by Dicheva et al. (2015) shows that much has been written about the topic, but most of the studies focus on game mechanisms and game dynamics from a theoretical perspective or from presentations of theoretical models (All et al., 2016; Dicheva et al., 2015). This PhD, therefore, contributes with an example of how a theoretical model (see Figure 70) for Game-Based Learning can be transformed into a practical learning design as well as an implementation of teaching design. The study thus contributes with a demonstration of how Game-Based Learning affects learning processes in higher education through empirical data, which has been described in the literature as a shortage (Dicheva et al., 2015; Gee, 2007; Hainey et al., 2014; Iliya et al., 2015; Qian & Clark, 2016; Silseth, 2012; Sourmelis et al., 2017; Squire, 2006). The designed model present how Game-Based Learning can inspire and challenge the academic teaching environments where learning has entirely different characteristics, such as being much more problem-oriented, analytical and reflective.

Furthermore, most educational games only support the use of a single-person perspective (Chang & Hwang, 2019), which contrasts with the vision of developing competencies such as the ability to discuss, negotiate and collaborate – an exercise that can, among other things, be constituted by group work (Leith et al., 2019). The presented model in the PhD contains a designed sociality through the configuration of quests and missions, where the students need to collaborate in order to succeed. Further, the context of ATCM, where the learning game is tested and implemented, is based on group work.

The PhD presents new gaming concepts such as “crafting and farming”, “game over” and “dungeons/missions” within a pedagogical context. This PhD argues that it is especially through these concepts that an existing normativity within Game-Based Learning can be a challenge and subsequently inspire further developments for how academic topics, including reflection, exploration and analysis, can be learned in a much more exploratory way through games.

Finally, this PhD contributes with a model for how to work with Reflective Practice-based Learning through Game-Based Learning, by embedding the six core principles that characterise this learning approach into game design. Similarly, the two selected core principles of RPL – teaching is planned with appropriate disruptions and teaching is organised as an exploration – are demonstrated through the empirical data of the PhD study, by elaborating how an explorative approach leads to a higher degree of reflection and depth in student projects.

12.4.1. COMBINING EDR AND DESIGN THINKING

As elaborated in Section 3.4, the concept of design is spoken of in general terms within the literature of Educational Design Research, but no directions or methods are given for how these designs occur. Nor is there any explanation for how the theoretical perspectives, which in many ways are the basis of what is being investigated, are translated into concrete designs. A contribution of this dissertation, therefore, is a methodology for how to conduct educational design. By combining theories and methods from the field of Design Thinking with Educational Design Research it has been possible to work beyond simple brainstorming techniques and idea generation methods in the design phase. The use of design principles and design schemas in this PhD is a response to the criticism raised in Chapter 3 against Educational Design

Research. The dissertation thus provides a methodology (see Figure 70) for how to create designs that link to theoretical assumptions, through the interpretation of Nelson and Stolterman's understanding of the connection between design principles and design schemas (Nelson & Stolterman, 2014).

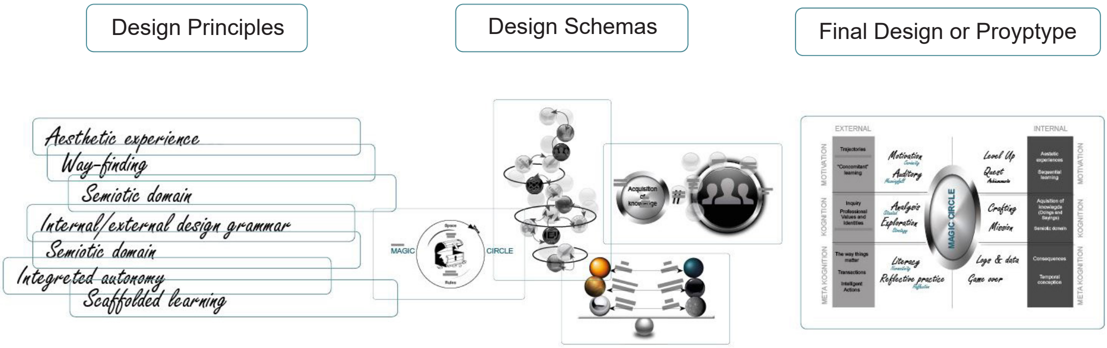


Figure 70 – The methodology of converting design principles into design schemas and prototypes.

One of the challenges was the lack of methodological insight into how design requirements and theoretical assumption are derived or how they are used to inform the design. By using an element of Design Thinking, this PhD thesis has presented a method for how sketching techniques help puzzle design principles to design schemas and then into coherent and final designs. These three steps of the design process respond to transferability within the project through the sketching techniques.

Finally, the individual design schemas presented in this PhD thesis contribute as an inspiration for how topics such as Game-Based Learning and Practice Theory can be linked in different ways and constellations. The derived design principles from each chapter within phase one will serve as inspirational bricks for design processes of others.

12.5. FUTURE WORK

More empirical studies in higher education are still relevant and needed regarding investigating how academic disciplines can be learned through the use of Game-Based Learning – notably studies addressing the effect of Game-Based Learning according to critical thinking and problem solving. There is, therefore, a particular need for empirical research on how game mechanisms can inspire the creation of new innovative representations of the academic in a meaningful way with the experienced freedom to challenge the presented content. As most educational games are still developed from an internal point of view, with a focus on the curriculum and training of practical skills, there is a particular need for empirical research based on learning games that are inspired by MMORPGs' understanding and application of a combined design grammar consisting of both internal and external factors.

This means that it is still relevant to investigate how computer players learn difficult content in MMORPGs. Many of the studies dealing with this particular genre of games have a specific focus on social aspects, which means that more general gaming mechanisms that stimulate problem solving and the desire to explore remain unclear. Among other things, this PhD thesis has highlighted the lack of studies that deal extensively with the concepts of death, crafting and farming, as well as progress.

Next, studies that challenge the application of the term "games" could help to broaden the understanding and anchoring of Game-Based Learning in higher education. The question is whether it is beneficial to use the term "games" instead of merely designing teaching that is based on game principles without being an actual game. Here, it is interesting to challenge the idea of whether a game needs to be completed or won.
It is a way of thinking in games where the students continuously contribute to the content of the game by, for example, putting together large parts of their achievement trees where the students themselves select topics of interest and thereby trigger unique and personal quests in each level. Similarly, talent trees can be implemented so that the allocation of the game's score varies depending on personal wishes and goals.

The final dimension is that the prevalence of Game-Based Learning is far lower in higher education than in the other educational sectors.

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APPENDIX A. DETAILED PRESENTATION OF THE PRE-STUDY

A.1. CRITICAL UTOPIAN ACTION RESEARCH

The PhD project is based, as described in the introduction, on a practical experience regarding the issues concerning "passive-aggressive resistance" against the teaching created by the educational institutions process-oriented approach to learning. These experiences are unexamined and imprinted with tacit knowledge, which potentially can be full of biases, prejudices and unchallenged assumptions.

The use of critical utopian action research in combination with educational action research in the pre-study is chosen as the method ensures that the students' voices can be heard without the researcher influencing the content of the perspectives being discussed. Critical utopian action research as a method deals with these imbalances through recognition of the researcher being present while students have the opportunity to express themselves in "free space". The method makes it possible to address criticism about bias as the students contribute with new knowledge and insight without being directly affected by the researcher. The use of critical utopian action research as a form of interview is not only to gain knowledge about the practice but equally to visualise the paradoxes and inconsistencies that exist in practices between teachers and students. It is, therefore, crucial to establish a "free space" where students have the opportunity to discuss respectively critical and utopian perspectives on teaching and learning as a concept (Skovsmose & Borba, 2004).

Critical utopian action research seeks to understand and investigate situations by having a special focus on hypothetical situations. Fundamentally, it is about identifying anything that might be different from existing practice (Skovsmose & Borba, 2004). Critical utopian actions are the movement between criticism and utopia within a room of "free space". The movement between criticism of existing conditions and utopian ideas is what generates progress and new insights. The critical phase facilitates the identification of frozen structures, while the utopian phase enables energy to create a change of the structures (Nielsen and Lyhne, 2016).

Critical utopian action research is a way to work with interview forms that move beyond gathering information. The interviewer participates actively by facilitating the process through initiating actions. This process brings the researcher from a critical theoretical position towards a more action research-based position. In the case of a reflective emancipatory approach, the process challenges institutional and structural relationships to identify emancipatory possibilities. Traditional interview techniques like push-polling are not optimal in action research as they affect the participants' positions directly (Nielsen and Lyhne, 2016).

A critical utopian interview form is orchestrated in a way that creates a reflective space aimed at supporting a transformative learning process for both the researcher and the participants. The concept of "free space" is defined by being a space that belongs to the people involved and therefore free of systemic impact – something that characterises traditional forms of interviews where the researcher sets the agenda for discussion (Nielsen and Lyhne, 2016).

The interview is methodically structured around a conversation about a chosen theme where critical perspectives are transformed into a visionary/utopian idea generation that will ultimately point towards a potential future. The movement of the conversation is intended to identify the frozen structures and make them visible.

Where critical utopian action research is traditionally used to create change initiated by the participants, the method is utilised as an interview strategy with a focus on wanting to understand practices rather than changing them in this PhD thesis. The PhD project is structured as previously described as an educational research design. The application of critical utopian action research as an interview form will be based on the theoretical formulation by Skovsmose and Borba (2004). The reason for this choice lies in the embedded analysis strategies related to their understanding of criticism and utopia. Skovsmose and Borba's approach is built around a cyclical process extending over three primary positions stretched in a triangle – current situation (CS), imagined situation (IS) and arranged situation (AS) (Skovsmose & Borba, 2004).

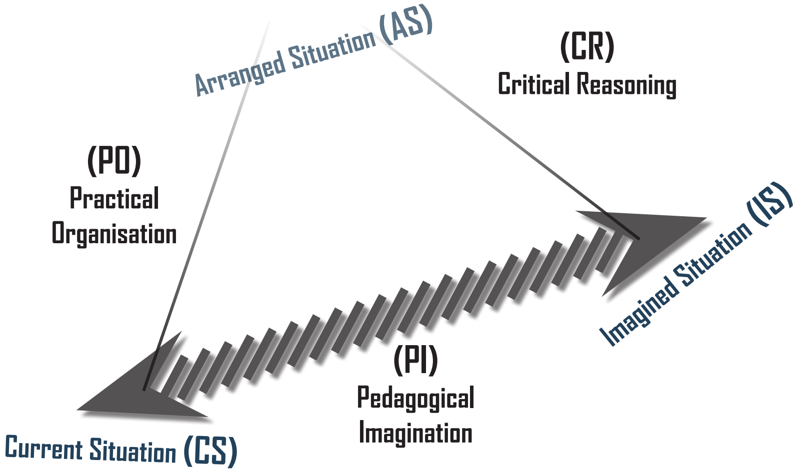


Figure A1 – Showing the combination of the research design and the use of critical utopian action research as a way to operate from an insider position.

The method's validity is found in the three analytical concepts, pedagogical imagination (PI), critical reasoning (CR) and practical organisation (PO), that occur in the spaces between the three primary positions (Skovsmose & Borba, 2004).

Pedagogical imagination (PI) is interested in the relationship between the current situation (CS) and imagined situation (IS). Pedagogical imagination (PI) therefore consists of a complex conceptualisation of things that could be done differently and are, therefore, seen as an identification of alternatives to CS. Pedagogical imagination thus expresses a historical sensitivity and recognition of what has happened and at the same time a critical position regarding not taking the current situation for granted (Skovsmose & Borba, 2004).

Critical reasoning (CR) is interested in the relationship between the imagined situation (IS) and the arranged situation (AS). It cannot be expected that the imagined situation (IS) can be achieved in the arranged situation (AS), which is why critical reasoning is essential. Critical reasoning creates an analytical strategy that aims to explore the imagined situation based on studies of a specific arrangement that represents the imagined situation. Through reasoning, we try to get an understanding of the imagined situation through evidence gathered in an arranged situation (Skovsmose & Borba, 2004).

Practical organisation (PO) is interested in the relationship between the current situation (CS) and arranged situation (AS). Practical organisation (PO) is established by an organisation and consists of practical planning of activities that are required to set up a situation similar to the imagined situation (IS). The practical organisation thus represents a realistic or pragmatic version of the imagined situation (Skovsmose & Borba, 2004).

Based on a hybrid of Educational Design Research and action research, the developed research design for the pre-study tries to address the criticisms that are relevant. Special topics such as data collection and the importance of the researcher's own professional identity regarding the interpretation of the collected data have been the focal point. I believe that the use of critical utopian action research as a form of interview can be a strategy for developing design principles that take the different positionings into account. I believe that the method will support the independence of the student and thus create a free dialogue for topic teaching and learning.

Figure A2 – The movement from a critical position towards a utopian position with the aim of revealing existing contradictions.

As the field of practice in this PhD thesis contains clear paradoxes regarding an understanding of the concepts of learning and education, it is crucial that the chosen research design can accommodate this complexity.

A.2. DATA COLLECTION

The study is based on four different workshops with four selected educational programmes on technology at UCN. The students of the chosen programmes are an average of one year into their education and have an emerging sense of what it means to study. In each workshop, the students are divided into three groups of three or four people. The collected data from the workshop create a discussion on "pedagogical imagination". By comparing the students' statements with UCN's understanding of learning, including my own, the goal is to identify the tensions that currently make learning difficult. The goal is not to identify who is "right" but rather to get an understanding of the clash between the different ontological positions of the teachers and students. This conceptualisation of possible tensions and contradictions between teachers and students makes it possible to rethink or find alternatives to the current situation (CS).

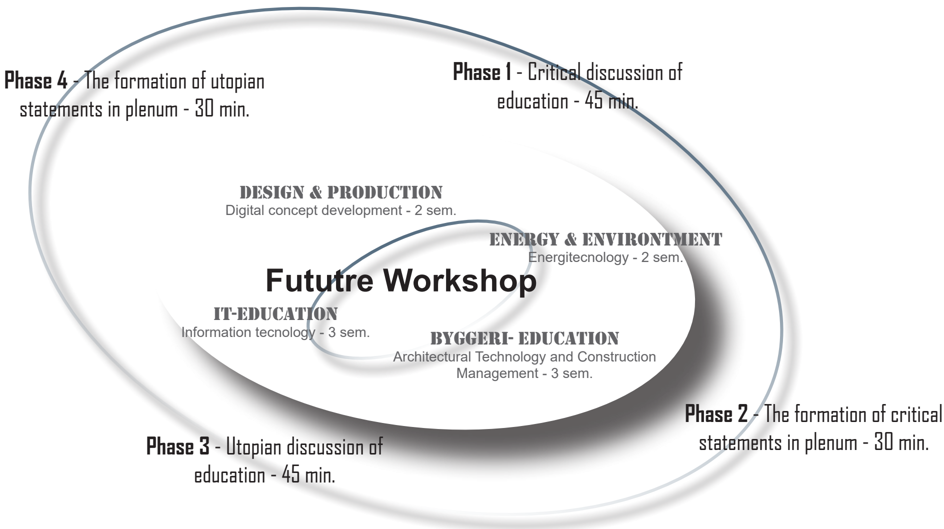


Figure A3 – Illustrates the four phases of the critical utopian workshops.

