Towards a playful approach to learning collaboration.

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Abstract

This thesis looks into whether soft skills and group comprehension can be affected by playing a game designed for this purpose. If students can gain group work experience by playing. We developed a game for this purpose. With this game we could freely choose which elements we want to draw from reality. Games are often a limited and simplified version of reality. Limited in this context means that we have picked out some of the most important aspects of group work. This let players experience these elements during a short game round in contrast to everyday life, where a group work often takes days, or weeks. Initially, we hypothesized that among students there are many with little knowledge about how important it is to manage working in groups. This is because, especially during the corona shutdown, there were many students who did not work in, or form groups, even after encouragement from the lecturers. Not forming groups, especially at the beginning of a course can have consequences, like social implications, and losing out on gaining group work experience. It is certainly a problem that should be solved as soon as possible. Thus, we created a solution which we then tested. The results show that it is the case that students do have a grasp of soft skills and group comprehension. By using the game students get introduced to four of the five stages in Tuckman's Five-Stage Theory of Group Development. (Tuckman, 1965) where they can gain additional valuable experience without risk.

Keywords: Collaboration, Group work, Game-based Learning, Games, Motivation.

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Chapter 1

Introduction

This thesis wants to find whether soft skills and group comprehension can be affected by playing a game designed for this purpose. If by playing, students can gain group work experience.
The game is designed to push players to cooperate for survival. A quantitative questionnaire presents baseline variables for students knowledge- and value- of structured groups. A practical experiment test if the presumption, playing one game round can lead to a net gain in appreciation for aforementioned skills and knowledge, as stated in the hypothesis.

First, groups and individuals: When given a task it's usually a goal to complete it quickly, but properly. Many, especially larger tasks, demand more than one person, you need a group. A group isn't always efficient, it needs experience to become optimized, both the group, and even more important, it's members need experience.
Second, games, play and motivation. By providing learning opportunities and using intrinsic motivation with the goal of making groups efficient in a limited time span. While also giving each participant personal simulated experience throughout four of the five stages in Tuckman's Five-Stage Theory of Group Development.
Third, experience, time and risk. For people without much group experience it's easy to default to do any work individually, especially for new students. Using the arguments above these people can experience group dynamics and group work without large commitments of either time or risk. Removing some of the barrier of getting group work experience.

1.1 Background

Throughout our studies we've been in many groups, some bad and some good. In recent years it seems to us that the appreciation by students of general group work has declined. Students struggle to form groups for group assignments and projects. This leads to the same students not gaining group work experience. It also leads students to not use group work as a practical tool even when they're encouraged to do so by teachers. In some situations this could lead to both a higher workload for each student, and them missing out on learning, and experiencing, group work and dynamics. To some degree it could seem that students lack knowledge of group value.

Especially when global Covid conditions made it so students couldn't meet physically in class to form groups the question arose; how can we start solving this issue. Conversations with professors lead to the direction of this project.

Creating and using groups has been the norm for a long time, there have always been some that struggle more than others with this, and need extra guidance. During the recent years this issue went from affecting a few students, to affecting a larger group.

Contextualizing project group work in a game context may transfer relevant knowledge. By designing a coop-game where collaboration, both through communication and decision making based on the needs of the group as a whole, the students may have a simulated experience of group work project.

1.2 Hypothesis and Research Questions

We'll be testing if soft skills and group comprehension can be affected by playing one round of a game that we designed for this thesis. If by playing students can gain group work experience.

Hypothesis:
The effects and value of well structured groups and roles are undervalued by

students. By contextualizing the skills, tasks and roles in project work within a game context, we gain simulated experience and a net gain in appreciation for general group- knowledge, comprehension, communication, and experience.

Research questions:

- Does playing the game affect appreciation for these "soft" skills?

- Does the feeling of comprehension of group work change by playing the game?

- Does the game transfer relevant information?

Chapter 2

About the Game

This chapter goes through the details of the game the development. From the practical- to the conceptual- aspects. By contextualizing skills, tasks and roles within a game context we introduce students to a semiotic domain where the game should implicitly teach them the values of collaboration. The game is designed to accelerate the process of going through important steps that's involved in any, or most group work. By leaning on motivation- and game-theory research we developed a game that does this. While being entertaining combined with these implicit lessons it's expected that students can gain appreciation, and experience with group work and soft skills.

2.1 Design Constraints

The game needed to be playable for varying group sizes. Usually more players equals more downtime, for the purpose of our thesis, that would not be favorable. Collaboration has to be valuable in the game. Use implicit learning and avoid having one way to win. Peek interest by choice diversity for replay-ability, in addition to introduce groups dynamics. All this while keeping in mind that we need to gain measurable results quickly, for the thesis research.

The game was developed for an narrow use case first, then rounded to be as entertaining as possible within the thesis' framework. While it is a prototype it needed to display a certain level of quality to facilitate the participants immersion in the game.

2.2 Design and Prototyping

Figure 2.1: Picture of prototype stages, early hand drawn prototype left and last stage prototype right

Here we're going through the hows and whens regarding the practical side of designing and prototyping. Going from white-boarding, hand drawn- tiles and cards to using the google suite, and script for automation when producing prototypes. Playing and testing mechanics one at a time, adjust and repeat, that was the beginning. Later in the project there were periods where physical meetings was prohibited, this was a challenge especially for demoing and testing. It forced us to go digital, Tabletop Simulator resembles a framework where one can manipulate cards, game pieces, and all other tabletop related things while also uploading your own content. It uses it's own standards so some adjustments had to be made compared to the printing prototyping that was used prior. This new approach did have real benefits other than remote play. Setup, resetting, and shuffling by clicking a button increased productivity. Though our communication was less effective than previously.

The game was largely based on the "Print and play" model, especially in the demo stage. When writing the rules, a large challenge of game making, we could rely on the highly held, tidy, and efficient rule book from "Kill Doctor Lucky". This provides structure and content location, what to start, and end, with.

When the main mechanics and rules were finalized we could start developing

Figure 2.2: Screen capture from our "Tabletop Simulator" implementation

the software and make physical game pieces. The physical pieces were modeled, sliced and finally 3D printed.

The software is a web-based tool. During the development, additional elements of the game where implemented in the digital component. Even though this was to an acceptable degree accomplished, it ended up being more time consuming than expected. The development tool used were Visual Studio Code. The program uses two external libraries, heap(Ranjous, 2020a) and priorityQueue(Ranjous, 2020b), together they provided a heap-based implementation of priority queue. These libraries are developed by Eyas Ranjous, and published as part of *The javascript data structures project*. In this program they were used in order to find the shortest paths between nodes in a graph. Some of the notable challenges in the development were functionality dealing with the random elements of the game. Distribution of random elements in order to create a unique map, were challenging due to limited programming knowledge. Furthermore facilitating functions letting the players utilise their in-game abilities, in order to unlock certain parts of the map, proved an additional challenge.

The target audience for this research are students. During higher education, part of the syllabus is collaboration and organisational behaviour. This thesis wants to find the possible effect of using a more playful approach to learning collaboration.
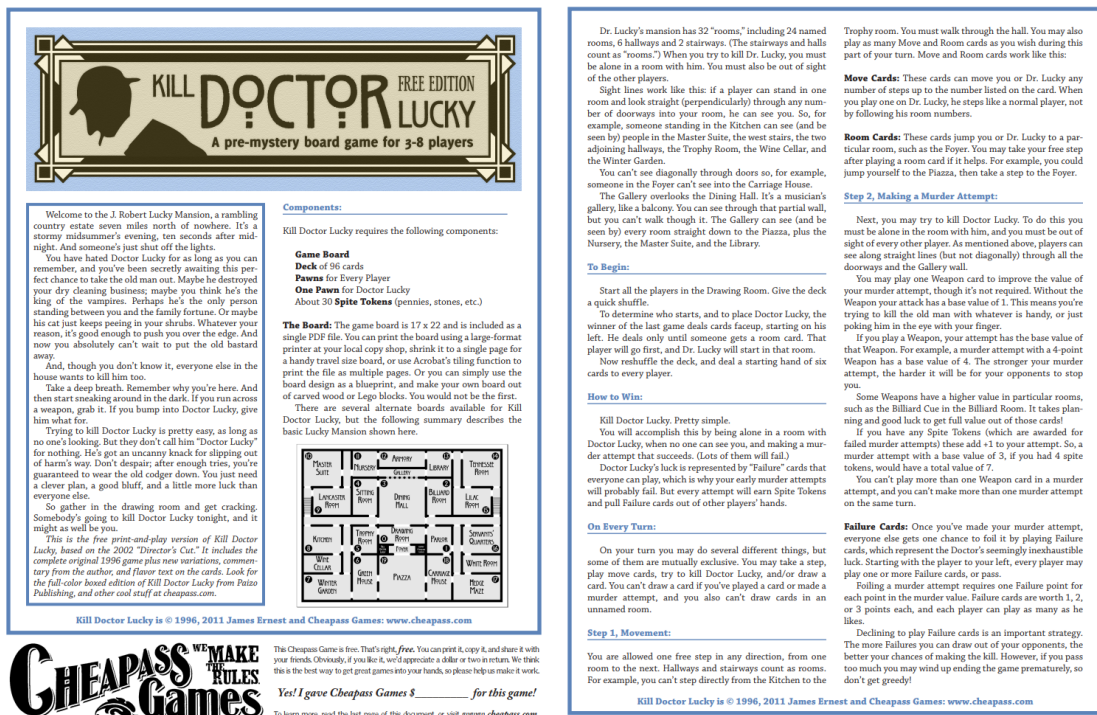
Figure 2.3: Kill Doctor Lucky rule book. 1. and 2. page

2.3 Mechanics and Concepts

Engelstein and Shalev, 2019 define Cooperative games as "Players coordinate their actions to achieve a common win condition or conditions. Players all win or lose the game together."(Engelstein & Shalev, 2019, p.4). The goal is to teach the players collaboration by teaching them the importance of well structured groups and roles.

By designing around the Coop-game genre, inter-group competition is toned down. And letting all players share one player piece, the boat, makes it easy for players to understand that communication is needed to make the game playable. The map changes every play-through, giving players new challenges every time. The players are given long-term goals, and are expected to implicitly understand the short-term goal of survival. Only after both short, and long term planning, a group can thrive and experience relative efficiency. Without planning and collaboration one leaves much up to chance, normally players should quickly pick up on this.

The Boat

A coop-game for 2-4 players (as of 23.03.22)

Components:

Digital Component
1 Game Board - Contains spot for *Island card deck* and *Boat Integrity*
- 1 **Boat Integrity** token
- Deck of 18 cards **Island expedition** cards
- One game piece for **The Boat**
- One game piece for the **storm**
- Two game pieces for the **Pirate-ship**

1 Player board - *per player*
- 2 tokens per player to keep track of your level on player
- **Class card** - *a player may only use one class card*
  - 1 **Navigator card** per player
  - 1 **Gatherer card** per player

Food Resources - *in two different colors. Representing (fish and fruit).*
- About 10 **Fruit Resource** Green tokens per player
- About 10 **Fish Resource** Blue tokens per player

1 **Start Token**
16 **Shallow water** tokens
4 **Corner Tiles** (Shipwreck, Harbor, 2x Desolate Land)
7 **Island Tiles**
7 **Fish Tiles**
6 **Lightning Tiles**
25 **Water Tiles**

The Story:

You find yourselves on a lifeboat far at sea. There was a shipwreck, now no one knows where you are, or where you used to be. You are lost at sea!

Even though locating land may be done by traveling in one direction, you are dependent on finding civilization. But before you may enter civilization you have to bring "**The Holy Thing**". **The Holy Thing** was fastened to your ship and is probably still there.
There is a **storm** brewing in one direction, see map. Sail through the perilous seas, reach the "**The Holy Thing**" and return to civilization.
In the boat you have six plugs for surviving leaks. (**Boat Integrity** located at **Main Board**)
The group divides the rest of the resources aboard the boat. There are two kinds of resources and each player uses one of each per action.

Everyone starts at the same level, as you are all passengers, and are all able to do the same actions. More abilities may be learned by using the upgrade ability.

The Board:

The board contains 49 spaces, placed in a 7x7 grid. The starting position is always the middle of the board. In chess terms at D4. The four corners represent destinations. Out of these, two specific tiles require a visit in order to win the game. Those are **The Shipwreck** and the **Harbor**.

All other tiles are unknown to the players, but information is obtainable by scouting og simply moving there. Most of the tiles represent **Open Water**, while empty there is still possible to fish here. An **Island-tile** will allow players to go on an expedition, this is a way to gather the **Fruit resource**. Expeditions can be dangerous, so this is not always the best choice. A fish-tile represents an area with more fish than usual. As opposed to the island-tiles, fish-tiles can not be dangerous. The only type of tile that is a sure **hazard** is the **Lightning-tiles**. These tiles will inflict **damage** on entering, as well as at the end of the turn.

Using the **digital component** the players may create a new scenario. Unlocking tiles on the digital map gives the players the information

needed to place the corresponding tile on the game board. Remember to not change the orientation of the **digital component** during play.

To Begin:
Each player starts with 6 **Fruit Resources**, and 6 **Fish Resources**.
Boat integrity located at the **Game Board**
Place **The Boat** at the center of the board on top of an "Open water tile". Place the **storm**, the **storm** covers 4 tiles and is placed on one of the four places, see image. Then place **The Boat Integrity** token. End the startup by placing tokens on your **Player Boards**.

To Win:
Locate the shipwreck and obtain **The Holy Thing**, now bring that item to the **Harbor**. As long as the boat arrives with at least one living crew member, it is considered a success for the whole group.

NOTE: If a player is out of resources at the players start in any turn, the player dies. The game will continue and the deceased player may contribute, but without being able to play as an active player.

On Every Turn & Turn Order:
The player that has most recently eaten receives the start-token and starts the game, continuing

with a clockwise turn order. Communication and "thinking out loud" within the group is advised, but not a necessity.

Action phase:
The active player starts performing actions. Each action should be paid for as they are being done. Players may perform as many actions as they want per turn, but each action may only be performed once.

When one player is done, the player to the left is the active player. After all players have ended their turn, the start-token goes to the player on the left. The Action-Phase is now done.

NOTE: Any player may skip this phase and not do any **Actions**. The player will then choose to **Lay dormant** and only pay 1x any **Food Resource**.

Action cost:
Each action costs 1x **fruit** and 1x **fish**.
If a player is out of one **Food Resource**, it is possible to pay with only one kind, but the cost is 3.

Actions:
- **Move**
  - This action moves the boat to an adjacent tile, this does not include diagonal tiles.
- **Scout**
  - Unlock any 2 adjacent tiles, including diagonal tiles.
- **Fish**
  - Fish on the current tile. Outcome will depend on tile and player abilities.
- **Upgrade**
  - Choose a class, or Level up one of your skills once. You gain this skill instantly.
- **Island expedition**
  - May only be used on an island tile. Outcome will depend on the number of joining players and player abilities.
- **Research (General Action)**
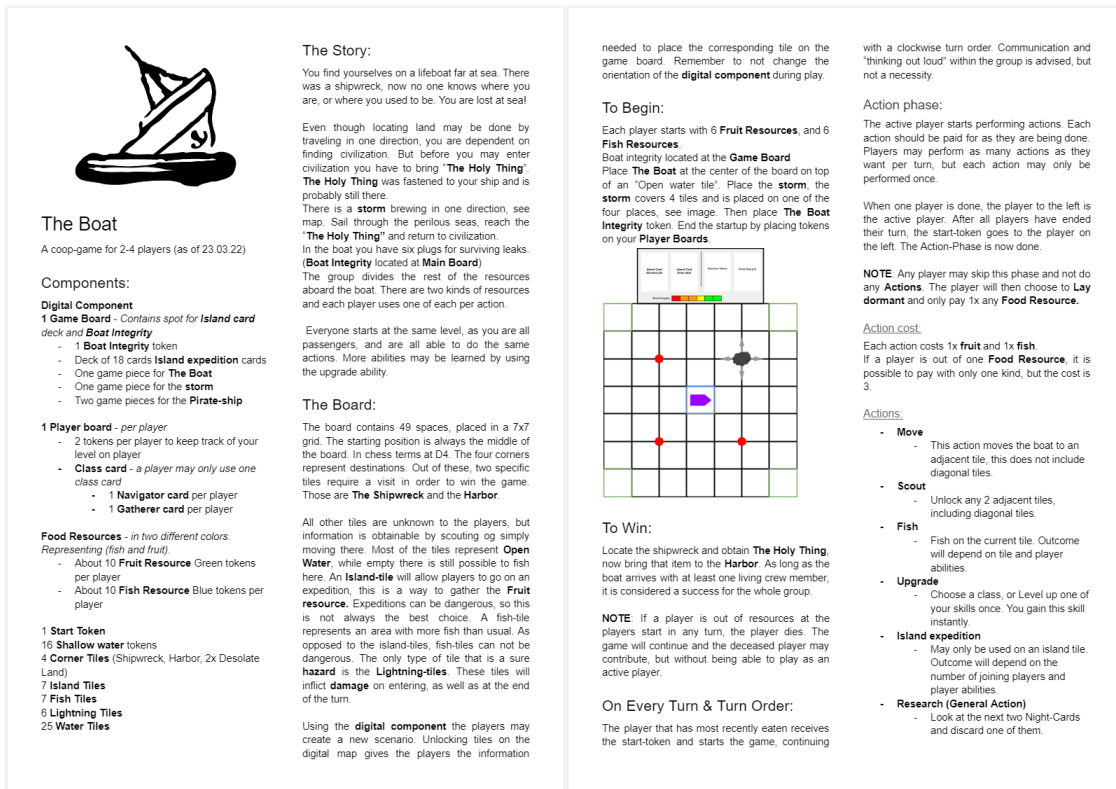 - Look at the next two Night-Cards and discard one of them.