In the first phase, the groups discuss critical perspectives on their education. Along the way, they write down comments regularly on post-it notes. The discussion runs for 45 minutes without interruption. In the last 10 minutes of the phase, the students categorise their post-it notes under headings they define. Everything is assembled on a poster, which is subsequently presented in the plenum. The students have an opportunity to discuss the contents of each other's posters. The criticism round is completed by the students selecting the topic they consider most important, concerning, interesting, etc. with small dots. In the next phase, the groups discuss utopian perspectives on the issues they jointly found most relevant. Just as in the previous phase, they write down their comments on post-it notes.

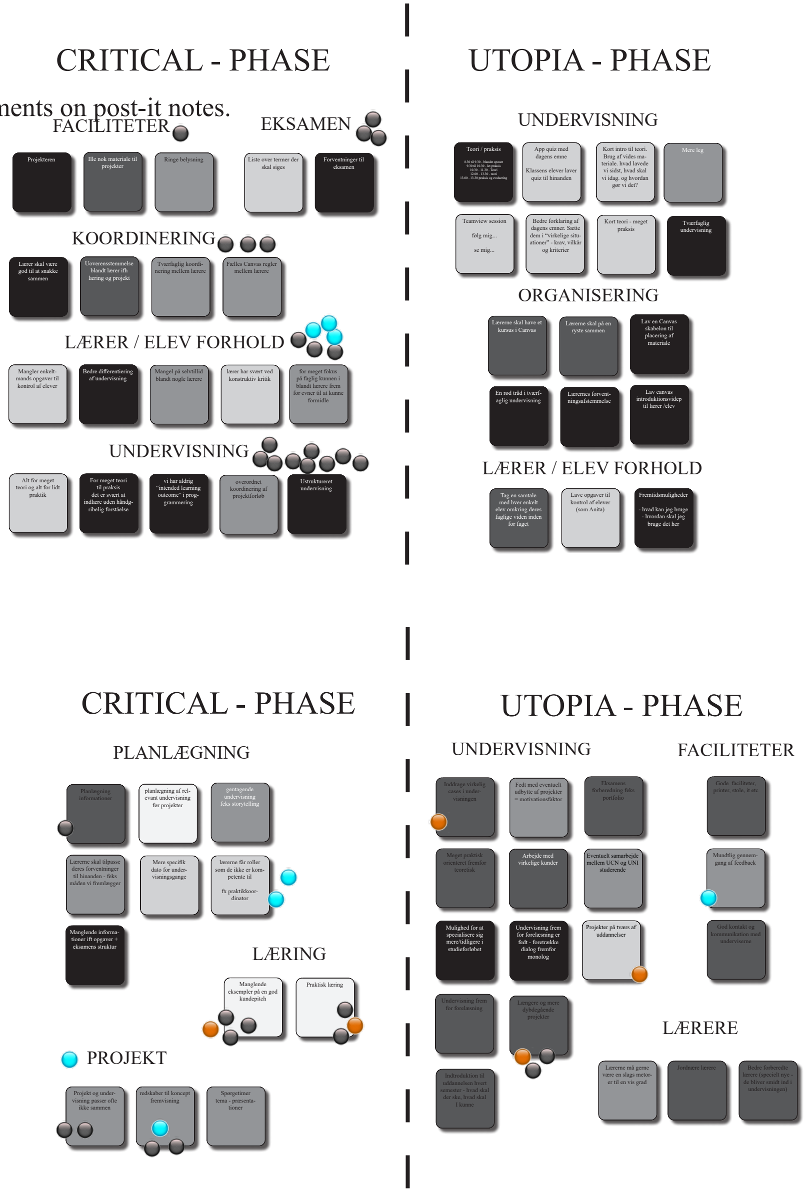


Figure A4 – Example of two of the posters created by the students during the critical utopian workshops.

The utopia phase also lasts for 45 minutes, with the students again categorising their post-it notes under new headings in the last 10 minutes. They prepare a poster again to present in the plenum. In the same manner as in the criticism phase, the students discuss the most relevant statements and mark them with dots.

The students' conversation and preparation of posters are recorded by a video camera and Dictaphones and transcribed afterwards. A qualitative content analysis is applied to the collected and transcribed data. The processing of the collected data is based on an abductive coding and interpretation of qualitative data.

Figure A5 – Pictures from one of the critical utopian workshops with the students.

In the qualitative approach to data collection, the focus will be on the students' reflective experiences, thoughts and emotions related to the use of Game-Based Learning as a facilitating framework in their semester project. The following table shows the type and amount of data collected, as well as the number of respondents who participated in each data collection session.

	Number of participants	**Number of pages**	**Number of hours**	**umber of posters**
Information tecnology	12	65	12	8
Energitecnology	10	63	9	6
Architectural Technology and Construction Management	30	76	30	20
Digital concept developer	16	83	12	8

Figure A6 – Schematic overview of data collection.

Exploratory observations and conversation primarily characterise the data collection in open interviews about the study from the perspective of understanding and explaining.

A.3. ANALYSIS OF DATA

The foundation of the data processing is the following four main features: selection of relevant parts of the data material, the degree of transcription, the coding procedure and the writing-up process. The individual steps are described in the sections below.

1) Selection of data: All conversations from the workshops and the plenum discussions are transcribed to ensure a broad base for the coding process.

2) The level of transcription: A prerequisite for the coding process is a transcript of video and audio recordings from the critical utopian workshops. Based on Kvale and Brinkmann (2014), the following criteria for the degree of transcription have been selected: a) the purpose of the transcription is interpretation of meaning; b) emotional outbursts, laughter and spontaneous sounds are marked in the transcription; c) "fill" words are included in the transcript so that text appears in accordance with the audio file (Kvale and Brinkmann, 2014).

3) Procedure for coding: The coding process for this PhD process, based on an abductive approach, focuses on an open category formation from both an inductive and deductive

perspective. The coding process thus has a sensitivity towards the possibilities of spontaneous categories emerging detached from the theoretical assumption. This means a focus on categories that emerged through an explorative data-driven inductive approach to students' narratives while the design principles of the project are used as clues.

The primary criteria for the coding process have been the frequencies of specific descriptions of students' experiences. The design principles have guided this coding process from a theoretical basis (Charmaz, 2014; Kvale and Brinkmann, 2014).

The coding process has been carried out exclusively physically and manually. The reason for this choice is the argument of obtaining a complete overview of all categories, which can be difficult within a digital map and file structure. This overview makes it much easier to observe and discover interesting patterns continuously over time through an embodiment created by the physical coding process.

4) Writing up: Through an investigation of the found categories, new theories have emerged through an abductive analysis. Through an axial coding of the found categories, coupled with the outlined sketches, several statements are identified. These statements provide a framework for writing up the analysis (Charmaz, 2014).

Each chapter in the analysis presents a table showing an essential statement for each of the found categories.

The analysis of the data collected will be based on the following two selected main categories: learning process and acquisition of knowledge. In the following sections, an analysis of the individual categories is presented in relation to the data collected.

A.3. LEARNING PROCESS

The analysis reveals a contradictory argumentation when it comes to how the students understand the responsibility of displaying autonomous behaviour. The question is whether there is inadequate planning of the learning process or the students are not able to explore a topic by themselves. In particular, the concepts of "project-based learning" and "trial and error" challenge the students' self-efficacy. The students fail to accept the ontological foundations on which UCN's learning approach is based. In particular, the category of "divergent response" is criticised by the students as they indicate that it is primarily the experience of a lack of communication among the teachers that is the problem. The table below shows several statements that point to this issue. The white boxes are statements in which the students express their uncertainty about how to act in the learning performance, while the grey boxes are statements in which the students direct criticism at the organisation of the learning situation.

LEARNING PROCESS

Autonomy	Trial and error	Project-based	Divergent answers	Open project
I did not know what to do	Be more optimal, fit with the teaching	It was for learning something, not for doing a project	What lessons are most important	They have no control over what requirements
A day off in the middle of it all	It is a bit late to know	… long before you know what it should contain	But what do you expect ...	Many things that have a slightly broad answer
Be free all the time	Be good at limiting yourself	It comes in big chunks	Then you just get totally confused	Where things can be done in different ways
Unsatisfied with planning	Then the errors come right away	They just throw it in your face	... or is it good enough	There IS a solution to things
I do not sit down	It ruins our schedule	Then you should be group-like	... being pressed	Very hard to make it
No, I just cannot do that	It is such a ring you run in	The project is spread out between teaching	The supervisors each have their own way	Information is missing regarding the tasks
Wasting our time	In order for us to be confused	Feels the pressure to do the project at home	2-3 different descriptions	Hard to figure out the requirements
Do the homework	Preferably in without these ongoing tasks		They still need to be in control	
Has not been taught	We are not making any mistakes	Can you choose it ...	Be better at communicating	They would get rid of the many questions
We have unused books	A long time before we know what it should contain	Was thrown heedlessly into it	Three different opinions	We felt compelled to leave
... did nothing	Learning by doing	Annoying with tasks in the middle	What shall we do then…	... that explains it all

<table>
<tr><td>Just a minimum</td><td>I am feeling, you have to start again</td><td>Not a big fan of RPL</td><td>Just sitting and staring</td><td>They refer too much to the semester schedule</td></tr>
<tr><td>Could not do anything</td><td>Scattered project day, lack of uniformity</td><td>Spend a week cutting clips</td><td>... find out when things are coming</td><td>The curriculum is difficult to understand</td></tr>
<tr><td>Really hard to hang in independently</td><td>If we had had them a month before</td><td>Was feeling, where does this lead too</td><td>Discrepancy between teachers</td><td>Hard to analyse</td></tr>
<tr><td rowspan="2">Half of the classes adjacent their head against the wall</td><td>Taking one behind schedule</td><td rowspan="2">Have the feeling that they want us to learn it ourselves</td><td>Have no clue</td><td>We do not know what the teachers are judging</td></tr>
<tr><td>… Was surprised both times</td><td>One said yes, the other said no</td><td>So we do not know what the result should be</td></tr>
<tr><td>A little up to yourself</td><td>Seems hard to close anything</td><td rowspan="2">There are limits to how healthy it is to be frustrated</td><td>Like they do not talk</td><td rowspan="2">Apparently, you are allowed to be half-finished</td></tr>
<tr><td>Still needs help</td><td>Whom am I going to ask</td><td>Then it changed</td></tr>
<tr><td>Do not know shit</td><td>Two days before we had to deliver</td><td rowspan="3">That time I could spend more effectively on something else</td><td>You doubt ...</td><td>It comes off the track</td></tr>
<tr><td>Missing tips on how to learn</td><td>... they want to see how much we fuck up</td><td>you had no idea whatsoever</td><td>After all, it cannot be done</td></tr>
<tr><td>Help to self-help</td><td>... hard to know when to stop the ring</td><td>There were no answers</td><td>The curriculum is almost code language</td></tr>
<tr><td>Coming from an artisan education</td><td>Project day before teaching</td><td rowspan="2">A reflexive education we just suddenly started on</td><td>Suddenly difficult to achieve it all</td><td>Have to guess too much</td></tr>
<tr><td>… Teachers available, they do not care</td><td>We can keep finding errors</td><td>Responds in a different direction</td><td>What is most important</td></tr>
</table>

<table>
<tr><td>Get something tangible out of it</td><td rowspan="2">Must really learn to prioritise a lot</td><td rowspan="2">We are not told: we have to go th-rough these things</td><td>Teachers walk around telling…</td><td rowspan="2">What the hell are we going for?</td></tr>
<tr><td>Very annoying</td><td>Hard to distinguish</td></tr>
</table>

Figure A7– Statements from the data expressing the students uncertainty about how to act in the learning situation.

A.3.1. AUTONOMY

In Examples 1.1 and 1.2, the students describe a situation where they cannot do anything due to poor planning by the teachers. The students point out that because they have not received enough teaching, they are not able to work on their assignment or projects. This is evidenced by a passive behaviour where they do nothing. They describe how the consequence of this is that they choose to go home. Their statements point to an understanding that teaching involves the presence of a teacher who delivers the curriculum.

If the examples are analysed from a teacher's perspective, they illustrate the students' inability to independently acquire knowledge, formulate problems, work analytically with a topic, etc. Part of the teaching in higher education is planned so that the students must actively and independently research and explore their professionalism. Thus, a large part of the teaching is self-study rather than whiteboarding. It is therefore problematic if the students choose to do nothing or go home rather than initiate activities that can promote their self-study. Schatzki (2016, 2017) talks about the concept of "coming to know", which is about the students' agency, capacity and ability to act, in the learning process (Schatzki, 2016, 2017). The example, therefore, shows that the students do not have the necessary tools to facilitate their learning process.

> ***Example 1.1***
> *Student 1: "I sat and chuckled the first day of the project."*
>
> *Student 2: "Well, we all did."*
>
> *Student 1: "Yeah, we just sat there and chatted."*
>
> *Student 2: "We were sitting at home. Think we went home the first day of the project, we could not do anything. I think we agreed that we should not meet because we could not do anything."*
>
> ***Example 1.2***
> *"And then it is the same with these project days we have; they have also*

been poorly planned. We had a lesson once and then we had a project day, it was WHAT, at home and cockroaches because we could not do anything, we had no idea what to do anyway."

The inability to work independently is also evident in the students' reaction to situations where the ongoing project days come before a specific course of instruction: *"Then you just sit and think fuck, I have nothing to do because we do not know what to do, we have not been taught what to do."* This quotation shows that the students again choose a passive approach, rather than starting investigating the academic topic and thereby being able to contribute with relevant questions in the subsequent course of instruction. There is thus an expectation that teaching has been arranged with exact convergence to the students' workflow.

In the utopian presentation of the courses, the students also talk about planning their project days so that there is no time-wasting in the form of the students not knowing what to work with. The organisation of the teaching must thus ensure that the project days are arranged in a way where the students do not have to start working on the assignments before having an accurate description of the content. The argument for this desire is to avoid making mistakes by not starting on a task until they have acquired the necessary knowledge and insight.

Example 1.3

"Well, it was for example something like that if we could be allowed to plan this perfect teaching and study, then, for example, the project days, plan them better so that we do not feel that the project day is wasted, that the students they know what to do exactly on these project days, so they always have something to do instead of just sitting [...]"

The students express concern about how they often finished their lessons in the middle of the day. They are surprised that they have significantly fewer hours of lectures than in previous educational programmes that have been characterised by a scheduled day until the afternoon. They find it problematic based on a thesis that it must necessarily mean that they cannot complete the syllabus of the semester and that way they do not learn anything or enough. The courses at UCN are composed in a way where a large part of the study time is supposed to be self-study. This means that students are expected to work independently with the material for up to 42½ hours per week. Teachers cover only half of the study time, and so a schedule of hours until noon does not mean that the students are free for the rest of the day. Thus, there is no clear understanding between the teachers and the students of the normative rules of what it means to be a student in full-time study.

Example 1.3

Student 1: "Yes, well I just feel that we want to learn and we are also

adult people and the fact that we get free after half-past two"
Student 2: "No, quarter to two."

Student 1: "Yes, but still, it is like, because in high school there I always stayed until three or four o'clock."

Student 2: "Yes, you stayed there until four o'clock."

Student 1: "And here, we already stop at half-past two, it is like how the hell should we be able to learn."

There is likewise an expectation among students that teaching is equal to learning. Thus, the teaching skills of the teachers are questioned if the students cannot immediately make sense of the topic after a lesson has ended. The following statements indicate that the teachers' arguments about how the students must take responsibility for their learning process are perceived by the students as a form of liability disclaimer: "Then I have written that there is too much emphasis on the word students, as I see it, then the school uses it as a liability disclaimer." In Example 1.4, the students express that they do not recognise that a learning process takes time and that it is often necessary to work with the material up to several times before the material is learned.