Figure 2.4: Thesis game - The Boat rule book 1. and 2. page

Managing resources will become any players main priority from the start as all players are first of all responsible for their own survival. It's a present, compelling task that needs to be handled imminently. It can be handled in multiple ways, the most efficient way is by having a, or making a resource specialist. Although that's not necessarily the first way groups will solve resource management.

2.3.1 Roles and Team

In order to create dependency amongst the players, the game presents them with a choice of taking on roles. Some roles are rather implicit e.g. the role of leader, the one who takes charge of the conversation. Other roles are presented to players as in-game roles. These roles are designed in order to fit the theme of the game. In the game the players are lost at sea, and the in-game roles are navigator, gatherer and general. Here the first two serves as specialist-roles, while the general role represents a set of skills that they all have in common from the start. In order to form the roles, a Tech Tree mechanic is implemented.
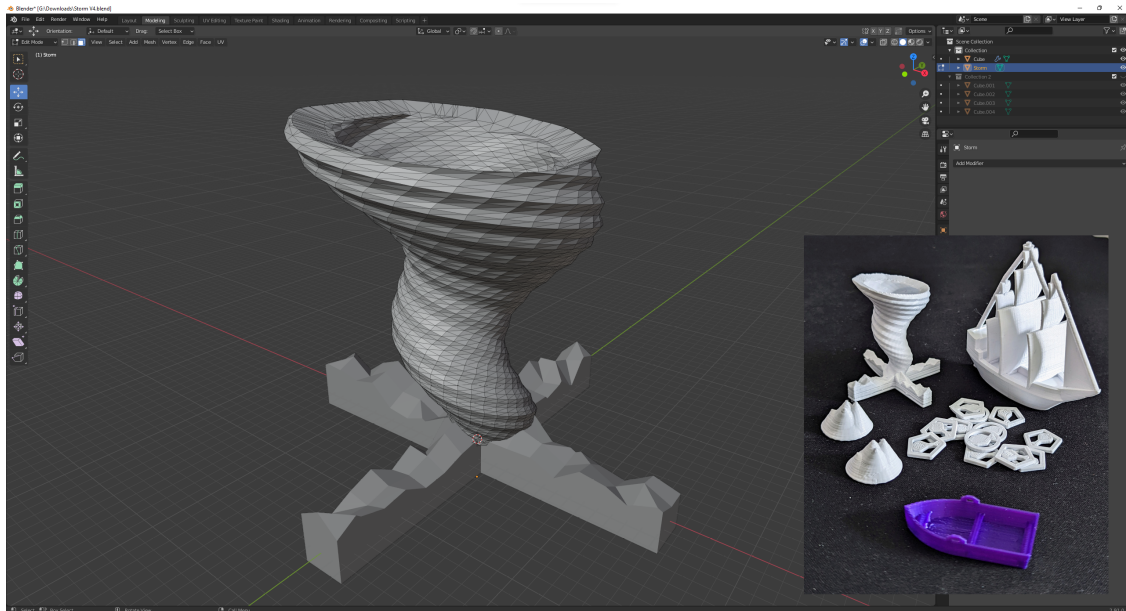
Figure 2.5: Storm-file version 4 in Blender and Physical game pieces

Engelstein and Shalev, 2019 defines this mechanic as: "During the course of the game, new Actions become available to specific players, or existing Actions are improved."(Engelstein & Shalev, 2019).

To maintain the dependency within the team and correctly reflect teamwork outside the game, in terms of projecting a team with complimentary skills, the players are only able to choose one specialist-role. This is an implementation of the Variable Player Powers mechanic, "Each player has special Actions that only he or she can perform, or that modify standard actions."(Engelstein & Shalev, 2019, p.6) The roles are designed to compliment each other and the optimal group composition is having one of each. This is done by making the navigator able to obtain information about the first main goal, which makes the role crucial in the early stages. The Gatherer is important in order to maintain a healthy reserve of resources. We made the general role in such a way that it is advantageous for one player to focus solely on it. One way this is done is by giving the role a really strong last upgrade, which let the player repair the ship, this is an action which cannot be done in any other way.

Each round of player-turns represents one day in-game. By introducing new potential challenges each round the game encourages communication. It forces the players to assess their situation often, and they will encounter unanticipated
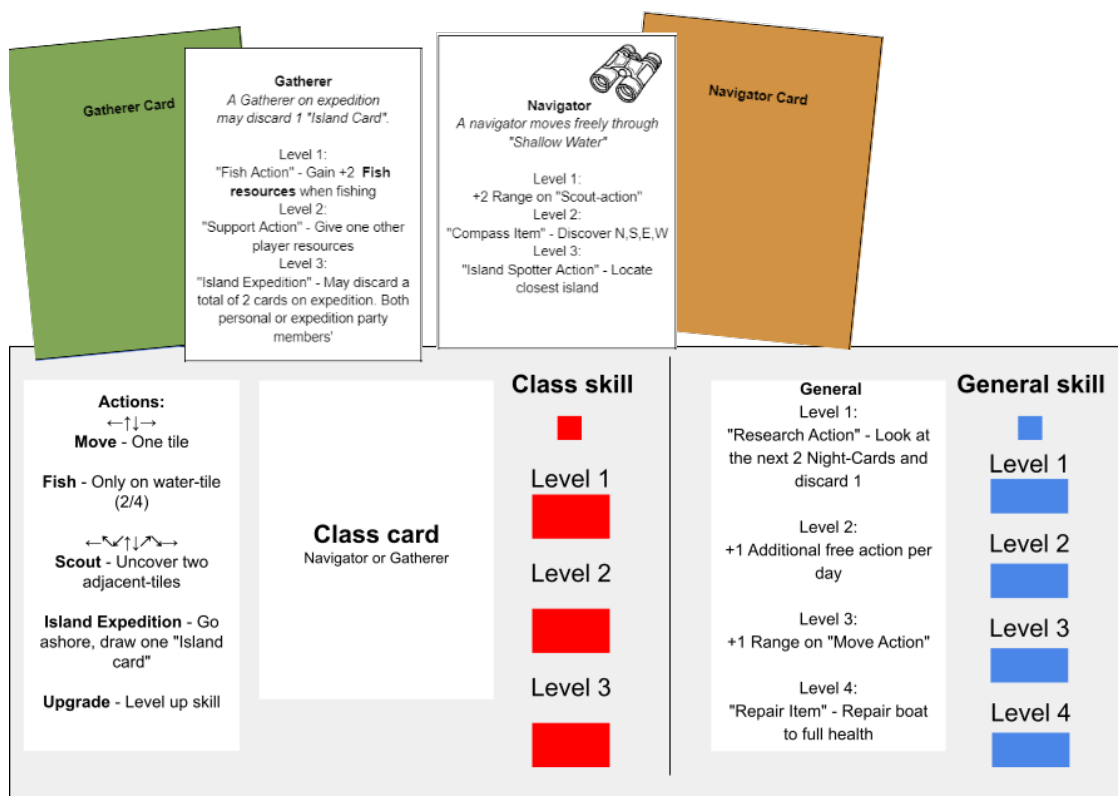
obstacles.

Figure 2.6: The Player card and possible specialization cards.

2.3.2 Actions

Similar to the general role, the players start with the same available actions they are able to preform. In order to acquire more actions or enhance the ones they have in some cases, each player has to "upgrade" their role. Giving all players the same starting point in terms of actions, is important in order to give all players freedom and opportunity to make more meaningful choices. In addition to increasing the players need to communicate.

2.3.3 Norms

As the players realise the importance of planning and distribution of tasks, they will have to prioritise defining roles. How soon this occurs will vary greatly, even though it is necessary in order to deal with different tasks simultaneously. As the game progresses the challenges will pose a larger threat. This is due

to a combination of unbalance in resources and potentially stacking dangers. Both gathering resources individually, in addition to avoiding damage will leave some members forced to act and exposed to dying. The team objective at this point should be to create a composition of roles that complements each other. This will ensure both sustainability and progress. During this process they will start creating new norms. Optimally the team will designate tasks according to strengths.

With roles and norms defined, their focus at this stage should change in order to be oriented towards the main goal. Utilising their combined abilities, the players will be able to deal with the challenges effectively.

2.3.4 Events

One goal is to make the players assess their situation each player turn. This is done by events. Engelstein and Shalev, 2019 defines this mechanic as: "Actions occur outside the control of players that cause an immediate effect, change the state of the game, or impact subsequent actions."(Engelstein & Shalev, 2019). They have regular timing, but random outcome. These events are designed in such a way that some of them may change the situation quick, and the players need to respond in order to avoid losing control. Other events does help the players, e.g. grant them more resources, which allows them to make choices that were previously impossible.

Nightcards

After every round a night card is flipped. The nightcard can be good, bad, or do nothing. It keeps players on their toes and usually provides them with an imitate problem to solve.