Example 1.4
Yes, so if the teachers they make available, then they are, at least to me, they do not care about what the teachers can do. If they succeeded in conveying a message so that those out here can receive and understand and get something tangible out of it, they do not care because they lean on us being students and if you do not understand it then you must go home and read. And as I understand it, well, then we have to spend double time because we are sitting out here wasting our time on some teachers that we do not understand, and on top of that, then we have to go home and read about what has just gone through school, try to understand it for yourself, and then we also have to do the homework at the same time.

The examples reviewed show that there is a fundamental mismatch between the students' and the teachers' normative understanding of teaching practice. There is thus a lack of shared understanding of what Schatzki refers to as the "teleoaffective structures" to what is acceptable or not acceptable in a given teaching situation, which is evidenced in the students' criticism of the planning and structure of the education. Therefore, based on Dewey's understanding of the concept of experience, there is a risk that the students' frustration will block and disrupt the possibility of learning. On top of that, the students' experiences are so incoherent that they do not intertwine into a whole, which is simply confusing.

In the students' utopian presentation of their education, it is clearly illustrated that they want the teachers to spend more time explaining the topic rather than the academic deepening that takes place through self-study. In Example 1.7, the student uses the phrase "it is easier I think to have it explained" to describe why one of their utopian ideas deals with a desire for teachers to convey the substance to a much greater extent.

> ***Example 1.6***
> *"Where it is harder to go through the material at home. It is something more…"*

> ***Example 1.7***
> *"Yes, but also a bit easier to understand when the teachers explain it than if you just go to one page and read about it yourself. It is somewhat easier to explain."*

In continuation of this, the students place the responsibility for the learning with the teachers. In the students' utopian vision, it should be possible to "replace" teachers who are unable to explain the material so that the students understand it the first time. They thus assign the teaching function to a unilateral mediating role where learning takes place through a simple knowledge transfer.

> ***Example 1.8***
> *"After all, it is not just someone who has an angle on it, such as finding out how to deliver the message, if you do not understand the message, then a new one to explain it in a different way, and if you still do not understand it, then find another one, a third way."*

Therefore, there is no recognition of the students having a responsibility to acquire knowledge themselves through active participation and prohibition. In addition, there is no understanding of why the acquisition of complex areas of topics is time-consuming, and that the process is often perceived as confusing and unclear.

A.3.2. TRIAL AND ERROR AND PROJECT BASED LEARNING

In addition to traditional confrontational teaching, students must achieve part of their learning goals by working with a project. The following quote, "And it was for learning something, it was not for doing a project, as a first project, it's for learning something", shows that students do not consider working with a project to be something that contributes to their learning. The next example points to the same, namely that some of the students do not think that the project-based learning complements the teaching. Therefore, they have a feeling of having to do another form of homework that they cannot quite define, rather than working with the project. Thus, they experience a dilemma because they really see the project as a waste of time.

Example 1.8

"Because the project is spread out between teaching throughout the semester. Also, as (name) he talked about, when you want to do something at home, you feel pressured to do something that benefits the project directly instead of something that can supplement the teaching."

A large number of generic skills or abilities are learned through participation in multiple practices consisting of different situations played out in different bundles. Therefore, according to Schatzki, learning is the result of acquiring a specific habitus that is necessary to operate within a particular practice. He argues that different individuals acquire knowledge partly over time and partly at different levels. Dewey describes learning in another way as something that points forward to something. Learning, therefore, has an experimental nature and Dewey, therefore, argues that education and teaching are the elements that underpin and set the direction of the experiences.

Project-based learning is an effective teaching method for creating multiple practices through an experimental approach. Exploratory behaviour in particular provokes the students because it brings them into situations where they do not know what the next step is and they cannot expect a finished result. The phrase "because it is apparently okay to be half finished if there is a process behind" illustrates the students' amazement at being taught that way. The examples show that the students have been instructed by the teachers in how to work with problem-oriented tasks, but that they do not share the ontological idea behind this learning approach.

Example 1.9

"Because they also say, if there is common confusion and we ask, then they say: just look at the semester plan or look at byg-erfa or what the hell. This is actually because they do not even know 100% what to do. So we do not even know what the result should be when (unclear), because it is apparently okay to be half finished if there is a process behind."

Example 1.10

"I think it is hard closing something. You can always do something just to make it a little better. Then I think it is hard to stop. Just like when my, my biggest problem with this form of teaching is that you set yourself up, so you have to learn to prioritise a lot."

The experimental approach involves situations and activities that require inquiry, a reflective approach to learning. Dewey describes the concept of inquiry as something that is highly connected to the emotional experience. It is a feeling of something being difficult, an embedded conflict or uncertain situation, where inquiry is the way to resolve this conflict to make sense. The example below shows the inner conflict that occurs when students are repeatedly asked by teachers to see the problem from a new angle. If reflection starts the learning process, it is not particularly interesting if the student has found a “reasonable” solution to a problem, but rather his or her ability to challenge the work further through a reflective work process.

> ***Example 1.11***
> *Student 1: "But I thought that the way the education might be built is, we make mistakes, and then we correct them, and that is how it runs all the way through. Is it what gets frustrating, or is it because you feel it is a waste of time?"*
>
> *Student 2: "Well, it is probably a bit frustrating when you sit with it yourself, and you think you did a reasonable drawing and you really feel a little afterwards that you have to start again, it is extremely frustrating, but it is probably also what you learn from."*
>
> ***Example 1.12***
> *Student 1: "But again, we have also talked a lot about the fact that we also have to be careful not to go too far out. Suddenly then we have done something that we cannot use for shit and must change 100 times."*
>
> *Student 2: "This is also what we are afraid of, just by jumping forward and then just starting to do something else, and then they come and say well the domain it is not like this at all anymore, now there are some new things or something."*

The examples reviewed show that there is a very fundamental mismatch between the students’ and the teachers’ ontological understanding of what learning is. The students experience their projects as a mess and miss clear markings of what is a fact and what is needed for their work to be good enough. There is no basic acceptance of how a trial-and-error approach provides learning regarding the practice they become part of after completing their education.

A.3.3. OPEN PROJECTS

This section is about open frameworks of content that characterised higher education. The students describe how they find it problematic that the teachers have no standard for what a project must contain, what is right and wrong, and what they need to learn. The students contend that the teachers do not have an agreement over the understanding of the academic content, which means they get different answers from teacher to teacher. The students argued that the problem is due to the teachers’ lack of coordination and overview of the individual semesters. They use the primary school as an example (2.1) of previous experiences where the teachers have control of the academic content as opposed to what they experience at their current educational institution.

Example 2.1
Student 1: "Something I thought about when she presented it in there was that in primary school all teachers always had very good control over what to teach, they had very good control of the syllabus. Here the teachers have less control over what they have to teach. So they have less control over the topics and therefore they also have less control over how to get through everything."

Student 2: "For example, I think they have control over what they teach, but they do not have the actual requirements for learning or what we have to learn. That's where the problem lies. They have no control over what requirements there are. It does not matter what it is that we have to learn either. I think they can do their own thing anyway."

If the two examples are analysed from a teacher's perspective, it can be argued that the problem is due to the students' inability to critically evaluate what is relevant in relation to their problem area in a project. In addition, there is a lack of understanding of the complexity that a professional-oriented professionalism contains and the need for knowledge as a concept to undergo constant development. It is therefore imperative that the students develop competences to be able to enter into a professional dialogue and discussion with the teachers so that, through a reflected approach, they will be able to make decisions about what is "right or wrong". The following statement, "They could do such a theme presentation explaining it all, they would even have to give answers to fewer questions if they just did", illustrates that the students basically want a clear answer from their teachers as to what is right or wrong, rather than exploring it by themselves.

The following example, 2.2, shows that the students consider learning to be about copying "best practice". It challenges Dewey's argument that it is the relationship between action and thinking and thus the transaction itself that is learning. If teaching is based on a communicative delivery of "best practice", the students will not achieve the bodily anchoring of a practice related to the content and processes that create the learning. Schatzki describes it as learning, understood as a process that follows a "path" that adds metaphorical and literal meaning, also called personal trajectories.

Example 2.2
"No, but I also think in relation to such an exam paper, so I think it was really hard to make it because there was not exactly like an example that could be copied."

Teaching built around the students' personal trajectories requires a curriculum that is open to interpretation. It is here that the students' definition of the topic and the problem becomes essential for the acquisition of the curriculum's learning objectives. In the following example, 2.3, students describe how they perceive their curriculum as something that, to them, most closely resembles coding language. It is the open and interpretive descriptions in the syllabus that allow the learner to create "personal trajectories" that the students find problematic. The students perceive their curriculum as something distant because they do not get a clear and concrete picture of what the facts are or what they have to achieve.

> ***Example 2.3***
>
> *Student 1: "Also, because the curriculum comes from a place that is perhaps a bit difficult to understand as a student, at least to begin with, because it is very much so."*
>
> *Student 2: "So for me to see, it is with an opening for interpretation, what you would like to write."*
>
> *Student 1: "It could also be made available to all mortals so that it was no such thing."*
>
> *Student 2: "Almost code language."*
>
> *Student 1: "Yes, it is a bit like code language where you think what the hell are we going for."*

The examples described illustrate, in the same way as the previous section, that students generally have difficulty navigating in an open learning process. The open framework for the content of the projects thus reinforces the students' experience of the project work as a mess with a lack of clear markings of fact. This argument is reinforced and supported by the students' descriptions of their utopian visions, where the statement "Then we wrote that it could be great if we got such a recipe or approach on projects, how the teachers really want it" clearly marks a desire for a clear defined framework in which teachers set the primary agenda.

A.3.4. DIVERGING ANSWERS

The next section deals with the students' experience of teachers giving them diverging answers when supervising them. Example 2.4 below shows how the student partly recognises that there may be several different ways of working with a problem, but that it must then be the teachers' responsibility to select relevant knowledge or methods for the students to work with. The premise that knowledge can be discussed and that it is through the confrontation of two different perspectives that knowledge is developed is not recognised by the student, which is clearly expressed through the phrase *"You cannot say what is wrong if the other says it is right".*

Example 2.4

"It is also in terms of projects, in programming, and it very much follows up on 1 and 2 semester projects. When you ask a teacher about if it was okay, whether this was approved, then it changed when another teacher says this is completely wrong. There are maybe many different ways you can do this, but then agree on what you do, i.e. what we do, and it may be that we have to define our task ourselves, but you still have to agree on it. You cannot say what is wrong if the other one says it is right. "

The students point to a lack of communication between the teachers as the reason for the divergent answers. Example 2.5 shows how different answers give the students a pending and passive position for their projects. They thus refrain from testing the different methods and knowledge up against their results based on the problem they work with. If the same problem is considered from a learning perspective, the approach to the projects must be kept open through, among other things, divergent answers. This allows the students to follow individual knowledge paths, where the combination of different activities gives insight and meaning.

Example 2.5

Student 1: "It is strange if you get something approved by a teacher and then it gets shot down by another teacher."

Student 2: "Yes, because I think they have to be a little better at communicating around the different topics that we have, for example, it took a really long time to figure out what architecture style we need to use for our programming. We had asked all three teachers actually."

Student 1: "They had three different opinions."

Through the teachers' divergent responses, the students train the ability to decide on specific challenges or problems themselves. This competence is important as their future profession has a complexity where it is not always possible to point out what is right and wrong; it depends on the context.

A.4. ACQUISITION OF KNOWLEDGE

The category "acquisition of knowledge" contains the following challenge: *"Lack of academic depth versus the teachers spelling it out on the blackboard."* The challenge is about the difference between the students' and the teachers' perception of learning, as well as how the acquisition of knowledge occurs. The section focuses on the categories of professional depth and precise answers as the primary angles.

The section focuses on the categories of professional depth and precise answers as the primary angles. The table below shows some of the statements that point to this issue. The white boxes are statements in which the students express their own uncertainty about how they should act in the learning situation, while the grey boxes are statements in which the students directly criticise the teachers' practice and organisation.

Figure A8 - Statements from the data expressing the students uncertainty about how to act in the learning situation.

ACQUISITION OF KNOWLEDGE	
Professional depth	Precise answers
That is because they do not have more hours to deal with it	We are in huge doubt
Whether you understand it or not, it is your own problem	It is not clear in the semester plan
It is partly our own responsibility, but it can't be 100%	It is just so misleading
I just mean you have been tethered too	Delivering something that is half-finished is not easy
They just expect us to do it	… Some official rules for the education
I have no idea how to ...	The formal requirements could well be…
It is heavy; they fly through it after all	It is crucial for one's exam and then you get such garbage
4 people, just sitting there	You feel it is a waste of time
When everyone understands it	After all, it cannot be right that there is nothing…
Lacked some depth in teaching	They would remove much doubt if we just had firm rules
They always scratch the surface	Because it is all built on the assumption

Business-related subjects lack depth	There is no right and wrong
Could make the presentations myself, because it is irrelevant if people have professional benefits	So maybe a clearer framework
	Then you will be able to do it right, then you have learned it

A.4.1. PROFESSIONAL DEPTH

A pervasive element in the data is how the students deal with frustration over not attaining a sufficient professional depth during their studies. They have a feeling that their knowledge acquisition only just “scratches the surface” of the topics they deal with. They argue that the problem to some extent is due to a fragmented experience where they are introduced to with many different areas of knowledge rather than focusing on a few. In addition, some data indicate that the students believe that the teachers’ teaching methods and priorities are problematic. Example 3.1 describes how the students give the number of teaching hours as the reason for the lack of depth, which means that they are forced into self-study. They express a desire for the teachers to provide a systematic and thorough delivery of the academic.

> ***Example 3.1***
> *Student 1: "I do not know if it is because of the overall level here, but I think that in general, the professional depth could be a step further."*
>
> *Student 2: "I think it is because they do not have more hours to deal with it."*
>
> *Student 1: "It might as well be, but you know, they always scratch the surface and explain it and then go home and find it out in depth and that is fair enough, but it might be cool if they just said, now we take every fucking millimeter of this."*

Bente Elkjaer suggests, through pragmatism’'s understanding of learning, that there is no separation between “coming to know about practice” and then “coming to be a practitioner”. Understanding a situation is, therefore, about being able to manoeuvre in complex interpersonal situations, which requires innovative responses and transformations (Schatzki, 2016, 2017). With this in mind, systematic delivery of the academic will thus not contribute to a professional deepening without a subsequent practical dimension. Dewey also argues that action and thinking are interconnected and that it is the transaction itself that is experienced and thus learning (Dewey, 1933, 1938a, 1938b). It is therefore essential for the academic depth that the students work independently with the material subsequently in connection with their projects based on the teachers’ presentation of the academic. In this way, the material will be transacted through an exploratory approach where action and thinking are linked, which contributes to the professional depth. Another point of criticism raised by the students is the teachers being very theoretical. They point out that it is especially when the material is put into a practical and real-life context that they experience learning something and that a predominantly theoretical approach to the material makes it difficult to gain a professional depth.