Island-expedition

This event is triggered by the players, and may only be done at certain places on the game map. This event is designed in order to show the advantages of

task distribution. Get the players to evaluate whom are best suited and what will benefit them as a team.

Storm

Inspired by the theme a game piece illustrating a storm was introduced in order to be an ever present danger. Being adjacent to this piece damages the boat. The movement of the storm is calculated by weighted dice rolls, and the tendency is illustrated with a weather forecast. This let the players plan ahead in order to avoid the storm. There is also an element of risk involved, as being close to the storm may be advantageous in some instances, even though the weather forecast may change. So in these situations assessing the groups ability to withstand the damage is advised.

2.4 Digital component

The digital component of this game is what makes it a hybrid game. At this stage it is developed as a prototype, or proof of concept resource.

As this is a cooperative game the purpose of the digital component is mainly to serve as the AI. This replaces several dice-rolls and draw-card decks. By digitising these mechanics they are not only gathered in one place, it shortens the game time and makes it more accessible. Both by decreasing setup time, and make all information easily readable to all players.

Furthermore the digital component serves as the map that represents the game board. As the game board heavily rely on the *Unknown information* mechanic, implementing the map layout in the digital component ensures that this information is hidden to all players. "Aspects of the game state are unknown to all players, but lie within a known range."(Engelstein & Shalev, 2019, p.6). One might say this makes the digital component serve as a kind of extremely simplified game master in addition to AI.
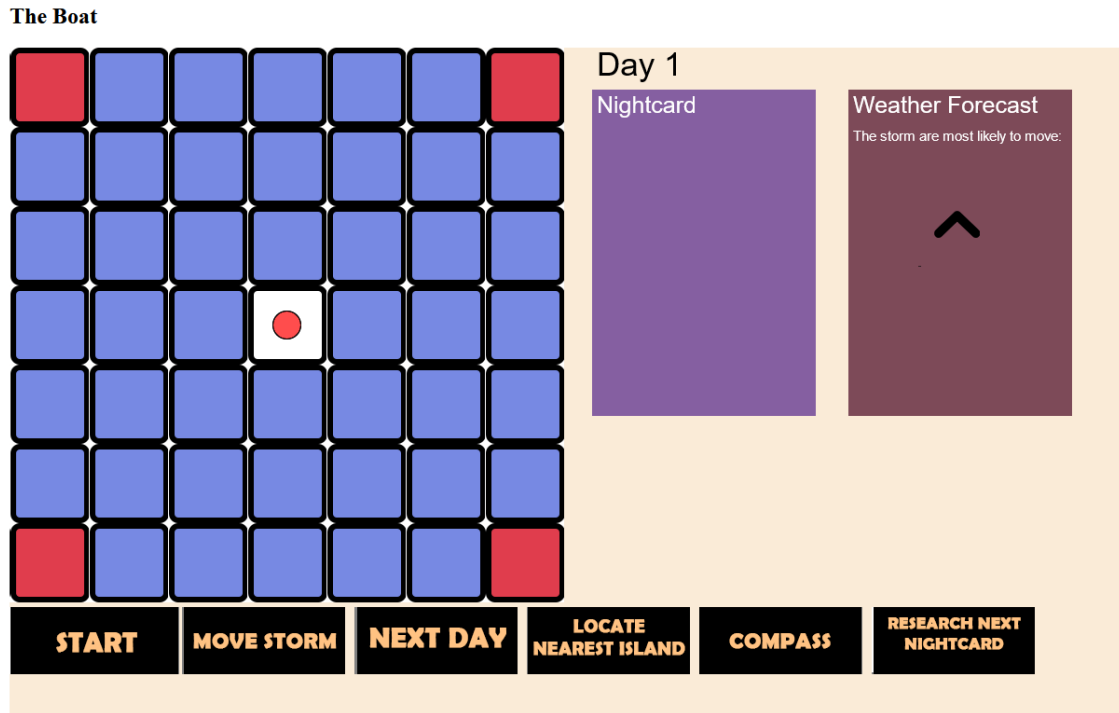
Figure 2.7: Digital Component UI.

The players interacts with the component by simple mouse clicks, as all pieces of the map are buttons in addition to the main buttons. All map information is distributed at the start of the game. This information is made known for the players through them actively seeking to unlock certain areas. Mostly this interaction will happen by the players moving to, or scouting the area. This is done by clicking the chosen area, the digital component will keep track of which area the players are moving to and which are only scouted. Some players will be able to utilise more advanced actions in order to unlock other areas of the game board. There are three actions relying on use of the digital component, these are the ability to get the location of the first main goal, the ability to locate nearest island and the ability to influence the next event. By locating the first main goal, or *The Shipwreck* as it's named in the game, the digital components finds that unique ID of that area and unlocks it. Since there are only one, it is rather uncomplicated. By locating nearest island area, the process is more complex. But by having ID's on each island, we are able to figure out the shortest route to one of them regardless of the position of the boat, using Dijkstra's algorithm. This were done by using priority queues(Ranjous, 2020b). Lastly the ability to influence the next event. Instead of getting one random event at the end of the

player turn, the player get two random events and get to pick one of them.

2.5   Solution Shortcomings

As there are a whole genre of coop games out there, one could argue that using any game could produce similar results. This particular game does require the players to learn and understand a sizeable amount of rules within a short time frame. There is a risk of frustration amongst some players, if there are noticeable variation in time needed to understand, or if the task seems out of reach.

Adaptability for various group sizes is another shortcoming. This is a result of a lack of play testing focusing on this area. Measures can be taken in order to manage this, one of which a rule that decreases resources gained with each additional player.

The digital component is perfectly adequate as for a prototype, in terms of potential further development improvements would be necessary. In terms of user experience, the program does demand a confirmation from the players before reveling potential game breaking information. This happens only when using special functions. Hidden information may be revealed by clicking on an area to unlock it. However, this will either fall under the category of cheating, or as a simple mistake. Securing against cheating would be a large task, and not necessary in a prototype. The same is the case of securing for all small mistakes, as they will most likely not be game breaking.

Chapter 3

Theory

This chapter elaborates on a combination of theories relevant for this thesis. This entails the importance of groups and collaboration, in addition to group development. It elaborates on theory revolving motivation, with an emphasis on self-determination theory(SDT), in order to understand how games can be used as a more motivating way of learning collaboration. We examine relevant theory on games and play, and games as learning tools. Finally it explores relevant pedagogical theories.

3.1 Collaboration and Group-work

3.1.1 Groups and Teams

This thesis will be distinguishing between groups and teams, therefore it's important to offer definitions that are found useful for the purpose of this thesis. These are broad terms and the definitions vary from one field to another. Sinding et al., 2018 define a group by stating: "Although other definitions exist, we draw from the field of sociology and define a group as two or more freely interacting individuals who share collective norms and goals and have a common identity."(Sinding et al., 2018, p. 225) This definition is based in part on one found in 'A Parsimonious Definition of Group: Toward Conceptual Clarity and Scientific Utility.(Smith, 1967, p.142-67).

This definition may be applied to a larger group of students then what is relevant in this research. One might claim that this definition describes a group of students during their early phase of a group project.

To turn a group into a team we give groups a suggested list of conditions to meet. Sinding et al., 2018 used the definition by Katzenbach, 2005 to define a team: "a team is defined as 'a small number of people with complementary skills who are committed to a common purpose, performance goals and approach for which they hold themselves mutually accountable."(Katzenbach, 2005, p. 45).

Drawing from this, members in a team has developed a relationship where they rely more on each other. While students in a class might share norms and goals as a group, students teamed up for a project need collaboration to reach their common goal due to the dependency amongst them. In Handbook of work group psycology, Guzzo states that all teams are groups but not all groups are teams.(West, 1996).

3.1.2 Group Development

Learning the value of collaboration is important for students. "University students are often teamed for class projects."(Sinding et al., 2018, p. 225). Although it depends on what subject, group work is often the most sensible approach, as opposed to individual assessment. But learning how to collaborate successfully, might prove difficult, and depending on the group, often the experience will vary. "Group effort can bring out both the best and the worst in people."(Sinding et al., 2018, p. 225).

As students we have experienced several different ways in which the students are teamed in groups. Regardless of how a group is created it develops over time. This thesis uses Tuckman's Five-Stage Theory of Group Development(Tuckman, 1965), as it is an often cited model to illustrate the characteristics of important stages in any groups development.

Tuckmans theory explains the different stages a group reaches during the process of working together. The stages are: Forming, Storming, Norming and Performing. The fifth stage, Adjourning, was added later by Tuckman together with a student. This made it Tuckmans Five-Stage Theory.
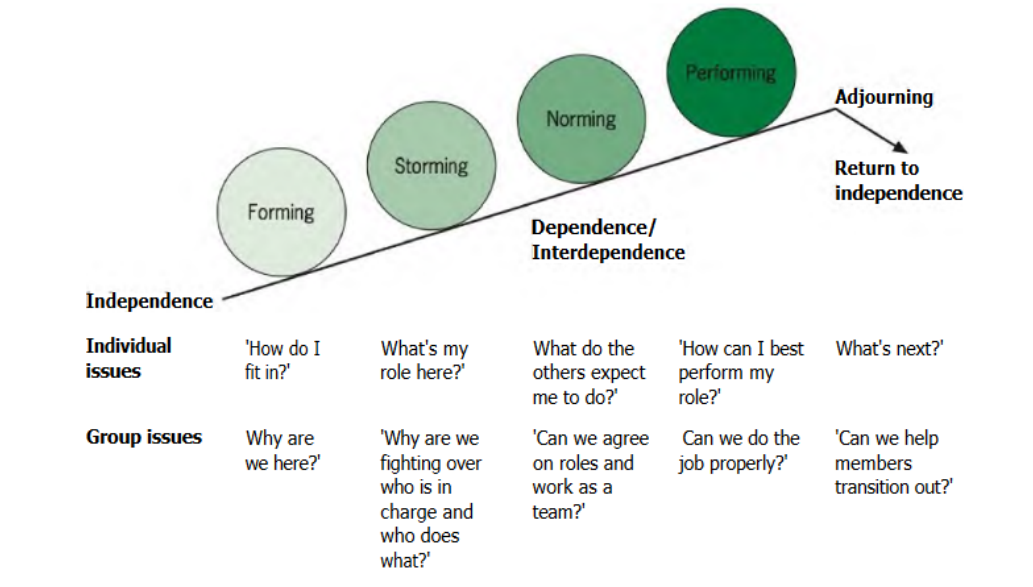
Figure 3.1: Tuckman's Five-Stage Model of Group Development Theory
(Sinding et al., 2018, p.229)

Going through the stages from first to last:

During the Forming-stage the group members tends to be uncertain of their role, what the group has as goals and who will take charge. Mutual trust within the group tends to be low and it's normal to be holding back.(Sinding et al., 2018, p.229-230).

The Storming-stage is a stage of testing. Members test if the leader makes good decisions and the try to determine where they fit into the power structure.(Sinding et al., 2018, p.230). This is also a phase where the members begin to discuss the needs of the group.

In the Norming-stage there are no more power struggles, someone other then the leader challenges the group to resolve it's power struggles in order to ensure that something can be accomplished. Questions about authority and power, or the group structure are resolved through matter-of-fact group discussion. This is further the stage where the members believe they have found their proper roles and they get an experience of team spirit.(Sinding et al., 2018, p.230).

The Performing-stage is when the groups activity focuses on solving task problems. There is open communication and co-operation. The members gets their work done without hampering others, and conflicts are handled constructively and efficiently. Cohesiveness and commitment to the group goals help the group achieve more than they could have done individually.(Sinding et al., 2018, p.230).

Lastly the Adjourning stage is when the work is done. In this stage the group should find a suitable way of ending the project, as some may find themselves with a sense of loss. Leaders should also emphasise valuable lessons learned in group dynamics to prepare everyone for future work in groups and teams.(Sinding et al., 2018, p.230).

3.1.3 Roles and Norms

Sinding et al., 2018 defines roles as: "Roles are sets of behaviour that people expect of occupants of a position"(Sinding et al., 2018, p.232).
In all groups there are roles, and all members has at least one. Though Tuckmans Theory does emphasise on the importance of someone emerging as a leader for progress in the group development process.

According to Tuckman, 1965, norms emerge when a group has reached a stage where the members have found their roles. In this stage the group figure out how to work together. As stated by Sinding et al., 2018: "Generally speaking, norms evolve in an informal manner as the group or organisation determines what it takes to be effective."(Sinding et al., 2018, p.234). They further define norms as: "Norms are defined as shared attitudes, opinions, feelings or actions that guide social behaviour."(Sinding et al., 2018, p.234).

3.1.4 Problems in work teams

Sinding et al., 2018 created a list of "Problems typically experienced by team members". The list of problems were created by compiling from several sources and contains the following:

" - team tries to do too much too soon

- conflict over differences in personal work styles (and/or personality conflicts)

- too much emphasis on result, not enough on team processes and group dynamics

- unanticipated obstacle causes team to give up

- resistance to doing things differently

- poor interpersonal skills (aggressive rather than assertive communication, destructive conflict, win-lose negotiation)

- poor interpersonal chemistry (loners, dominators, self-appointed experts do not fit)

- lack of trust

"(Sinding et al., 2018, p.266).

3.2   Motivation

Motivation is what drives human action. Motivation is defined by Ryan and Deci, 2000 as: "To be motivated means to be moved to do something"(Ryan & Deci, 2000, p.54). Motivated individuals are inspired and feels impetus to do a task. They want to perform and complete activities regardless of how they were motivated. Individuals without this drive are considered unmotivated, due to a lack of inspiration and the need to perform and complete activities(Ryan & Deci, 2000, p.54).

3.2.1   Self-Determination Theory

SDT explains the distinction between behaviours that are volitional and those that are more influenced by other and often outside sources. In SDT autonomy, competence and relatedness are presented as basic psychological needs that, if satisfied, identifies behaviours as self-determined.

Intrinsic and Extrinsic Motivation

In SDT Ryan and Deci, 2000 defines the distinction between intrinsic and extrinsic motivation as: "...*intrinsic motivation*, which refers to doing something because it is inherently interesting or enjoyable, and *extrinsic motivation*, which refers to doing something because it leads to a separable outcome"(Ryan & Deci, 2000, p.55). Intrinsically motivated behaviours are driven by the enjoyment in doing the task itself, in relation to SDT Ryan and Deci, 2000 states: "Intrinsically motivated behaviours, which are performed out of interest and satisfy the innate psychological needs for competence and autonomy are the prototype of self-determined behavior."(Ryan & Deci, 2000, p.65). They are motivated by enjoying the activity in itself(Ryan & Deci, 2000, p.56). Extrinsic motivation refers to motivation by outside factors. Extrinsically motivated individuals are moved to perform in order to get a reward or to avoid punishment.(Ryan & Deci, 2000, p.60).

"Extrinsically motivated behaviours - those that are executed because they are instrumental to some separable consequence - can vary in the extent to which they represent self-determination."(Ryan & Deci, 2000, p.63).

While extrinsic motivation may be in contrast to intrinsic motivation, there are varied types of extrinsic motivation. Some extrinsic motivated behaviours are done with of a high degree of willingness, and not purely out of the sense of duty or demand(Ryan & Deci, 2000). In relation to students motivation Ryan and Deci, 2000 describe this distinction with: "Students can perform extrinsically motivated actions with resentment, resistance, and disinterest or, alternatively, with an attitude of willingness that reflects an inner acceptance of the value or utility of a task. In the former case - the classic case of extrinsic motivation - one feels externally propelled into action; in the later case, the extrinsic goal is self-endorsed and thus adopted with a sense of volition."(Ryan & Deci, 2000, p.55).

"Central to SDT is the distinction between *autonomous motivation* and *controlled motivation*. Autonomy involves involves acting with a sense of volition

and having the experience of choice."(Gagné & Deci, 2005, p.333).

"That is, we saw that social contextual conditions that support one's feelings of competence, autonomy, and relatedness are the basis for one maintaining intrinsic motivation and becoming more self-determined with respect to extrinsic motivation. We pointed out that in schools, the facilitation of more self-determined learning requires classroom conditions that allow satisfaction of these three basic human needs - that is that support the innate needs to feel connected, effective, and agentic as one is exposed to new ideas and exercise new skills."(Ryan & Deci, 2000, p.65).

These three psychological needs; competence, autonomy and relatedness are important needs for students.(Niemiec & Ryan, 2009).

3.3   Play and Games

There are important links between games, motivation and learning. In order to get a better understanding of these relations it's important to explore definitions of both play and game.

3.3.1   Play

To explain the origins of play Huizinga, 2016 states: "Play is older than culture, for culture, however inadequately defined, always presupposes human society, and animals have not waited for man to teach them their playing."(Huizinga, 2016, p.1). This is an often cited statement, one could argue that both animals and children play because they have to, as a part of primary socialization. Huizinga, 2016 address this notion with:

"It may be objected that this freedom does not exist for the animal and the child; they *must* play because their instinct drives them to it and because it serves to develop their bodily faculties and their powers of selection. The term

"instinct", however, introduces an unknown quantity, and to presuppose the utility of play from the start is to be guilty of a *petitio principii*. Child and animal play because they enjoy playing, and therein precisely lies their freedom."(Huizinga, 2016, p.7-8).

Huizinga, 2016 emphasises the importance of freedom and that all play is voluntary. Furthermore he defines play as "not ordinary" or "not real", but this must not be interpret as not serious. Furthermore he stated "The contrast between play and seriousness is always fluid."(Huizinga, 2016, p.8). Another central aspect of play is the limitation in time and space, which describes how a game has a start and an end, together with the physical limitation. This creates what Huizinga, 2016 describes as "the magic circle". He further describe how valuable the "play-community" is for retaining the magic even after the game is over, and preserve the play as a game within the memory.(Huizinga, 2016, p.5-12).