> ***Example 3.2***
> *Student 2: "Hmmm, I do not know if we should start talking about the notion that some teachers should avoid not being too theoretical."*
>
> *Student 1: "I feel like I understand it best when it is practical and when it is transferred to reality."*

The two examples present two perspectives: is a professional deepening practical or theoretical? Who is responsible for the professional deepening? According to Schatzki, generic skills or abilities are learned through participation in multiple practices. Obtaining an ability thus requires considerable experience from different situations played out in different bundles (Schatzki, 2016, 2017b). Here, the theorising of first-order abilities can be directly linked to a practice of doings and sayings that will contribute to the formation of second-order abilities such as coordination, organisation, communication, planning and designing. Learning, and thus academic depth, is thus closely linked to increasing the operationality that is created through changes and the acquisition of new tools. Thus, the academic immersion in a professional learning context is an expression of a link between theory and practice or, as mentioned earlier, the transaction between thinking and action (Dewey, 1933, 1938a, 1938b). Schatzki, therefore, talks about the concept of "coming to know", which is about the students' agency, capacity and ability to act in the learning process. Thus, the responsibility for learning is two-sided, as students must be aware that post-processing of the theoretical material in a practical context is necessary to reach a professional depth. On the other hand, it is the teacher's responsibility to facilitate the teaching situation so that the students can subsequently bridge the gap between theory and practice through reflection processes and practical exercises. In Example 3.3, the students express frustration at being slowed down, and they point out the teacher's responsibility and role in creating motivation by putting the academic into context through the phrase "*explain why we should be motivated*".

> ***Example 3.3***
> *Student 1: "I just mean, you have been left in the wind..."*
>
> *Student 2: "We really are..."*
>
> *Student 1: "... and it is partly our own responsibility but not fucking 100%"*

Student 2: "No."

Student 1: "No, we come here to… so we show up to learn something."

Student 2: "That is it, so it is also where I find it hard to figure out how much it is our responsibility to motivate ourselves and how much it is the responsibility of teachers to help engage us and explain why we should be motivated, that is what they are here for. Or else could we just as well have a book, as you say."

A.4.2. PRECISE ANSWERS

The perspective of the category of acquisition of knowledge is how learning, according to the students, is first and foremost about the acquisition of factual knowledge. Example 3.4 shows how the students link the acquisition of knowledge with the ability to do something right. The students thus demand a clear marking of what is right or wrong and a precise and concrete definition of the syllabus.

Example 3.4
Student 1: "And then you will be able to do it right, then you have learned it, then you have this stick and this stick."

Student 2: "I want to slice it like that, but it is perhaps most applicable to myself because I lack the understanding that there is a difference between right and wrong. It should not just always be a good bet."

Some students are able to reflect on the difference between their previous educational experiences and their current experiences in higher education. Here, in particular, the statement "to face a result" illustrates how they are not offered an exact procedure for the acquisition of knowledge and the use of methods in their current education that leads to a correct result as opposed to previous training courses.

Example 3.5
"I also find it hard to get used to sitting here compared to what you come from before. There you always faced a result of how you have to do it, but now you really face the fact that you have to set up your study path yourself, and it might just be a difficult process to start with that you just have to learn what to do and you cannot just get the answer. "

It is pointed out that it is difficult to define a personal study path yourself, given the flexibility of the curricula in relation to choice of methods and acquisition of knowledge. Thus, the students themselves must select relevant theoretical and methodological material in relation to general profession-oriented topics. A large part of the criticism is therefore that the students do not think that the teachers sufficiently translate the curriculum's open learning objectives into concrete syllabuses aimed at clear and precise results. In addition, there is an experience of the teachers not having an internal communication regarding the content of the programmes, as the students are presented with different attitudes about what is considered relevant theoretical and methodological material.

A.5. CONCLUSION

Bente Elkjaer suggests, through pragmatism's understanding of learning, that there is no separation between "coming to know about practice" and then "coming to be a practitioner" (Dewey, 1938a, 1938b; Buch and Elkjaer, 2015) Understanding a situation is therefore about being able to manoeuvre in complex interpersonal situations, which requires innovative responses and transformations. Dewey also argues that action and thinking are interconnected and that it is the transaction itself that is experienced and thus learning (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013; Schatzki, 2016, 2017). It is, therefore, crucial for the academic depth that the students work independently with the project after the teachers' knowledge dissemination. In this way, the material will be transacted through an exploratory approach where action and thinking are coupled, which contributes to the professional depth.

According to Schatzki, generic competencies or abilities are learned through participation in multiple practices. Obtaining an ability thus requires considerable experience from different situations played out in different bundles (Schatzki, 2016, 2017). Here, theorising of first-order abilities will be directly linked to a practice of doings and sayings that contributes to the formation of second-order abilities such as coordination, organisation, communication, planning and designing. Learning, and thus the academic depth, is linked to increasing the operationality that is created through change and the acquisition of new tools (Schatzki, 2016, 2017). Thus, academic immersion in a professional learning context is an expression of a link between theory and practice or, as mentioned earlier, the transaction between thinking and action (Brinkmann, 2006; Buch & Elkjaer, 2015; Dewey, 1933, 1938a, 1938b; Elkjær & Wiberg, 2013).

APPENDIX B. INTERVIEW GUIDES LINES

B.1. INTERVIEW GUIDE - SPRING 2017

Interviews spørgsmål til de studerende

Forskningsspørgsmål	Interviewspørgsmål
Hovedgruppe 1	Spørgsmålsgruppe 1
Autonomy & Motivation Viden om hvorvidt gamification understøtter de studerendes vidt forskellige og personlige trajectories hvad angår en differentiering i hastighed, interesser, og indhold og herved øger motivationen Dertil kommer indsigt i hvordan GBL-principper påvirker de studerendes motivation, ex. det at kunne vinde	Præsenter kort jer selv – alder, tidligere faglige baggrund ec. Beskriv hvordan jeres generelle motivation har været i forhold til projektforløbet? Hvordan har det været at skulle arbejde med arkitektopgaver? Har I været åbne eller afvisende overfor nye typer af arbejdsopgaver som arkitektfasen traditionelt indeholder? Hvordan oplevede I jeres gruppearbejde? - problemer? - samspilsdynamikker? - beslutningsprocesser? - samarbejde? - personlige interesser? Hvad var jeres umiddelbare tanke da I blev præsenteret for GBL metoden, og at I skulle arbejde med det? Vil I opfatte jer selv som gamere? Hvordan har i det med… - tanken om at vinde? Over andre eller jer selv? - tanken om at nå et mål? - andet? Hvilken betydning har det grafiske layout på jeres motivation? Hvilken betydning havde det for jeres motivation at koncepter er bygget op omkring ord der kendes fra computerspil? Hvilke quest-typer var mest motiverende? Og hvorfor…

	Hvilke quest typer valgte I fra? Og hvorfor… Er der quest som I har lavet flere gange? Og hvilke Hvilken strategi arbejdede I efter i forhold til at stige i levels? Hvilken betydning havde achievement på jeres valg af quest? Oplevede I at antallet af quest var overskueligt? Hvilken betydning fik GBL for jeres motivation? - forandrede motivationen sig undervejs? **Specifikke spørgsmål til grupperne på baggrund af refleksionssamtaler og observationer vedr. hovedspørgsmål 1:** **Gruppe 1** I valgte ikke at arbejde med gamification – ville I have taget et andet valg i dag? Og hvorfor / hvorfor ikke Var I enige om den beslutning? Og ændrede det sig under vejs? **Gruppe 2, 3 og 5** I valgte at arbejde med gamification – ville I have taget et andet valg i dag? Og hvorfor / hvorfor ikke Var I enige om den beslutning? Og ændrede det sig under vejs? I holder op med at arbejde med gamification undervejs, hvorfor det? **Gruppe 4** I valgte ikke at arbejde med gamification – ville I have taget et andet valg i dag? Og hvorfor / hvorfor ikke Var I enige om den beslutning? Og ændrede det sig under vejs? I taler om at antallet af quest opgaver på en gang i hver kuvert var medvirkende til at I ikke kunne overskue at arbejde med det – kan I ikke uddybe det lidt mere?

Hovedgruppe 2	Spørgsmålsgruppe 2
Exploration & Analysis Skal give viden om de studerendes evne til at være selv-faciliterende i forhold til analysearbejde, procesforståelse samt udforskning af faglige elementer. Dertil kommer deres procesforståelse i forhold til at kunne koble refleksions-processer med analysearbejde Belyse hvorvidt de studerendes evne til selvfacilitering gennem anvendelsen af gamification principper bidrager positivt til en øget selfefficacy samt behavioral persistance i forhold til emner de ikke tidligere har prioriteret. Undersøgelse af hvorvidt anvendelsen af gamification tager initiativet fra de studerende? – er der risiko for at gamification (eller systemet) bliver FOR styrende	Prøv at diskutere hvordan I har udvalgt /analyseret jer frem til hvilke typer af metoder og værktøjer der ville kunne gavne jeres arbejde i arkitektfasen Vil I karakterisere jeres projektarbejde som undersøgende eller eks-perimenterende? Hvorfor / hvorfor ikke? Hvilken betydning havde idéskabelse for udviklingen af jeres hovedgreb? Hvad skete der i de situationer hvor I blev usikre på hvordan I skulle komme videre i jeres projekt? Hvordan oplever I jeres egen evne til at kunne facilitere projektet i den fase I er i nu? Ud fra hvilke kriterier besluttede I hvilke Quest der var relevante at lave? Kan I beskrive hvordan I oplevede gamification i forhold til at få et fokus på ideudvikling - hvilke quest anvendte i mest og hvad bidrog de evt. med? Forsatte jeres idegenerering i forhold til at omfatte andre emner som industrialisering, statik, bæredygtighed, detaljer etc? hvorfor /hvorfor ikke På hvilken måde oplevede I at achievements understøttede fremdrif-ten i jeres arbejdsproces? Stemte jeres egne forventning til de enkelte aktiviteters rækkefølge overens med strukturen i gamification opsætningen? Gav GBL opgaverne mulighed for at I kunne designe/skabe jeres egen tilgang til projektet På hvilken måde påvirkede GBL jeres tidsmæssige fordeling af opgaverne?

	Oplevede I at GBL forandrede den måde I arbejdede med analyseopgaver, eksempelvis i forhold til processer, værktøjer og metoder? Hvordan er jeres oplevelse af GBL i forhold til at få færdiggjort aktiviteter og opgaver Kan I give en så detaljeret beskrivelse som muligt af en situation hvor GBL gav jer ny læring i forhold til hvordan arkitektfasens proces ser ud… - Hvilken del af oplevelsen vil I opfatte som læring? **Specifikke spørgsmål til grupperne på baggrund af refleksionssamtaler og observationer vedr. hovedspørgsmål 2:** **Gruppe 1** I fortæller i jeres samtale at I oplevede spillet som lidt af en omvej i forhold til at nå et mål – overvejede I undervejs hvilken betydning jeres valg af en mere direkte vej kunne have for jeres læring I bad efterfølgende om alligevel at få udleveret flere levels efter at I havde talt point sammen på alt det I havde lavet af jer selv – hvilke overvejelser lå bag den beslutning I fortæller i jeres samtaler at I følte det ville have været mere relevant at arbejde med gamification på første semester, da I nu godt ved hvordan I skal strukturere og planlægge et projekt – nu hvor I kigger tilbage på forløbet, hvordan er jeres opfattelse så nu? I jeres samtaler er I meget optaget af at jeres projekt det skal ligne den virkelighed i kommer ud til – hvilke overvejelser gør I jer i forhold til at målet er læring og ikke nødvendigvis et færdigt produkt når I planlægger jeres aktiviteter? **Gruppe 2**: I fortæller i jeres samtaler at I var nysgerrige på hvilke quest der var i kuverterne i forhold til om indholdet matchede jeres egen forventning til den proces i var i gang med Oplevede I en sammenhæng mellem det I selv havde forventet og det I fik udleveret? – og hvilke tanker og refleksioner bidrog det til i jeres arbejde I beskriver i jeres samtaler at processen har været langsommere end I normalt har været vant til – Kan I ikke prøve at uddybe hvilken be

	tydning det har fået for jeres projekt? I fortæller i jeres samtaler at I havde følelsen af at det var let at beslutte jer for hvilket hovedgreb I skulle arbejde videre med på grund af analysernes dybde – kan I uddybe det lidt mere? I jeres samtaler får man det indtryk at I ikke kan se relevansen i at idegenerer når hovedgrebet er på plads – kan I uddybe det? **Gruppe 3** I snakker om at der er flere af quest kortene som I har svært ved at forstå – I peger særligt på et akademisk sprog – kan I uddybe det lidt mere? - undersøgte I nærmere hvad de ord I ikke forstå betyder eller handler om? Hvordan håndterede I den frustration der opstod i situationer hvor I ikke kunne forstå quest beskrivelserne? I taler om at der var mange ting I gerne ville have været startet på men som I undlod fordi I fulgte spillet – hvilke overvejelser gjorde I jer i forhold til jeres egen opfattelse af processen kontra spillets forståelse? **Gruppe 4** I fortæller i jeres samtaler at I ikke havde nogen klar fornemmelse af om forholdet mellem analyse, koncept og hovedgreb, Kan I uddybe det lidt mere? Hvordan arbejdede I med de kreative processer, eksempelvis idegenerering? Kan I ikke beskrive hvilke metoder I anvendte og hvorfor? I fortæller at de første gamification opgaver var nogle I ville ha lavet af jer selv, og derfor følte I ikke at gamification gav jer noget nyt sådan at I kunne se en mening med at arbejde med det – kan I uddybe det? I beskriver at I faktisk i starten oplevede at gamification hjalp jer i gang med processen, I diskutere derefter hvorfor det så var at I fravalgte det efterfølger, og tale ri den forbindelse om at det var episoder hvor quest opgaverne ikke fulgte 100 % de aktiviteter klassens øvrige undervisere i gangsatte – kan I ikke prøve at uddybe jeres overvejelser lidt mere?

	Gruppe 5 I fortæller jeres samtale at I helt sikker ikke ville have gået den "samme vej" hvis I selv skulle have defineret opgaverne – kan I ikke prøve at uddybe forskellen? I giver udtryk for en bekymring over ikke at være nær så langt som den anden klasse på grund af de aktiviteter gamification medfører – hvordan er jeres syn på det nu hvor I er igennem processen? I fortæller i jeres samtaler at I var nysgerrige på hvilke quest der var i kuverterne i forhold til om indholdet matchede jeres egen forventning til den proces i var i gang med I beskriver i jeres samtaler at processen har været langsommere end I normalt har været vant til – Kan I ikke prøve at uddybe hvilken betydning det har fået for jeres projekt? I beskriver i jeres samtaler at I oplevede et flow i processen fordi I altid havde nogle gamification opgaver som I kunne lave – kan I ikke uddybe hvad I mener med det?
Hovedgruppe 3	Spørgsmålsgruppe 3
Refleksiv praksis Skal give viden om hvordan de studerende har arbejdet med refleksion i forhold til de praksis-orienterede aktiviteter, som semesteropgaven bygger på. Herunder hvilken betydning refleksionsprocesser har haft for deres analysearbejde. Dertil kommer viden om i hvilket omfang de studerende har arbejdet i dybden i forhold til deres analysearbejde Har til formål at give viden om hvilken betydning gamification konceptet har for de studerendes tilegnelse af en refleksiv praksis.	Kan I beskrive hvad begrebet analyse betyder? Hvordan har I tidligere udarbejdet analyser – prøv at beskriv de enkelte trin i jeres arbejde Spørg ind til deres måde at arbejde med: Problemafklaring Teori (Litteratursøgning) Empiri Analysestrategier Konklusioner På hvilken måde påvirkede GBL jeres analysearbejde? Hvordan hjælper GBL jer med at komme i dybden i analysen - er jeres oplevelse af gamification som metode i forhold til at komme i dybden med analyser? Kan I give en så detaljeret beskrivelse som muligt af en situation

	hvor GBL gav ny læring i forhold til analyser eller refleksionsprocesser… - Hvilken del af oplevelsen vil I opfatte som læring? På hvilken måde arbejdede I med de quest der indeholdt refleksionsopgaver? – og hvilken betydning fik det på jeres projekt **Specifikke spørgsmål til grupperne på baggrund af refleksionssamtaler og observationer vedr. hovedspørgsmål 3:** **Gruppe 1** I jeres samtaler sidestiller i procesbeskrivelse med beskrivelse af analyser – kan I ikke prøve at uddybe den sammenligning og hvordan I arbejder med det? I jeres samtaler taler I om den dybde I har arbejdet med i forhold til analyserne, og I giver indtryk af at I faktisk har brugt gamification opgaverne og at det har givet en helt anden dybde end I tidligere har oplevet? Kan I uddybe det? **Gruppe 3** I fortæller i jeres samtaler at gamification har givet en anden indgang til at arbejde med andre typer af værktøjer i forhold til jeres analyser – kan I prøve at uddybe det lidt mere? I taler om at I måske skal være mere åbne overfor nye ideer og tage jer tid til at undersøge hvad nye værktøjer kan – kan I uddybe det lidt mere? - hvilken betydning vil det have for jeres læring? **Gruppe 4** I beskriver at de første gamification opgaver betød at I kom i dybden med jeres rolleprofiler , men at de ville I ha været under alle omstændigheder hvis nu I var ordentlige og gode studerende – hvad mener I med det? - gjorde I jer nogle overvejelser i den forbindelse i forhold til jeres efterfølgende valg om ikke at følge spillet I taler om at I ikke føler at I har brugt jeres analyser så meget efterfølgende i processen – hvilke overvejelser gjorde I jer om at igangsætte aktiviteter der kunne sikre at jeres analysers resultater blev omsat i byggeriet. Gruppe 5 I fortæller i jeres samtaler at gamification har givet en anden indgang og forståelse af det at lave analyser – kan I prøve at uddybe det lidt mere?