3.3.2 Games

Game relates to play, and by comparing similarities amongst what we generally recognize as a game Juul, 2005 presented a model in his book *Half-Real: video games between real rules and fictional worlds*. This model includes six features of what is considered a game. Juul, 2005 presents his model as:"A game is 1) a rule-based formal system; 2) with variable and quantifiable outcomes; 3) where different outcomes are assigned different values; 4) where the player exerts effort in order to influence the outcome; 5) the player feels emotionally attached to the outcome; 6) and the consequences of the activity are optional and negotiable"(Juul, 2005, p.6-7).

In order to be a game, the players must be able to make meaningful choices. This is supported by Tekinbas and Zimmerman, 2003 in the book Rules of Play: Game Design Fundamentals: "*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."(Tekinbas & Zimmerman, 2003, p.34). This is supported by amongst others Sid Meier which gave games the definition of "a series of meaningful choices."(Koster, 2013, p.14).

Serious games

Serious games are games designed to accomplish something meaningful in the real world. Adams, 2013 define the term serious game as: "Game that is designed to solve a real-world problem through play.". Usually these games are designed to educate, and educational games are the oldest form of serious games. Serious games are designed with less emphasis on entertainment. However the best of them still are entertaining, because they are enjoyable to play.(Adams, 2013, p.27). Serious games are changing, and in contrast to older educational games, they now have more in common with commercial games. As stated by Adams, 2013 in the book *Fundamentals of Game Design*:

"Education gaming has advanced considerably since its beginnings, as designers have found ways to inspire players to learn, or to teach them things without their even being aware that they are being taught - a trick called *stealth learning*."(Adams, 2013, p.27)

3.3.3 Motivation in Games

In terms of motivation, the motivational effect of playing games can be related to popularity. One thing that is certain, is that games are getting increasingly more popular. Especially amongst kids there has been an increase in the popularity of games. There are many reasons behind this, some directly linked with the technological aspects. With advancements in technology, not only do games become more accessible, but definitely more appealing to a larger demography. "The true secret of why kids spend so much time on their games is that they're learning things they need for their twenty-first century lives."(Prensky, 2006, p.5).

Another reason for the increased popularity is that games in their nature are motivating, or fun, two factors which do have a close connection in terms of learning. "Fun from games arises out of mastery. It arises out of comprehension. It is the act of solving puzzles that makes game fun."(Koster, 2013, p.40). This is because it is not "forced learning", but instead are activities driven by intrinsic motivation.

Flow is another aspect of what makes games popular. Csikszentmihalyi describes flow as being the optimal experience. "Flow is the exhilarating pleasure that occurs when someone are engaged with an activity and feels in control of his or her actions."(Tekinbas & Zimmerman, 2003, p.360). Flow is not the same as fun, flow is what makes people play games for hours, without the experience necessarily being fun all of the time. Experiencing flow is something everyone has done, but it is quite rare.(Koster, 2013, p.98). According to Prensky, 2006, achieving a true flow experience requires to main factors. The first is what he call *"leveling up"*, this is making the players feel they are getting better at the game, to achieve mastery over something difficult and complex. The second factor is that the players are always kept between feeling the game is to hard or to easy. A game needs to remain constantly just hard enough for players to feel they can do it if they really try.(Prensky, 2006, p.59).

Csikszentmihalyi created a list of characteristics, four of which is needed for the activity to result in flow. These are, the activity needs to be challenging, the goals needs to be clear, the game must give clear feedback and lastly the paradox of having control in an uncertain situation. The other four characteristics describes the effects of flow. The merging of action and awareness, concentration, the loss of self-consciousness and the transformation of time.(Tekinbas & Zimmerman, 2003, p.360).

When flow occurs during group situations it's called group flow. Group flow may be both experienced by individuals an observed by an external observer. Pels et al., 2018 defines group flow as: "Group flow is a shared state of balance within a group as represented by (a) fluent, positive interactions within

the group, (b) a high collective competence of the group and (c) a collective state of mind of the group by means of positive relationships between group members, often resulting in optimal collective performance and creativity, and making group flow a positive collective experience."(Pels et al., 2018).

As mentioned games do teach, and together with the characteristics of increasing motivation and the opportunity to let players experience flow, games are strong learning tools. Strong in the sense that the players are implicitly motivated to practice. Koster, 2013 supports this by stating: "Since games are teaching tools, players seeking to advance in a game will always try to optimize what they are doing."(Koster, 2013, p.113). Koster, 2013 also states that when there are nothing more to learn the fun is gone, and therefore the motivation declines.

3.3.4   Learning with games

This thesis explores research involving games as learning tools. More specific a certain type of game, for learning a very specific field. To better understand the relationship between games and learning, in education as well as outside of education there are several theories that needs to be explored.

Regarding what games can do in terms of teaching, its important to know that theories argue that playing games always teaches something."The world is full of systems that we can choose to approach as games, and by approaching them that way, we make them into games. Games are puzzles to solve, just like everything else we encounter in life."(Koster, 2013, p.34). Even abstract games with less roots in real life teaches the player how to analyse and learn patterns(Koster, 2013). "whenever one plays a game, and whatever game one plays, learning is happening."(Prensky, 2006, p.64).

In his work *Don't Bother Me Mom - I'm Learning!* Prensky, 2006 gives several examples of children learning surprisingly complex concepts from their games.(Prensky, 2006). He mentions many examples, from children learning economy in games like *Sims* and *Sim City* to customer satisfaction in *Roller*

Coaster Tycoon.(Prensky, 2006, p.10). He also writes about the 10-year old boy named Tyler that learned an array of skills from playing RuneScape(Prensky, 2006, p.103 - 105). Amongst these skills were soft skills and collaboration.

Prensky, 2006 writes that together with the numerous complex systems children learns from their games that increasingly: "children learn from their games *how to collaborate effectively with others*"(Prensky, 2006, p.10). While Prensky, 2006 focuses on digital games, we argue the main principles are transferable to our own, semi-digital game. Learning occurs while playing games in general, not unlike how Huizinga, 2016 state that children and animals learn during play. What exactly players learn while playing in terms of skill or subject, depends on the game, their individual knowledge, personality and the environment, or context.

"Games are something special and unique. They are concentrated chunks ready for our brains to chew on. Since they are abstracted and iconic, they are readily absorbed. Since they are formal systems, they exclude distracting extra details. Usually, our brains have to do hard work to turn messy reality into something as clear as a game is."(Koster, 2013, p.36).

Learning processes are present even when people go beyond the limits of the game. This usually occurs as cheating, to understand how someone cheating is still learning, Koster, 2013 states, "This is a natural impulse. It's not a sign of people being bad (though we can call it bad sportsmanship). It's actually a sign of lateral thinking, which is a very important and valuable mental skill to learn. When someone cheats at a game, they may be acting unethically, but they're also exercising a skill that makes them more likely to survive. It's often called "cunning.""(Koster, 2013, p.114).

3.3.5 Semiotic domains

When approaching learning by playing games, the writings by Gee, 2007 is a good source. Though his principles mainly applies to video games, his theory

on learning in games and how games teaches literacy, we'd argue to be relevant to the wider genre of games, both digital and analog. To better understand this, it is necessary do define the term.

Gee, 2007 defines semiotic domains as: "By a semiotic domain I mean any set of practices that recruits one or more modalities (e.g., oral or written languages, images, equations, symbols, sounds, gestures, graphs, artifacts, etc.) to communicate distinctive type of meanings."(Gee, 2007, p.19).
Gee, 2007 offers another definition of semiotic domain."an area or set of activities where people think, act, and value in certain ways."(Gee, 2007, p.19).
Games let the people perform tasks and make choices in one domain without real risks. All skills learned or improved during gameplay is similar to practice and studying.

Understanding semiotic domain as a term helps understand the way a game may be considered to exist of two main layers. The shell, or semiotic shell i.e. the way the game is represented. In addition to the core, or the gameplay of the game. Mäyrä, 2008 defines gameplay and shell as "While the core, or the gameplay layer concerns everything a player can do while playing the game, and also game rules that govern these actions, the shell includes all the semiotic richness modifying, containing an adding significance to that basic interaction."(Mäyrä, 2008, p.17).

3.4 Pedagogical approaches

3.4.1 Behaviourism

Behaviourism originated in the US, in the early 1990's. This approach relied on empirical ideals, influenced by philosophy. Meaning their view was that true science should only study what could be observed or measured. Behaviour or response can be measured, in addition that what influences or stimuli caused it. Emotions, cognition and feelings should be disregarded as they are not measurable and individual.(Imsen, 2020, p.36). Behaviourists state that we are able to shape human behaviour by applying the knowledge of stimuli and response.