	I fortæller at Jan Gehl opgaven fik betydning for jeres projekt – kan I ikke prøve at uddybe det lidt nærmere? - på hvilken måde har jeres oplevelse bidraget til læring? I fortæller i jeres samtale at der var opgaver ikke kunne se relevansen af men som I lavede alligevel for at få point. I fortæller at opgaverne så alligevel var ”frugtbare” for jeres projekt – kan I ikke uddybe lidt mere hvilke quest der er tale om og hvilken betydning det fik for jeres projekt? I siger på et tidspunkt at quets har givet input til hovedgreb og koncept men ikke så meget fagligt – hvad er faglighed for jer? og hvorfor ser I ikke hovedgrebet og koncept som værende faglige elementer?

B.2. INTERVIEW GUIDE - FALL 2017

Interviews spørgsmål til de studerende

Forskningsspørgsmål	Interviewspørgsmål
Hovedgruppe 1	Spørgsmålsgruppe 1
Autonomy & Motivation Generel motivation for projektet Viden om hvorvidt gamification understøtter de studerendes vidt forskellige og personlige trajectories hvad angår en differentiering i hastighed, interesser, og indhold og herved øger motivationen Dertil kommer indsigt i hvordan GBL-principper påvirker de studerendes motivation, ex. det at kunne vinde ***Citater fra refleksionssamtale*** *(1) Jaja, jeg bliver overhovedet ikke motiveret af spillet, må jeg indrømme, eller levels for den sags, jeg bliver motiveret af sådan design processen, eller sådan noget. Altså for den fremgang der er fra, altså hele konkurrence eller hele designet indtil at vi får en beslutning med det endelig design. Det er det som motiverer mig fordi jeg ved også at vi skal videre i programmet*	Prøv at diskutere hvordan I jeres motivation har været i tidligere semestre i projektets opstartsfase? Prøv at diskutere hvordan jeres motivation i de forrige semestre har været i forhold til analyse og refleksion. Beskriv hvordan jeres generelle motivation har været i forhold til projektforløbet – og særligt i opstartsfasen? Hvordan har det været at skulle arbejde med arkitektopgaver? Har I været åbne eller afvisende overfor nye typer af arbejdsopgaver som arkitektfasen traditionelt indeholder? Hvad var jeres umiddelbare tanke da I blev præsenteret for GBL metoden, og at I skulle arbejde med det? Bliver I motiveret af: - tanken om at vinde? Over andre eller jer selv? - tanken om at nå et mål? - andet? Hvilken betydning fik GBL på jeres motivation i forhold til projektperiodens begyndelse? - forandrede motivationen sig undervejs? Hvilke quest-typer var mest motiverende? Og hvorfor… Lavede I de quest hvor I skulle præsentere jeres arbejde for en anden gruppe? hvis ja, diskuter hvilken betydning det fik. Hvis nej, diskuter hvorfor I ikke valgte at gøre brug af den mulighed? Hvilke quest typer valgte I fra? Og hvorfor… Er der quest som I har lavet flere gange? Og hvilke Hvilken strategi arbejdede I efter i forhold til at stige i levels?

(2) Jeg har det godt nok sådan lidt at hvis jeg bliver lost på noget tidspunkt, så er det pisse godt at tage spillet op, hvis det er sådan at jeg ikke ved hvad jeg skal gøre nu så tager jeg spillet op *(3) Det motiverer mig faktisk mere end jeg regnet med. Jeg havde tænkt at det var da ikke vigtigt hvilket levels man var i, men man er alligevel nysgerrig efter at få lov til at se hvad der er i næste kuvert, så man sidder hele tiden og tæller sammen, hvad der skal til for at man kan* *(4) Det gør i hvert fald mere nysgerrighed og det gør også at man ikke lader, bare springer frem til det spændende i level 7, der garanteret er det mest spændende af dem alle sammen, at man lige som stadigvæk får lavet det her analyse og forarbejde.* *5) Ja men man kan selvfølgelig sige at indirekte giver pointene jo en form for motivation fordi at hvis du nu bare kunne smide alle kortene på bordet alle level i en stor skide stak så ville man jo ikke få dem i den korrekte rækkefølge, så det giver god mening at du skal yde noget her, som så udløser i det her tilfælde point, det kunne lige så godt have givet et flag eller bogstav for at du kan komme videre til næste level. - Så du får det i den korrekte sådan mere eller mindre korrekte rækkefølge*	Hvilken betydning havde achievement på jeres valg af quest? Oplevede I at antallet af quest var overskueligt? Specifikke spørgsmål til grupperne på baggrund af refleksionssamtaler og observationer vedr. hovedspørgsmål 1: **Gruppe 2:** Prøv at diskutere citatet (1) – I taler om at spillet motivere jer når I oplever at det er meningsfuldt? og hvordan hænger det sammen med at I får point? **Prøv at diskutere hvilken betydning citatet (2) har haft for jeres proces – At I altid kunne tage spillet op hvis ikke I vidste hvad I skulle gøre** **Gruppe 3:** Prøv at diskutere hvorfor I oplevede at de her levels var vigtige? på hvilken måde var de meningsfulde? Citat (3) Prøv at diskutere hvordan I oplevede at undervisningen har medvirket til at levels bliver mere motiverende? Citat (4) **Gruppe 4:** Kan I uddybe citatet (5) i forhold til at motivationen kommer når I oplever aktiviteterne meningsfulde, fremfor point

Hovedgruppe 2	Spørgsmålsgruppe 2
Exploration and analysis Skal give viden om de studerendes evne til at være selv-faciliterende i forhold til analysearbejde, proces-forståelse samt udforskning af faglige elementer. Dertil kommer deres procesforståelse i forhold til at kunne koble refleksionsprocesser med analysearbejde Belyse hvorvidt de studerendes evne til selvfacilitering gennem anvendelsen af gamification principper bidrager positivt til en øget selfefficacy samt behavioral persistance i forhold til emner de ikke tidligere har prioriteret. Undersøgelse af hvorvidt anvendelsen af gamification tager initiativet fra de studerende? – er der risiko for at GBL (eller systemet) bliver FOR styrende ***Citater fra refleksionssamtale*** (6) Men det snakkede vi jo allerede om på level 2 altså, oh gud hvornår kommer der noget om en bygning som vi skal tegne, jamen der ledte vi efter analyserne, hvornår kom analyserne, så begyndte analyserne at komme, så begyndte man lidt og sige at nu vil vi godt til at lave en bygning. Så det er jo nok	Prøv at diskutere hvordan I har udvalgt /analyseret jer frem til hvilke typer af metoder og værktøjer der ville kunne gavne jeres arbejde i arkitektfasen Ud fra hvilke kriterier beslutter I normalt hvilke opgaver der er relevante at lave? - proces, - produkt, - læring Prøv at diskutere hvordan denne her måde at bliver undervist på er anderledes i forhold til det I har oplevet på de tidligere semestre- Hvilken betydning har det haft for jeres læring Prøv at diskutere hvordan jeres oplevelse tidligere har været i forhold til selvstændigt at skulle udarbejde analyser. Oplevede I det anderledes den her gang? Diskutere på hvilken måde det var anderledes? Prøv at beskrive jeres proces i forhold til at nå frem til et hovedgreb? - ideudvikling, - skitsering, - analysearbejde Hvilken betydning havde idéskabelse for udviklingen af jeres hovedgreb? Hvad skete der i de situationer hvor I blev usikre på hvordan I skulle komme videre i jeres projekt? Hvordan oplever I jeres egen evne til at kunne facilitere projektet i den fase I er i nu? Ud fra hvilke kriterier besluttede I hvilke Quest der var relevante at lave? Kan I beskrive hvordan I oplevede GBL i forhold til at få et fokus på ideudvikling - hvilke quest anvendte i mest og hvad bidrog de evt. med? Stemte jeres egne forventning til de enkelte aktiviteters rækkefølge overens med strukturen i GBL opsætningen? Gav GBL opgaverne mulighed for at I kunne designe/skabe jeres egen tilgang til projektet

også det der med at man gerne vil have at der sker noget. (7) Hvis der ikke havde været noget spil, så havde vi nemlig været tvunget til at lave en aktivitetsliste hvor vi så selv skulle finde på alle tingene, så tror jeg sgu nok at vi havde glemt en ting eller to (8) Jeg tror ikke vi var noget frem til det her uden at have fulgt spillet, fordi så havde vi bare tegnet noget den første dag og sagt det går vi videre med (9) Men jeg tror også at nu her hvor at vi har fået, vi er i hvert fald ved at have bestemt os for en form på bygningen og jeg tror med det samme at vi også har den form på plads så tror jeg der kommer så meget energi i selv, til at vi egentlig bare får lyst til at gå vores egne veje og ikke følge questene så meget fordi at nu er vi lige opslugt af at skulle have løst det og det og det (10) Jamen vi har været god til at sænke paraderne og så bare sige okay vi har det her design og nu kører vi et eller anden skib ting, det skal sgu være lidt skrå, det skal være lidt skævt og du ved, og vi har sindssygt frem og tilbage proces som vi har snakket om før, hvad fanden gør vi her, altså	På hvilken måde påvirkede GBL jeres tidsmæssige fordeling af opgaverne? Oplevede I at GBL forandrede den måde I arbejdede med analyse-opgaver, eksempelvis i forhold til processer, værktøjer og metoder? Hvordan er jeres oplevelse af GBL i forhold til at få færdiggjort aktiviteter og opgaver Kan I give en så detaljeret beskrivelse som muligt af en situation hvor GBL gav jer ny læring i forhold til hvordan arkitektfasens proces ser ud… - Hvilken del af oplevelsen vil I opfatte som læring? **Specifikke spørgsmål til grupperne på baggrund af refleksions-samtaler og observationer vedr. hovedspørgsmål 2:** **Gruppe 1** I diskutere en del sammenhængen mellem point og opgaverne i kortene – om I laver opgaverne for at få point, eller om det er fordi I finder opgaverne relevante ? - Hvis nu der ikke havde været point? - Hvad nu hvis der havde været få kort, hvem havde så styret jeres projekt Prøv at diskutere hvad faglighed er for jer og hvordan arkitekturfasen er et bidrag dertil? Hvad Tænker I om jeres eget citat (6) i dag ? diskuter hvad det betyder at jeres undervisere (visualiseret gennem spillet) har en anden opfattelse af hvordan I skal gribe processen an i forhold til jeres egen oplevelse **Gruppe 2:** Diskuter citatet (7) – hvad tænker I om det nu? I diskuterer en del sammenhængen mellem point og opgaverne i kortene – om I laver opgaverne for at få point, eller om det er fordi I finder opgaverne relevante ? - Hvis nu der ikke havde været point? - Hvad nu hvis der havde været få kort, hvem havde så styret jeres projekt Prøv at gøre jer nogle tanker om hvorfor I bliver præsenteret for brainstorms teknikker I ikke umiddelbart er positive overfor

	Prøv at sammenligne dette semester med de tidligere semestre – på hvilken måde er læringsspillet med til at give jer en større forståelse for prioriteringen **Gruppe 3** Har spillet overrasket jer I forhold til hvilke veje I er blevet ført på? Har I haft oplevelse af at I selv har haft indflydelse på hvilke veje I kunne gå? eller har det været en ført hånd? Prøv at uddybe citatet (8)? hvilken betydning har det fået for jeres læring, at I ikke bare tegnede bygningen første dag? Hvorfor tænker I at det ville have været den vej I havde valgt Citat (9) - Det kunne jeg godt tænke mig at folde lidt mere ud. På jeres grafer ser det ud til at I slipper spillet lige omkring hovedgrebet **Gruppe 4** Citat (10) Det kunne jeg godt tænke mig at få uddybet – Prøv at diskutere på hvilke barriere spillet har nedbrudt – kom gerne med nogle eksempler
Hovedgruppe 3	Spørgsmålsgruppe 3
Refleksiv praksis Skal give viden om hvordan de studerende har arbejdet med refleksion i forhold til de praksis-orienterede aktiviteter, som semesteropgaven bygger på. Herunder hvilken betydning refleksionsprocesser har haft for deres analysearbejde. Dertil kommer viden om i hvilket omfang de studerende har arbejdet i dybden i forhold til deres analysearbejde Har til formål at give viden om hvilken betydning gamification onceptet har for de studeren-	

des tilegnelse af en refleksiv praksis. **Citater fra refleksionssamtale** *(11) Men det er bare lige som om at det er gået for langsomt siden at vi er startet, ikke, men jeg tror bare man er for vant til det der med bare at springe i gang med en bygning, fordi at vi har haft den på de andre semestre* *(12) Jeg synes også at det giver god mening det der med at tit, der har vi bare lige så snart at vi har lavet et eller andet, så har vi sagt at det er en analyse, men jeg synes måske at på det her semester der har vi fået lidt mere ud af at du laver et forarbejde, før du laver din analyse.* *- Ja men så også det der med at være bevidst om hvorfor du egentlig skal lave den, fordi at det er nok der at det på de særligt første semestrene, var lidt svært at få lavet de der analyser, fordi man sådan hvad fanden skal jeg lave det for* *- Jeg anende ikke hvad analyse det var på de to første semestre tror jeg ikke* *(13) Ja, du gør dig også nogle andre tanker, når det er også at for eksempel med hensyn til at du skulle finde noget inspiration og nogle forskellige ting. et er meget udspecificeret, de spørgsmål, så du gør dig nogle andre tanker, end jeg i hvert fald lige ville have gjort, med bare at sidde og lave en analyse.*	Kan I beskrive hvad begrebet analyse betyder? Hvordan har I tidligere udarbejdet analyser – prøv at beskriv de enkelte trin i jeres arbejde Spørg ind til deres måde at arbejde med: Problemafklaring Teori (Litteratursøgning) Empiri Analysestrategier Konklusioner På hvilken måde påvirkede GBL jeres analysearbejde? Hvordan er jeres oplevelse af GBL som metode i forhold til at komme i dybden med analyser? På hvilken måde arbejdede I med de quest der indeholdt refleksionsopgaver? – og hvilken betydning fik det på jeres projekt Kan I give en så detaljeret beskrivelse som muligt af en situation hvor GBL gav ny læring i forhold til analyser eller refleksionsprocesser… - Hvilken del af oplevelsen vil I opfatte som læring? **Specifikke spørgsmål til grupperne på baggrund af refleksionssamtaler og observationer vedr. hovedspørgsmål 3:** **Gruppe 1** Prøv at diskutere jeres eget citat (11) – hvad tænker I om det nu? Hvad betyder hastighed i projektarbejdet i forhold til læring? Hvilken betydning har GBL har på jeres proces i forhold til at sætte hastigheden ned og derved give plads til refleksion? Prøv at diskutere jeres eget citat (12) – hvad tænker I om det nu? Har I fået en bedre forståelse af hvordan man analysere – har I taget de erfaringer med jer ind i næste fase? **Gruppe 4** Hvad tænker I om det udsagn i dag? – på hvilken måde blev jeres projekt anderledes end tidligere? Citat (13) Har I fået en bedre forståelse af hvordan man analysere?