This cause and effect way of measuring behavior, relies heavily on the importance of reward and punishment. Hedonism supports this as it states humans seeks pleasure and tries to avoid pain.(Imsen, 2020, p.36-37). As expectations has become an increasingly important aspect of explaining motivation and reasoning behind actions amongst humans, there has been an increased acceptance for non-observable phenomenons in behaviouristic theories.(Imsen, 2020, p.37).

3.4.2   Constructivism

As opposed to behaviourism, constructivism argues that knowledge is a product of our mind. Constructivism state that acquiring knowledge is an ongoing process. John Dewey emphasised the importance of active participation by the learners. He argued that learning is not a result of extrinsic stimuli, but rather that we are learning by doing.(Imsen, 2020, p.45).

An important constructivist within the field of psychology, Jean Piaget stated that we construct our own knowledge based on how we individually choose to apply new information. By this theory learners are no longer passive, with an active extrinsic source of information(stimulation), learners actively construct their own knowledge.(Imsen, 2020). This correlate to the earlier quote from Koster (Koster, 2013). To paraphrase; games are pre-digested chunks of knowledge. Hence they're easier for us to learn from. Constructivism and schema. When games cut down complexities of real life to condensed versions it could help us simplify information that's initially out of reach into something that's accessible.

3.4.3   Socio-constructivism

Social environments are often the context for learning. It is a social construct, governed by language. Social-Constructivism emphasises the significance of social interaction in learning. (Imsen, 2020, p.46).

Lev Vygotsky was a russian psychologist and theorist often mentioned as a social-constructivist. Vygotsky's theory included what is called Zone of Proximal Development(ZPD). He argued that since knowledge originates in the social

environment and is then processed by the individual, ZPD explains how children are able to preform better together then on their own.(Imsen, 2020).
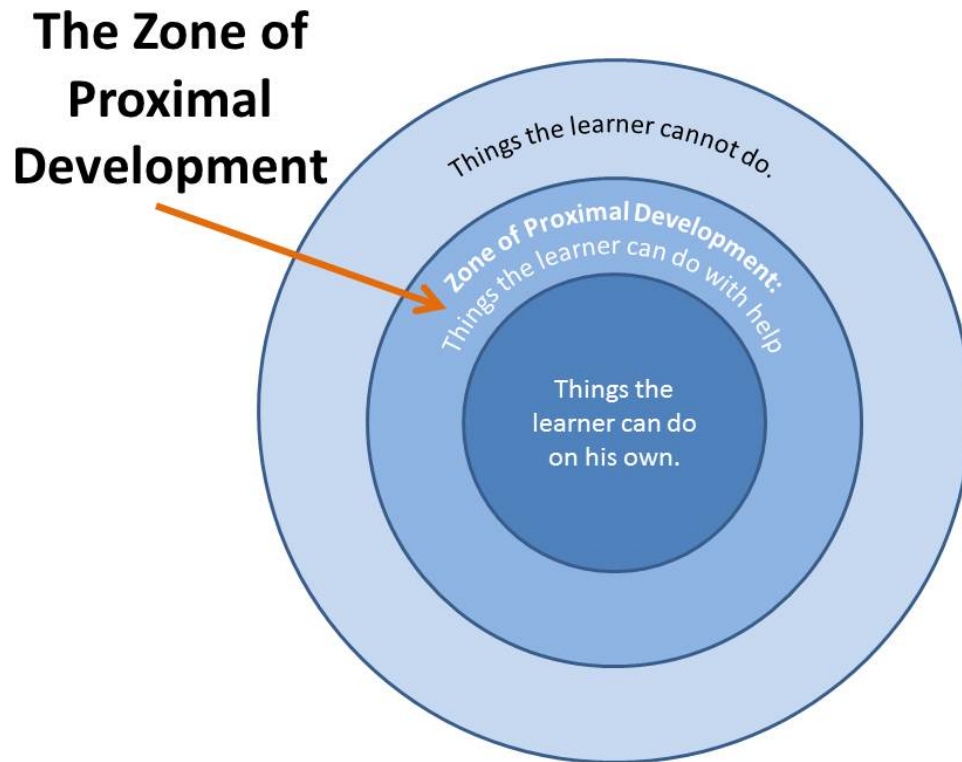

Figure 3.2: Vygotski's Zone of Proximal Development
(Porcello, n.d.)

Regarding play, Vygotsky stated that since play is related to joy it is reasonable to assume that children play in order to fulfill needs. With the changes in needs over time, the nature of the play will change accordingly. He defines rules as one of the characteristics of play, playing is not a random activity and the activity can not be defined as play without a set of rules.(Imsen, 2020, p.206).

Chapter 4

Methodology

This chapter describes research design, and methods, used in the thesis and also how these methods were implemented. Elements from both qualitative and quantitative methods are used via mixed method research. First presenting mixed method research, before the quantitative- and ending with the qualitative- methods.

Our hypothesis proposes assumptions that needs to be validated, and then expanded upon. Using the game variables in the test group are affected these variables are then measured against a control group. Quantitative methods are used to give our assumptions measurable variables. While the qualitative methods are be used to gather data that helps further explain findings collected from the quantitative data. In addition to gather qualitative feedback for the game to highlight potential issues.

4.1 Mixed Methods Research

"Mixed methods research is an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks. The core assumption of this form of inquiry is that the integration of qualitative and quantitative data yields additional insight beyond the information provided by either the quantitative or qualitative data alone."(Creswell, 2018, p. 4) There are three core Mixed Method Designs of which this study uses Convergent Design. Hence this thesis is cross-sectional, we gather independent

qualitative and quantitative data that is merged and interpreted. The other two examples, exploratory- and explanatory- sequential designs are longitudinal designs.
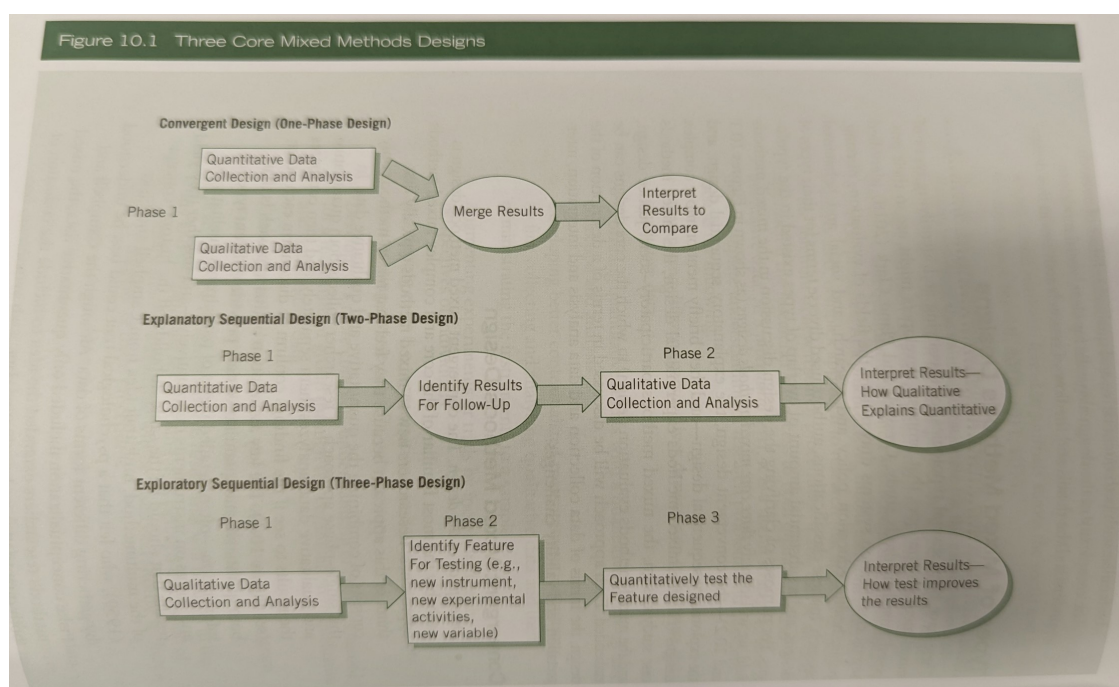

Figure 4.1: Visual representation of Mixed Methods Design models (Creswell, 2018, p. 218)

"At a practical level, mixed methods provides a sophisticated, complex approach to research that appeals to those on the forefront of new research procedures."(Creswell, 2018, p. 216)

4.1.1 Convergent mixed method design

Gathering both quantitative and qualitative data individually, in one phase, then converging it. First merging, then interpreting the results.

Convergent mixed methods design can be said to be built upon the multitrait-multimethod concept of Campbell and Fiske, 1959 where they explain how one can, practically, mix multiple data gathering methods for a deeper insight. Even though mixed methods research did not exists that time one can easily see the connection.