B.3. INTERVIEW GUIDE - SPRING 2018

Interviews spørgsmål til de studerende

<table>
<tr><th>Forskningsspørgsmål</th><th>Interviewspørgsmål</th></tr>
<tr><td>Hovedgruppe 1</td><td>Spørgsmålsgruppe 1</td></tr>
<tr><td>Autonomy & Motivation
Generel motivation for projektet

Viden om hvorvidt gamification understøtter de studerendes vidt forskellige og personlige trajectories hvad angår en differentiering i hastighed, interesser, og indhold og herved øger motivationen

Dertil kommer indsigt i hvordan GBL-principper påvirker de studerendes motivation, ex. det at kunne vinde</td><td>Prøv at diskutere hvordan I jeres motivation har været i tidligere semestre i projektets opstartsfase?

Prøv at diskutere hvordan jeres motivation i de forrige semestre har været i forhold til analyse og refleksion.

Beskriv hvordan jeres generelle motivation har været i forhold til projektforløbet – og særligt i opstartsfasen?

Hvordan har det været at skulle arbejde med arkitektopgaver?

Har I været åbne eller afvisende overfor nye typer af arbejdsopgaver som arkitektfasen traditionelt indeholder?

Hvad var jeres umiddelbare tanke da I blev præsenteret for GBL metoden, og at I skulle arbejde med det?

Bliver I motiveret af:
- tanken om at vinde? Over andre eller jer selv?
- tanken om at nå et mål?
- andet?

Hvilken betydning fik GBL på jeres motivation i forhold til projektperiodens begyndelse? - forandrede motivationen sig undervejs?

Hvilke quest-typer var mest motiverende? Og hvorfor…

Lavede I de quest hvor I skulle præsentere jeres arbejde for en anden gruppe? hvis ja, diskuter hvilken betydning det fik. Hvis nej, diskuter hvorfor I ikke valgte at gøre brug af den mulighed?

Hvilke quest typer valgte I fra? Og hvorfor…

Er der quest som I har lavet flere gange? Og hvilke

Hvilken strategi arbejdede I efter i forhold til at stige i levels?</td></tr>
</table>

	Hvilken betydning havde achievement på jeres valg af quest? Oplevede I at antallet af quest var overskueligt?
Hovedgruppe 2	Spørgsmålsgruppe 2
Exploration and analysis Skal give viden om de studerendes evne til at være selv-faciliterende i forhold til analysearbejde, proces-forståelse samt udforskning af faglige elementer. Dertil kommer deres procesforståelse i forhold til at kunne koble refleksionsprocesser med analysearbejde Belyse hvorvidt de studerendes evne til selvfacilitering gennem anvendelsen af gamification principper bidrager positivt til en øget selfefficacy samt behavioral persistance i forhold til emner de ikke tidligere har prioriteret. Undersøgelse af hvorvidt anvendelsen af gamification tager initiativet fra de studerende? – er der risiko for at GBL (eller systemet) bliver FOR styrende *Citater fra refleksionssamtale* *(1) De der point, de har ikke rigtigt sagt mig så meget. Så personligt ville jeg ha kunne tage det her mere seriøst hvis det var at man bare havde alle de her forskellige opgaver som vi skulle løse og så, ja jeg ved ikke Og så bare fik dem i en lang række*	Prøv at diskutere hvordan I har udvalgt /analyseret jer frem til hvilke typer af metoder og værktøjer der ville kunne gavne jeres arbejde i arkitektfasen Ud fra hvilke kriterier beslutter I normalt hvilke opgaver der er relevante at lave? - proces, - produkt, - læring Prøv at diskutere hvordan denne her måde at bliver undervist på er anderledes i forhold til det I har oplevet på de tidligere semestre- Hvilken betydning har det haft for jeres læring Prøv at diskutere hvordan jeres oplevelse tidligere har været i forhold til selvstændigt at skulle udarbejde analyser. Oplevede I det anderledes den her gang? Diskutere på hvilken måde det var anderledes? Prøv at beskrive jeres proces i forhold til at nå frem til et hovedgreb? - ideudvikling, - skitsering, - analysearbejde Hvilken betydning havde idéskabelse for udviklingen af jeres hovedgreb? Hvad skete der i de situationer hvor I blev usikre på hvordan I skulle komme videre i jeres projekt? Hvordan oplever I jeres egen evne til at kunne facilitere projektet i den fase I er i nu? Ud fra hvilke kriterier besluttede I hvilke Quest der var relevante at lave? Kan I beskrive hvordan I oplevede GBL i forhold til at få et fokus på ideudvikling - hvilke quest anvendte i mest og hvad bidrog de evt. med?

(2) Jamen jeg synes som sådan ikke at quest og levels de har givet sådan et decideret flow. Vi har heller ikke som sådan været på pointjagt, det har vi selvfølgelig lidt, men ikke sådan helt bevidst, vi ville have sådan et materiale som vi var tilfreds med, og så må det tager den tid der tager. Det der sådan har været, ja vores milepæl, det har jo sjovt nok været milepælene, så vi har givet det sådan ekstra gas for at nå de forskellige levels til de dage hvor at de skulle være færdige *(3) Det kan jeg sådan set ideen med, men jeg tror sådan når man skulle skrive tre ord for eksempel, eller en sætning eller sådan noget, så dan når vi kører den anden runde, så har jeg tænkt meget på hvad var det jeg skrev sidste gang, så på den måde har det ikke væres så produktivt, altså. Så det har været meget sådan gentagelser et eller andet sted synes jeg.* *(4) Men det er også lidt mere hvordan at spillet, altså her med nogle af de ting som det har bragt op har hjulpet os til måske at være mere proces orienteret of har givet os en lidt anderledes proces end det som vi har vant til, fordi det har altid været sådan noget, jamen vi laver en skitse fordi der er nogle byg-erfa blade og der er noget halløj der siger det, også underbygger det og finder noget, altså dokumentation på det og så ender vi ud med det her,*	Stemte jeres egne forventning til de enkelte aktiviteters rækkefølge overens med strukturen i GBL opsætningen? Gav GBL opgaverne mulighed for at I kunne designe/skabe jeres egen tilgang til projektet På hvilken måde påvirkede GBL jeres tidsmæssige fordeling af opgaverne? Oplevede I at GBL forandrede den måde I arbejdede med analyse-opgaver, eksempelvis i forhold til processer, værktøjer og metoder? Hvordan er jeres oplevelse af GBL i forhold til at få færdiggjort aktiviteter og opgaver Kan I give en så detaljeret beskrivelse som muligt af en situation hvor GBL gav jer ny læring i forhold til hvordan arkitektfasens proces ser ud… - Hvilken del af oplevelsen vil I opfatte som læring? **Specifikke spørgsmål til grupperne på baggrund af refleksionssamtaler og observationer vedr. hovedspørgsmål 2:** **Gruppe 1A** Diskutere og uddyb Citaterne (1), (2), (3) **Gruppe 3A** Diskutere og uddyb Citatet (4) **Gruppe 6A** Diskutere og uddyb Citatet (5), (6)

men lige nu der starter vi jo fra scrats, vi har jo ikke noget, på den måde har det jo hjulpet os til at lige som at få noget proces *(5) Men jeg tror alligevel at det er farligt at sige at hvis vi havde fået en aktivitetsliste hvor der ligesom er et eller andet at man så, nu har vi jo brugt mange, vi har lavet mange skitser et eller andet sted, måske ikke i hånden men vi har brugt lang tid på at sidde og lave nogle forslag og sådan noget og spørgsmålet er om vi ville have kommet så vidt omkring det hvis vi bare havde haft en aktivitets liste der sagde nu skal I lave det og det og det* *(6) Men jeg tror, jeg tror alligevel at vi har haft god nytte af spillet, og jeg tror også stadigvæk at man kunne have god nytte af spillet fordi at der står alligevel i spillet mange sådan, der er mange sådan ledetråde til hvad det er at man skal herfra og til hvad det er man skal have med, så man får det sådan brede spektrum med af alle de informationer der er nødvendige at have med for at kan lave et byggeri af den her størrelse*	
Hovedgruppe 3	Spørgsmålsgruppe 3
Refleksiv praksis Skal give viden om hvordan de studerende har arbejdet med refleksion i forhold til de praksis-orienterede	Kan I beskrive hvad begrebet analyse betyder? Hvordan har I tidligere udarbejdet analyser – prøv at beskriv de enkelte trin i jeres arbejde

aktiviteter, som semesteropgaven bygger på. Herunder hvilken betydning refleksionsprocesser har haft for deres analysearbejde. Dertil kommer viden om i hvilket omfang de studerende har arbejdet i dybden i forhold til deres analysearbejde Har til formål at give viden om hvilken betydning gamification konceptet har for de studerendes tilegnelse af en refleksiv praksis. *Citater fra refleksionssamtale* *(7) I starten der prøvede vi at følge levels fra start til slut, men jo længere hen som vi er kommet jo mere i stå er vi gået for at gå mere i dybden med de enkelte ting.* *(8) Nej altså vi har jo hentet virkelig meget inspiration og sådan noget fra, altså det vi har skulle lave gennem spillet, og så har det været med til at sætte nogle begrænsninger for hvad kan vi så, når vores ideer de har været fuldstændige flyvske og slet ikke passede ind til noget som helst* *(9) Men den afklaring er jo egentlig også først kommet nu fordi at lærerne har haft et oplæg nu og det har de garanteret gjort helt bevidst fordi at ellers så var vi ikke kommet så dybt ud i vores analyser og de her processer som vi har siddet med indtil nu*	Spørg ind til deres måde at arbejde med: Problemafklaring Teori (Litteratursøgning) Empiri Analysestrategier Konklusioner På hvilken måde påvirkede GBL jeres analysearbejde? Hvordan er jeres oplevelse af GBL som metode i forhold til at komme i dybden med analyser? På hvilken måde arbejdede I med de quest der indeholdt refleksionsopgaver? – og hvilken betydning fik det på jeres projekt Kan I give en så detaljeret beskrivelse som muligt af en situation hvor GBL gav ny læring i forhold til analyser eller refleksionsprocesser… - Hvilken del af oplevelsen vil I opfatte som læring? **Specifikke spørgsmål til grupperne på baggrund af refleksionssamtaler og observationer vedr. hovedspørgsmål 3:** **Gruppe 1A** Diskutere og uddyb Citatet (7) **Gruppe 3A** Diskutere og uddyb Citatet (8) **Gruppe 6A** Diskutere og uddyb Citatet (9)

B.4. INTERVIEW GUIDE FOR EDUCATORS

Interviews spørgsmål til de studerende

Forskningsspørgsmål	Interviewspørgsmål
Hovedgruppe 0	Spørgsmålsgruppe 0
Generelle spørgsmål ved planlægning af 4. semester	Det første jeg gerne vil have vi diskutere er indholdet af 4 semester i forhold til både proces og produkt – hvad er det for et projekt og hvilke kompetence/ læring skal de studerende nå gennem forløbet Hvilken undervisningsstrategi er semesteret bygget op omkring – hvilke valg har I som undervisere gjort for at sikre at de studerende når i mål Det næste jeg gerne vil have vi diskutere er de udfordringer og problemstillinger I som undervisere tidligere har oplevet på 4 semester – her tænker jeg på emner som analyse, motivation, selvfacilitering, refleksion og skriftlighed Kan I uddybe hvilken betydning det har haft for undervisningen/ læringen Diskuter hvad jeres umiddelbare tanker er om metoden gamification - hvad kan det bruges til? - fordele? - ulemper? - betydning for det afviklede forløb Hvordan oplevede i forskellen på de grupper der har arbejdet med gamification i forhold til de grupper der arbejdede mere traditionelt? Der var to grupper i B klassen som valgte ikke at arbejde med gamification, hvad tænker I om det?
Hovedgruppe 1	Spørgsmålsgruppe 1
Autonomy & Motivation Viden om hvorvidt gamification understøtter de studerendes vidt forskellige og person	Prøv at diskutere hvordan har I oplevet de to klasser motivation i forhold til projektet? Hvad tænker I om at GBL grupperne blev motiveret gennem tildeling af point i forhold til faglighed, ideudvikling, skriftlighed etc?

lige trajectories hvad angår en differentiering i hastighed, interesser, og indhold og herved øger motivationen Dertil kommer indsigt i hvordan GBL-principper påvirker de studerendes motivation, ex. det at kunne vinde	Oplevede I en forskel i motivationen i forhold til tidligere semestre hvad angår de studerendes arbejde med analyser, refleksion, idegenerering og skriftlighed?
Hovedgruppe 2	Spørgsmålsgruppe 2
Exploration and analysis Skal give viden om de studerendes evne til at være selv-faciliterende i forhold til analysearbejde, proces-forståelse samt udforskning af faglige elementer. Dertil kommer deres procesforståelse i forhold til at kunne koble refleksionsprocesser med analysearbejde Belyse hvorvidt de studerendes evne til selvfacilitering gennem anvendelsen af gamification principper bidrager positivt til en øget selfefficacy samt behavioral persistance i forhold til emner de ikke tidligere har prioriteret. Undersøgelse af hvorvidt anvendelsen af gamification tager initiativet fra de studerende? – er der risiko for at GBL (eller systemet) bliver FOR styrende	Diskuter jeres oplevelse af de to klassers evne til at facilitere sig selv gennem processen Hvordan oplevede i gruppernes evne til at udarbejde et koncept på baggrund analyse og efterfølgende udvikle et hovedgreb - er der her forskel på i forhold til tidligere semestre? - er der forskel på gamification grupperne og de grupper der har arbejdet traditionelt Jeg vil gerne at I diskutere jeres oplevelse af GBL´s betydning for gruppernes arbejde med henholdsvis koncept og hovedgreb - er der her forskel på i forhold til tidligere semestre? - er der forskel på gamification grupperne og de grupper der har arbejdet traditionelt Hvilke betydning har GBL haft i forhold til de studerendes evne til at kunne facilitere sig selv i den projektfase de arbejder i nu? Kan I sige noget mere om det… Har I flere eksempler på det

Hovedgruppe 3	Spørgsmålsgruppe 3
Refleksiv praksis Skal give viden om hvordan de studerende har arbejdet med refleksion i forhold til de praksis-orienterede aktiviteter, som semesteropgaven bygger på. Herunder hvilken betydning refleksionsprocesser har haft for deres analysearbejde. Dertil kommer viden om i hvilket omfang de studerende har arbejdet i dybden i forhold til deres analysearbejde Har til formål at give viden om hvilken betydning gamification konceptet har for de studerendes tilegnelse af en refleksiv praksis.	Hvordan oplevede i gruppernes evne til at udarbejde analyser? - er der her forskel på i forhold til tidligere semestre? - er der forskel på gamification grupperne og de grupper der har arbejdet traditionelt Hvordan oplevede i gruppernes evne til at reflektere? - er der her forskel på i forhold til tidligere semestre? - er der forskel på gamification grupperne og de grupper der har arbejdet traditionelt På et tidspunkt siger du (red underviser) - vi har givet B-klassen en opsang og bedt dem om at få fokus på deres analyse arbejde da de er bagud i forhold til A-klassen – kan du ikke uddybe hvad du mener med det?

B.5. GUIDELINES FOR THE REFLECTION CONVERSATIONS

Fortæl om hvilke quest/dungeons I har brugt mest tid på? Og hvorfor?

Hvordan oplever I at quest med skriftlige krav påvirker jeres designproces?

Hvilke fravalg har I lavet? og hvilke konsekvenser har det haft ?

I hvor høj grad har I fokus på en skriftlig bearbejdning af analyserne?

Beskriv hvordan jeres opgave prioritering har været?

Fortæl om hvilken betydning quest haft for det faglige indhold i jeres projekt?

Hvordan oplever I lige nu at læringsspillet fungerer ?

Hjælper quest og levels til at fastholde et flow i jeres arbejdsproces? og hvorfor/ hvorfor ikke?

Bliver I motiveret gennem level tankegangen? og hvorfor/ hvorfor ikke?

Fortæl om hvilke opgaver der har haft mest betydning for det faglige indhold i jeres projekt?

Hvordan oplever I lige nu at analyse-metoderne fungere som procesværktøj ?

Kan I fastholde et flow i jeres arbejdsproces? og hvorfor/ hvorfor ikke? og hvad er I evt udfordret på ?

APPENDIX C. QUANTITATIVE SURVEY QUESTION

Navn ______________________ **Gruppe** ______________________

Hvor gammel er du ?		**Hvilken baggrund har du ?**		**Hvor mange timer om ugen spiller du computerspil?**	
Under 20 år	○	Tømrer	○	Under 5 timer	○
Mellem 20-25	○	Murer	○	6-10 timer	○
Mellem 26-30	○	HTX	○	11-15 timer	○
Mellem 31-35	○	STX	○	over 15 timer	○
Over 35	○	Andet	○	Aldrig	○

	1	2	3	4	5	6	7	8	9	10
På en skala fra 1-10, i hvor høj grad har du oplevet at læringsspillet gav en god opstart af projektet?	○	○	○	○	○	○	○	○	○	○
På en skala fra 1-10, i hvor høj grad har **læringspillet** været med til at sætte en ramme om semesterets opgaver?	○	○	○	○	○	○	○	○	○	○
På en skala fra 1-10, i hvor høj grad har du oplevet at **missioner** har hjulpet dig til at analysere?	○	○	○	○	○	○	○	○	○	○
På en skala fra 1-10, i hvor høj grad har du haft fokus på at analysere når du sammenligner med de tidligere semestre?	○	○	○	○	○	○	○	○	○	○
På en skala fra 1-10, i hvor høj grad har **læringsspillet** fået dig til at analysere når du sammenligner med de tidligere semestre?	○	○	○	○	○	○	○	○	○	○
På en skala fra 1-10, i hvor høj grad har du haft fokus på at beskrive dit arbejde når du sammenligner med de tidligere semestre?	○	○	○	○	○	○	○	○	○	○
På en skala fra 1-10, i hvor høj grad har **læringsspillet** fået dig til at beskrive dit arbejde når du sammenligner med de tidligere semestre?	○	○	○	○	○	○	○	○	○	○

Spørgsmålsgruppe 1

	1	2	3	4	5	6	7	8	9	10
1.1 A - På en skala fra 1-10, hvor motiveret har du generelt været for semesterprojektet?										
1.2 A - På en skala fra 1-10, hvor positiv indstillet har du generelt været over for designprocessens arbejdsmetoder										
1.3 A - På en skala fra 1-10 i hvor høj grad har tanken om at opnå nye levels generelt motiveret dig?										
1.4 A- På en skala fra 1-10 i hvor høj grad har quest generelt motiveret dig til at arbejde med det faglige indhold?										

Spørgsmålsgruppe 2

	1	2	3	4	5	6	7	8	9	10
2.1A - På en skala fra 1-10, i hvor høj grad har du generelt haft fokus på en refleksiv bearbejdelse af faglige elementer?										
2.2 A - På en skala fra 1-10, hvor bevidst har du generelt været i forhold til at anvende analyseværktøjer der bidrager til refleksion										
2.3 A - På en skala fra 1-10, i hvor høj grad har du haft følelsen af at der har været fremdrift i jeres designprocessen gennem refleksion?										
2.4 A - På en skala fra 1-10 i hvor høj grad har du generelt arbejdet med specifikke analysemetoder der har givet ny faglig indsigt?										
2.5 A - På en skala fra 1-10, i hvor høj grad har dungeons generelt bidraget til en refleksiv bearbejdelse af faglige elementer?										
2.6 A - På en skala fra 1-10, i hvor høj grad har du oplevet at quest har skabt fremdrift i design processen gennem refleksion?										

2.7 A - På en skala fra 1-10 i hvor høj grad har du oplevet at arbejdet med specifikke quest har givet ny faglig indsigt?	1 2 3 4 5 6 7 8 9 10

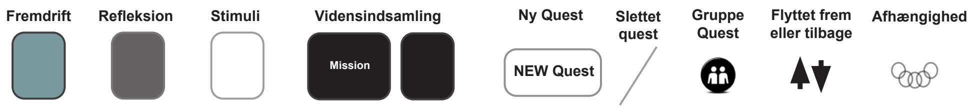
Spørgsmålsgruppe 3

3.1 A - På en skala fra 1-10, i hvor høj grad hr du oplevet at der har været en retning i jeres proces?	1 2 3 4 5 6 7 8 9 10
3.2 A - På en skala fra 1-10, i hvor høj grad har du oplevet at gruppen selv har kunne facilitere design processen?	1 2 3 4 5 6 7 8 9 10
3.3A - På en skala fra 1-10, i hvor høj grad har du arbejdet med opgaver og aktiviteter du ikke tidligere i dit uddannelses forløb har vægtet højt?	1 2 3 4 5 6 7 8 9 10
3.4 A - På en skala fra 1-10, i hvor høj grad har du haft fokus på at udarbejde analyser?	1 2 3 4 5 6 7 8 9 10
3.5A - På en skala fra 1-10, i hvor høj grad har du haft fokus på at skabe ideer til projektet?	1 2 3 4 5 6 7 8 9 10
3.6 A - På en skala fra 1-10 i hvor høj grad har du haft følelsen af at der har været tid til at arbejde med opgaverne?	1 2 3 4 5 6 7 8 9 10
3.7 A - På en skala fra 1-10, i hvor høj grad har du oplevet at quest har bidraget til at skabe retning i din proces?	1 2 3 4 5 6 7 8 9 10
3.8 A - På en skala fra 1-10, i hvor høj grad har du oplevet at quest og levels har hjulpet dig til selv at facilitere design processen?	1 2 3 4 5 6 7 8 9 10
3.9 A - På en skala fra 1-10 i hvor høj grad har quest og levels bidraget til at du har hfat følelsen af fremdrift i design processen?	1 2 3 4 5 6 7 8 9 10
3.10 A - På en skala fra 1-10, i hvor høj grad har gamification bidraget til at du har arbejdet med opgaver og aktiviteter som du ikke tidligere har vægtet højt i dit uddannelses forløb?	1 2 3 4 5 6 7 8 9 10

3.11 A - På en skala fra 1-10, i hvor høj grad har gamification hjulpet gruppen med at have fokus på at udarbejde analyser?	1 2 3 4 5 6 7 8 9 10
3.12 A - På en skala fra 1-10, i hvor høj grad har gamification hjulpet gruppen med at have fokus på at skabe ideer til projektet?	1 2 3 4 5 6 7 8 9 10
3.13 A - På en skala fra 1-10 i hvor høj grad har du haft følelsen af at der har været tid til at arbejde med gamifcation opgaverne?	1 2 3 4 5 6 7 8 9 10

APPENDIX D. LIST OF THE QUEST STRUCTURE

Følgende skemaer er en liste over questene for hver iteration, de forskellige ikoner angiver hvordan om questen har forandret sig fra den ene iteration til den næste. Faverne henviser til game-designets fokus på 4 forskellige quest positioner jf. Dewey



D.1. ITERATION 1

Level 1					
Description of quest		NEW Quest			
Whats the time Der skal udvikles en tidsplan for projektet					
Make the contract Der skal udvikles en gruppekontrakt for projektet					
Whats the task Projektmaterialet granskes og analyseres					
Whats the role De studerende defininere deres roller I pojektet					
Level 2					
Find inspiration De studerende skal finde inspiration (billeder)					
The library Litt. søgning via biblioteket					
Surf the net Systematisk Block søgning i databaser					

Mission of inspiration Inspirationstur rundt i byen					
Mission of the "genious loci" Registrering af grundens "sjæl"					

Level 3

What direction Udtænk 5 pejlemærker for bygningen					
Fly on the wings Brainstorn af hovedemner på tid					
Find the bricks Brainstorn af underemner på tid					
Brain, Brain, Brain Brainstorm af ideer					
New material Brainstorm ord til idekæder					
New ideas Idegenerering					
Mission of the structure Udarbejdelse af struktur analyse					
Mission of the site Udarbejdelse af stedsanalyse					

Level 4

Map your mind Lav en mindmap der forbinder ideerne					
Draw the line Udarbejde skitser					
Know the people Beskriv projektets målgruppe					
Know the function Udarbej en funktionsanalyse					

Ching analysis Lav en analyse af jeres hovedgreb					
LEGO show the way Byg små legomodeller af hovedgreb					
3 dimension Lav modeller af små hovedgreb					
Walk the talk Gå en tur og diskuter projektets indhold					
Level 5					
The digital world Arbejd med masser i Revit					
Know the environtment Lav en vind og solanalyse					
Wildcard Find selv på en relevant opagve					
Picture the world Beskriv konceptets stemning					
The bazar is open Sæt ideer, refleksioner og inspiration til salg					
Decision maker Tag en beslutning					
Can you post it Sæt en ide til slag i Bazaren					
Ideas goes strong Arbejd med ide-strenge					
Spin the wheel Udvikle ideer for industrialisering					
I have a princip Lav skitser med afsæt i energi design					
Yell and tell by writing Initierende beskrivelse af konceptet					
Argumention Udvikle argumenter for design valg					

Mission of Nordic built Undersøg Nordic built principperne					
Level 6					
Find the pieces Brainstorm ord for industrialisering					
Brain industrialization Brainstor ideer for industrialisering					
Lets look at that factory Udvikle pejlemærker for industrialisering					
Ching ching Lav skitser med afsæt i Ching principperne					
Ching ching (2) Lav skitser med afsæt i Ching for facaderne					
Draw the plan Skitser på planløsningen					
Draw the facade Lav skitser for facaderne					
Know the logistic Udarbej en logistik analyse					
Mission of the model Udarbejd med fysisk model					
Mission of the registration Udarbejd en registreringsrapport					
Level 7					
Yell and tell Lav et moodboard for konceptet					
Picture the materials Beskriv gennem billeder materialevalg					
Pictures the colour Beskriv gennem billeder bygningens farver					
Draw the situation Skitser på situationsplanen					

Picture the light Beskriv gennem billeder bygningens lys					
What about the surroundings Brainstorm ideer for situationsplanen					
Pipeline Lav en analyse af installationssystemet					
Don't fall down Lav en analyse af det statuske system via revit					
It burns Beskriv gennem revit brandanalysen					
How to built the design Beskrivelse af de konstruktive principper					
Walk and talk Gå en tur og diskuter projektet					
Level 8					
Draw the inside Udarbejd bygningsdelsanalyser					
Give it energy Beskriv det samlede energisystem					
Integrate me Beskriv ideen bag jeres integreret design					
Accesilility Beskriv gennem revit bygningens tilgængelighed					
What do we miss Diskuter projektets mangler					
Reflection of choice Overholdes konkurencens betingelser ?					
Show me the money Beregn bygningens omkostninger					
Mission of the 6 thinking hat Gør status gennem de 6 tænke hatte					
Level 9					

Make it work Lav en drejebog for filmen					
Define it all Præsenter de integrerede designvalg via billeder					
Can it work Præsenter det bygningens funktion via billeder					
Show it now Præsenter det bygningens æstetik via billeder					
Let it flow Præsenter det tekniske system gennem billeder					
I do not fall Beskriv gennem billeder det statiske system					
Is it going to be built Udarbejde en strategi for bygningens opførelse					
Recycle me Beskriv argumenter for bæredygtighed					
Mission of virtual reality Undersøg bygningen gemmen VR					
Level 10					
Carry it out Udarbejd præsentationsmateriale					
Level 11					
Power it up Lav en powerpoint					
Show it big Lav plancher					
Practice pitching Øv jeres mundtlige oplæg					
Tell the story Lav en A3 mappe					

D.2. ITERATION 2

Level 1

Description of quest		NEW Quest			
Whats the time Der skal udvikles en tidsplan for projektet					
Make the contract Der skal udvikles en gruppekontrakt for projektet					
Mission of inspiration Inspirationstur rundt i byen					
Mission of the "genious loci" Registrering af grundens "sjæl"					
Whats the task Projektmaterialet granskes og analyseres					
Whats the role De studerende defininere deres roller I pojektet					

Level 2

Find inspiration De studerende skal finde inspiration (billeder)					
The library Litt. søgning via biblioteket					
Find its mass Lav en analyse af bygningers masse		NEW Quest			
Surf the net Systematisk Block søgning i databaser					
Mission of the structure Udarbejdelse af struktur analyse					
Mission of the site Udarbejdelse af stedsanalyse					

Level 3

Know the people Beskriv projektets målgruppe					
Know the function Udarbej en funktionsanalyse					
What direction Udtænk 5 pejlemærker for bygningen					
Fly on the wings Brainstorn af hovedemner på tid					
Find the bricks Brainstorn af underemner på tid					
Brain, Brain, Brain Brainstorm af ideer					
New material Brainstorm ord til idekæderder					
New ideas Idegenerering					
Mission of the registration Udarbejd en registreringsrapport					
Level 4					
Map your mind Lav en mindmap der forbinder ideerne					
Draw the line Udarbejde skitser					
Yell and tell by writing Initierende beskrivelse af konceptet					
Decision maker Tag en beslutning					
The digital world Arbejd med masser i Revit					
Picture the world Beskriv konceptets stemning					
Ching analysis Lav en analyse af jeres hovedgreb					

LEGO show the way Byg små legomodeller af hovedgreb					
3 dimension Lav modeller af små hovedgreb					
Talk to me Fortæl om projektet til en anden projektgruppe		NEW Quest			
Im listening Lyt til en anden projektgruppe		NEW Quest			
Come around Beskriv projektets tilgængelighed		NEW Quest			
Integrate me Beskriv ideen bag jeres integreret design		NEW Quest			
Can you built it Lav en beskrivelse af konstruktionsprincipperne					
Pipeline Lav en analyse af installationssystemet					
Get around Lav en analyse af de infrastrukturelle principper		NEW Quest			
Mission of Nordic built Undersøg Nordic built principperne					
Level 5					
Know the environtment Lav en vind og solanalyse					
Wildcard Find selv på en relevant opgave					
The bazar is open Sæt ideer, refleksioner og inspiration til salg					
Decision maker Tag en belsutning					
Can you post it Sæt en ide til slag i Bazaren					
Draw the site Udarbejd skitser til situationsplanen		NEW Quest			

Building a system **Beskriv byggesystemerne for designet**		NEW Quest			
Modul Lav en strategi for modulbyggeri		NEW Quest			
Safaira Lav en vurdering af energibehovet		NEW Quest			
More Safaira Lav en parameter analyse		NEW Quest			
I have a princip Lav skitser med afsæt i energi design					
Ideas goes strong Arbejd med ide-strenge					
Spin the wheel Udvikle ideer for industrialisering					
What about the surroundings Brainstorm ideer for situationsplanen					
Yell and tell by writing Initierende beskrivelse af konceptet					
Argumention Udvikle argumenter for design valg					
It burns Beskriv gennem revit brandanalysen					
Pipelines (2) Udarbej løsninger for det tekniske system		NEW Quest			
Talk to me (2) Fortæl om projektet til en anden projektgruppe		NEW Quest			
Im listening (2) Lyt til en anden projektgruppe		NEW Quest			
Level 6					
Find the pieces Brainsstorm ord for industrialisering					
Brain industrialization Brainstor ideer for industrialisering					

Lets look at that factory Udvikle pejlemærker for industrialisering					
Ching ching Lav skitser med afsæt i Ching principper					
Ching ching (2) Lav skitser med afsæt i Ching for facaderne					
Draw the plan Skitser på planløsningen					
Draw the facade Lav skitser for facaderne					
Draw the inside **Udarbej bygningsdelsanalyser**					
Stabilize me Lav 2D planer for det bærende system		NEW Quest			
Find the solution find løsninger med fokus på brand, lyd, fugt etc.		NEW Quest			
The force Lav et kraftforløb for det bærende system		NEW Quest			
Talk to me (3) Fortæl om projektet til en anden projektgruppe		NEW Quest			
Im listening (3) Lyt til en anden projektgruppe		NEW Quest			
Accesilility Beskriv gennem revit bygningens tilgængelighed		NEW Quest			
The theory of flow Udarbejd en analyse af byggetakten/flow		NEW Quest			
Design is a standard Analyser af design-standardiserede systemer		NEW Quest			
Know the logistic Udarbej en logistik analyse					
Mission of the model Udarbejd med fysisk model					

I do not fall

Level 7

Yell and tell Lav et moodboard af konceptet					

Picture the materials Beskriv gennem billeder materialevalg					
Pictures the colour Beskriv gennem billeder bygningens farver					
Draw the situation Skitser detaljer for situationsplanen					
Picture the light Beskriv gennem billeder bygningens lys					
The components **Find løsninger for lyd, brand, fugt etc**		NEW Quest			
Innovation or not Diskuter innovationsgraden		NEW Quest			
Don’t fall down Lav en analyse af det statuske system via revit					
How to built the design Beskrivelse af de konstruktive principper					
Walk and talk Gå en tur og diskuter projektet			↓		
Give it energy Beskriv det samlede energisystem			↑		
Integrate me Beskriv ideen bag jeres integreret design			↑		
What do we miss Diskuter projektets mangler			↑		
Level 8					
Let it spin Udarbejd en frejebog form filmen		NEW Quest			
Let it flow Præsenter det tekniske system gennem billeder			↑		
I do not fall Beskriv gennem billeder det statiske system			↑		
Define it all Præsenter de integrerede designvalg via billeder			↑		

Can it work Præsenter det bygningens funktion via billeder					
Show it now Præsenter det bygningens æstetik via billeder					
Is it going to be built Udarbejde en strategi for bygningens opførelse					
Reflection of choice Overholdes konkurencens betingelser ?					
Recycle me Beskriv argumenter for bæredygtighed					
Show me the money Beregn bygningens omkostninger					
Mission of the 6 thinking hat Gør status gennem de 6 tænke hatte					
Level 9					
Make it work Lav en drejebog for filmen					
Mission of virtual reality					
Level 10					
Carry it out Udarbejd præsentationsmateriale					
Level 11					
Power it up Lav en powerpoint					
Show it big Lav plancher					
Practice pitching Øv jeres mundtlige oplæg					
Tell the story Beskriv projektet gennem billeder					

D.3. ITERATION 3

Level 1					
Description of quest		NEW Quest			
Whats the time Der skal udvikles en tidsplan for projektet					
Make the contract Der skal udvikles en gruppekontrakt for projektet					
Find inspiration De studerende skal finde inspiration (billeder)					
Mission of "genious loci" Indfang stedets sjæl gennem billeder					
Whats the task Projektmaterialet granskes og analyseres					
Whats the role De studerende defininere deres roller I pojektet					
Look at me (1) Se youtube videor om design af hovedgreb		NEW Quest			
Look at me (2) Se youtube videor om design af hovedgreb		NEW Quest			
Look at me (3) Se youtube videor om design af hovedgreb		NEW Quest			
Look at me (4) Se youtube videor om design af hovedgreb		NEW Quest			
Level 2					
What direction Udtænk 5 pejlemærker for bygningen					
Fly on the wings Brainstorn af hovedemner på tid					
Find the bricks Brainstorn af underemner på tid					

Brain, Brain, Brain Brainstorm af ideer					
Surf the net Systematisk Block søgning i databaser					
Find inspiration De studerende skal finde inspiration (billeder)					
The library Litt. søgning via biblioteket					
Find its mass Lav en analyse af bygningers masse					
Mission of the structure Udarbejdelse af struktur analyse					
Mission of the site Udarbejdelse af stedsanalyse					
RAID of the inspiration Alle grupper bidrager med inspirationsbilleder		NEW Quest			
Level 3					
Know the people Beskriv projektets målgruppe					
Know the function Udarbej en funktionsanalyse					
Know the environtment Lav en vind og solanalyse					
Wildcard Find selv på en relevant opgave					
Define the road Udarbejd en tidsplan for den statiske rapport					
New material Brainstorm ord til idekæder					
New ideas Idegenerering					

Find the pieces Brainsstorm ord for industrialisering					
Brain industrialization Brainstor ideer for industrialisering					
Lets look at that factory Udvikle pejlemærker for industrialisering					
Spin the wheel Udvikle ideer for industrialisering					
Mission of the registration Udarbejd en registreringsrapport					
Level 4					
Map your mind Lav en mindmap der forbinder ideerne					
Draw the line Udarbejde skitser					
Yell and tell by writing Initierende beskrivelse af konceptet					
The digital world Arbejd med masser i Revit					
Ching analysis Lav en analyse af hovedgrebet					
LEGO show the way Byg små legomodeller af hovedgreb					
3 dimension Lav modeller af små hovedgreb					
Talk to me Fortæl om projektet til en anden projektgruppe					
Come around Beskriv projektets tilgængelighed					
Its integrated Beskriv ideen for integreret bygningsdesign					
Pipeline Lav en analyse af installationssystemet					

Get around Lav en analyse af de infrastrukturelle principper					
Mission of Nordic built Undersøg Nordic built principperne					

Level 5

I have a princip Lav skitser med afsæt i energi design					
Decision maker Tag en beslutning					
Picture the world Beskriv konceptets stemning					
Yell and tell Lav et moodboard for konceptet		NEW Quest			
Modul Lav en strategi for modulbyggeri					
Safaira Lav en vurdering af energibehovet					
More Safaira Lav en parameter analyse					
Draw the site Skitser på planløsningerne					
Can you built it Lav en beskrivelse af konstruktionsprincipperne					
Don't fall down Lav en analyse af det statuske system via revit					
Im listening Lyt til en anden projektgruppe					
3 dimension again Byg en stor model der samler de små modeller		NEW Quest			
It burns Beskriv gennem revit brandanalysen					
Pipelines (2) Udarbej løsninger for det tekniske system					

Beskriv projektets koncepter, principper, ide
refleksioner, tekniske aspekter, industrialis
energi
deisgns etc

Mission of the code Find projektets sammenhænge gennem kodning					
Level 6					
What about the surroundings Brainstorm ideer for situationsplanen					
Building a system **Beskriv byggesystemerne for designet**					
Draw the situation Skitser detaljer for situationsplanen					
Whats the projects Lav en projekt rapport		NEW Quest			
The big board Lav A2 plancger der illustrer ideen		NEW Quest			
Talk to me (2) Fortæl om projektet til en anden projektgruppe					
Im listening (2) Lyt til en anden projektgruppe					
Integrate me Beskriv ideen bag jeres integreret design					
Level 7					
Picture the materials Beskriv gennem billeder materialevalg					
Pictures the colour Beskriv gennem billeder bygningens farver					
Picture the light Beskriv gennem billeder bygningens lys					
The components Find løsninger for lyd, brand, fugt etc					
Draw the inside Udarbejd bygningdelsanalyser					
Draw the facades Lav skitser for facaderne					

Draw the plan Lav skitser for planløsningerne					
Stabilize me Lav 2D planer for det bærende system					
Find the solution find løsninger med fokus på brand, lyd, fugt etc.					
The force Lav et kraftforløb for det bærende system					
Accesilility Beskriv gennem revit bygningens tilgængelighed					
Give it energy Beskriv det samlede energisystem					
What do we miss Diskuter projektets mangler					
Innovation or not Diskuter innovationsgraden					
Level 8					
Write it down Beskriv projektets koncepter, principper, ideer...		NEW Quest			
Let it flow Præsenter det tekniske system gennem billeder					
I do not fall Beskriv gennem billeder det statiske system					
Define it all Præsenter de integrerede designvalg via billeder					
Can it work Præsenter det bygningens funktion via billeder					
Show it now Præsenter det bygningens æstetik via billeder					
Let it spin Udarbejd en frejebog form filmen					

Whats the status Hvad er projektets status		NEW Quest			
Recycle me Beskriv argumenter for bæredygtighed					
Reflection of choice Overholdes konkurencens betingelser ?					
Is it going to be built Udarbejde en strategi for bygningens opførelse					
Show me the money Beregn bygningens omkostninger					
Know the logistic Udarbej en logistik analyse		NEW Quest			

APPENDIX E. LIST OF ACHIEVEMENT

1.iteration Spring 2017	2.iteration Fall 2017	3.iteration Spring 2018
Idea maker - 300 point Lav over 100 idé forslag til jeres projekt	**Idea maker - 300 point** Lav over 100 idé forslag til jeres projekt	**Idea maker - 300 point** Lav over 100 idé forslag til jeres projekt
Whats the purpose - 500 point Udarbejdelse af en funktionsanalyse	**Whats the purpose - 500 point** Udarbejdelse af en funktionsanalyse	**Whats the purpose - 500 point** Udarbejdelse af en funktionsanalyse
Give it a face - 500 point Godkendte facader af underviser	**Give it a face - 500 point** Godkendte facader af underviser	
Masters of missions - 1000 point Gennemfør alle spillets missions	**Masters of missions - 1000 point** Gennemfør alle spillets missions	**Masters of missions - 1000 point** Gennemfør alle spillets missions
Shaping the future - 200 point Godkendt hovedgreb af underviser	**Shaping the future - 200 point** Godkendt hovedgreb af underviser	
Open your mind - 1000 point Gennemfør over 50 quest	**Open your mind - 1000 point** Gennemfør over 50 quest	

1.iteration Spring 2017	2.iteration Fall 2017	3.iteration Spring 2018
Enough Energy – x point energidesign		
Masters of games - x point **Lege**		
Leadership - x point Planlægning		
Creating gravity - x point Statisk analyse		
	I'm listening - 500 point Afhold min. 2 feedback møder med de andre grupper	
	Finding the road - 100 point Beskrivelse af 5 pejlemærker gennem tekst på 100 ord pr stk	**Finding the road - 100 point** Beskrivelse af 5 pejlemærker gennem tekst på 100 ord pr stk
	Reach level 2 - 300 point Inden fredag uge 35	**Reach level 3 - 300 point** Inden fredag uge 5
	Reach level 5 - 500 point Inden fredag uge 37	**Reach level 4 - 500 point** Inden mandag uge 6

1.iteration Spring 2017	2.iteration Fall 2017	3.iteration Spring 2018
	Reach level 7 - 1500 point Inden fredag uge 39	**Reach level 6 - 1500 point** Inden fredag uge 6
	Reach level 9 - 2000 point Inden fredag uge 41	
		Surf the net - 400 point Udarbej en protekol for litteratursøgningen
		Volume studies - 1000 point Udarbejd volumenstudier - løs begge quest

APPENDIX F. RULES OF THE GAME

Regel 1 - Det er muligt at optjene point gennem quest (små kort), milepæle og missioner/raids (små kurverter)

Regel 2 - Hver ny level starter på 0 point - det er dog muligt at overføre overskydende point fra sidste level.

Regel 3 - Milepæle er pointgivende og mulige point fremgår på den vedlagte oversigt.

Regel 4 - Alle Quest er påført dette symbol  der anviser hvor mange point questen giver.

Regel 5 - Hver quest er påført følgende 4 symboler der indikere questens formål.

Regel 6 - Hver opmærksom på at enkelte quest kun er pointgivende såfremt bestemte milepæle eller tidligere quest er lavet. Disse kriterier fremgår på questkortene under følgende symbol. 

Regel 7 - Der er quest som kun er pointgivende når de er løst som en gruppe. Dette kriterier fremgår på questkortene ved at følgende symbol er påført. 

Regel 8 - Gruppen skal sikre at level scoreboard og milepæle scoreboard er ajourført under hele forløbet. Gruppen er selv ansvarlig for at tælle point sammen, men skal være opmærksom på at vejlederne forbeholder sig retten til at slette point, der er opnået på uærlig og useriøs vis.

Regel 9 - Hver quest kan gentages flere gange.

Regel 10 - Kuverterne må først åbnes når gruppen har opnået den rette level.

Regel 11 - Gruppen bestemmer selv i hvilken rækkefølge de enkelte quest og missioner løses, dog skal I være opmærksomme på quests indbyrdes afhængighedsforhold, hvilket er anført på questkortene som tidligere beskrevet.

SUMMARY

This thesis investigate and experiment with “Reflective Practice-based Learning (RPL)”, which is a new learning approach at University College ’of Northern Denmark (UCN), through the use of Game-Based Learning. Within the pragmatic paradigm, this PhD project developed knowledge through the use of Educational Design Research. It used a mixed-method approach to data collection and abductive reasoning to investigate how a perspective of Game-Based Learning inspires the development of a new teaching and pedagogical concept with the aim of strengthening practice professionalism through sequential learning and inquiry processes in a higher education learning environment. Through a theoretical understanding of World of Warcraft, the PhD project thus examines how a designed learning game affects the pedagogical concepts of motivation and autonomy, analysis and exploration, and reflective practice through the use of game principles.

The domain of Practice Theory will inspire the theoretical perspective through an understanding and interpretation of learning as “landscapes of practice” consisting of designed complex and personal learning trajectories.

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