Especially when studying game play and related mechanics it's a good idea to use multiple methods. "Studies into the effects of game playing generally rely on scientific method and involve setting a hypothesis to explain and predict how a relation between certain measurable variables function and then creating

an experiment to support or falsify the hypothesis. While many social science studies involve observations in natural settings, preparing a controlled experiment requires two groups of test subjects, where the other group acts as a control sample compared with the results derived from testing the experimental sample."(Mäyrä, 2008, p. 158)

	Phase one, data gathering - Workflow			
Test Group	Observation - Non participatory	Group interview	Questionnaire \ Interview	Questionnaire
Control group				

Beginning ◆————————————————➤ End
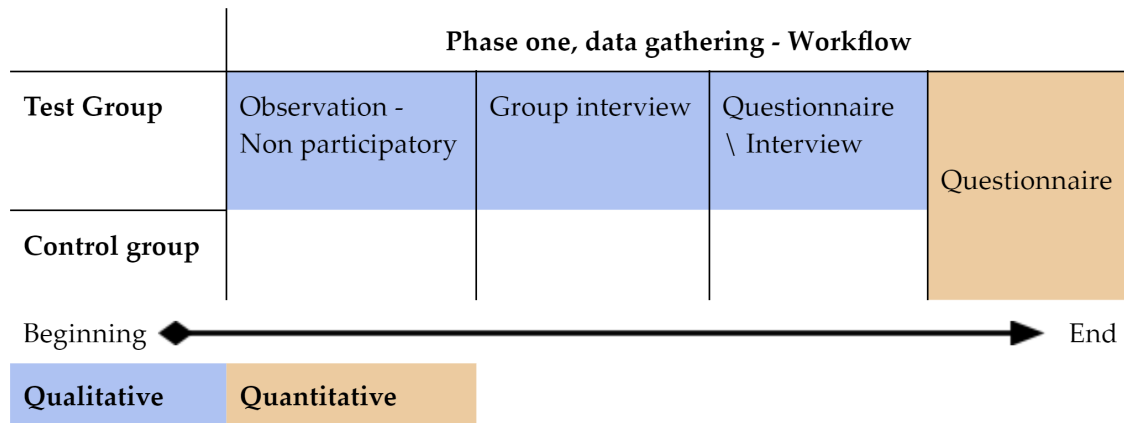
Qualitative	Quantitative

Figure 4.2: Visual representation of our data gathering workflow

From the quantitative data we needed a wide range of variables. One reason for this was that the thesis background don't have substantial data backing. To still be able to make valid assumptions we measured a wider range of variables making it easier to spot patterns and use cross analysis with multiple variables, both qualitative and quantitative to strengthen our arguments.

4.2 Quantitative Methods

Quantitative Methods shows trends through variables via larger data sets. "Quantitative research: A research approach that examines the relationships between variables by collecting and analyzing numeric data expressed in numbers or scores. (Clark, 2016, p. 4)" One questionnaire was used and given to all participants. The purpose of this questionnaire is to quantify the assumptions that are stated in the hypothesis. We are therefore using online cross-sectional quasi-experiment (Creswell, 2018, p. 30). Cross-sectional meaning data is gathered at one point in time, not over a time period. Quasi-experiment, meaning there are two subject groups. First, a test group. For them variables will be consciously altered by going through the qualitative testing before answering

the questionnaire. Second, there's the control group that provides, clean, unaffected data(Creswell, 2018, p. 188). We mostly relied on close ended questions mainly using Likert scales (Sharp, 2019, p. 281) while having an even number scales. Reaching a total of 38 respondents of which 15 belong to the test group and 23 to the control group. The control group recipients got the questionnaire via email that was sent to a range of students at the University of Agder several hundred from different classes and age groups. The thesis don't rely on ethnography other than the fact that the test selection is students at University of Agder, and thereby we did not gather additional ethnographic information.

For simplicity and bias the questionnaire was made using Microsoft Forms. All participants, both the test- and control- group answered digitally in private. The test group completed the questionnaire after the qualitative section of the study, where they had undergone the practical experiment and a group interview. After completing the qualitative part with all groups the questionnaire was sent out to gather replies and form the control group.

While we did mostly rely on likert scale questions we did use other type of questions too. Rankings discover general values, and see what statement participants believe to be more, or less, important and number scale where number would be more relatable and understandable. This questionnaire was anonymous both for ease of handling the data and making it simpler for participants to answer truthfully. it was iterated upon, tested, and proofread by us, lecturers and fellow students before it got distributed. We didn't consider the empirical details of sex age and other personal details hence these details weren't gathered. In the analysis the data was first sliced by control group and test group. Within the test group we found some unexpected interesting details when comparing groups that won against the once that lost. That led to a closer analysis on winning and loosing groups.

4.3 Qualitative Methods

Using qualitative data supplements findings in the quantitative data, it also how we validate the game. That was the initial reasons to also have a qualitative

part in the thesis. Once we underwent experiments there were several emerging parallels between sessions in the experiment and the theoretical basis. We're starting with an experiment and observations, then following up with a group interview and questionnaires.

"Qualitative research: A research approach that focuses on exploring individuals' experiences with a phenomenon by collecting and analyzing narrative or text data expressed in words and images.(Clark, 2016, p. 4)"

"Nonverbal behaviors are easily misinterpreted, especially cross-culturally. Therefore, whenever possible and appropriate, having observed what appears to be significant behavior, some effort should be made to follow up with those involved to find out directly from them what the behavior really meant. (Patton, 2015, p. 291)"

As Silverman (Silverman, 2021, p. 3) puts it "qualitative research is claimed to be concerned with subjective meanings and hence very different from quantitative research's pursuit of objective 'facts'." Though this does not give the complete picture it gives an inclination. Which he also points out later in the book.

4.3.1 Practical Experiment

To recruit participants we used snowball sampling (Sharp, 2019, p. 261), where participants spread the word. Note that participants were discouraged to share anything other than that the fact that they played a game in the experiment. Experiments were preformed in groups of three. Participants were randomly assigned to groups. The first couple of participants were recruited in common areas around the university before the snowball effect could do the rest. Though there were some challenges regarding scheduling in the end we had five groups of three that completed the experiment. The experiments lasted slightly over one hour, where 20 minutes were used going through experiment the start script and explaining rules. We, the observers were also there to help with the rules in general throughout the experiment. After the experiment, participants spent up to one more hour filling out the two questionnaires. The room that was used was an intimate room designed for group work. It was visually and audibly secluded from larger rooms as to limit any interventions or disturbances

from outside.

Film and audio were recorded and participating observers (Sharp, 2019, p. 290) were present at each experiment. A participant Observer has two roles both observing and participating knowing what situation calls for what role is key. We acted as observers that did not actively participate in the test groups tasks. The observer tasks was to make observations, but also explain rules and help participants understand the game quickly and correctly. Directing focus away from less relevant elements, like rule reading and interpretation while leaving the other elements up to the participants, if left unchecked could affect results in an unpredictable way. Using a 360 degree camera everything were captured at once so we could frame anything after the experiment. Separate sound recordings were for redundancy. The small roof mounted camera and one audio recorder recorder were both left alone throughout the experiment making the devices very forgettable. When saving data like this Norsk senter for forskningsdata, NSD, is involved to approve all data gathering and handling. Participants has given written approval for video- and audio- recordings. For the sake of biases participants were given a temporary sanitised consent document. This document did not contain any task specific information. After the all parts of the experiment and questionnaires were answered they received complete versions of consent document where they got additional information.

After playing one round of the game participants were asked questions both about the result, and if anything stood out to them. This is to supplement what observations were made and ensure that situations that participants found especially memorable were indeed noticed and analysed. This was a semi-structured Group interview where the test groups was interviewed using open questions and general talking points to encourage conversation in the group setting. (Creswell, 2018, p. 263). Each experiment ended with individual questionnaires, first one qualitative using open ended questions, and second, the quantitative questionnaire. The questionnaires were used even when the participants were physically present this again to remove biases and is to collect personal and honest experiences. Especially biases that arise through being directly affected by the presence of others. Another reason is to cancel proba-

ble disadvantages of the group interview such as dominant characters. (Sharp, 2019, p. 301)

Chapter 5

Findings

The findings come from the two questionnaires and one practical experiment. The data was gathered and analysed digitally. In the analysis many answers were decoded to number values in order to calculate averages.

5.1 Questionnaire Overview

Beginning with the first assumption from the hypothesis: The effects and value of well structured groups and roles are undervalued by students. This assumption, and the thesis, was based upon different personal experiences from multiple sources. What we find in the quantitative data, obtained through the online questionnaire, did not show any deviations or obvious shortcomings in regard to that assumption. The control group proposed that students indeed have a decent base knowledge of group structure. What the test group shows is that going through a short game session the variables were affected and we could see a difference in the answer averages.

5.1.1 Questionnaire Results

Using the collectively asked likert scale question (Q- 2, 3, 7, 8, 9, 10, 11, 12, 13, 14) we could extrapolate that there was a slight a shift between the test group and control group AVG values. The test group consistently had higher scores than the control group, though only slightly. With a 6 option scale that means any answer above 3 is positive, blue color, and less than 3 is orange.
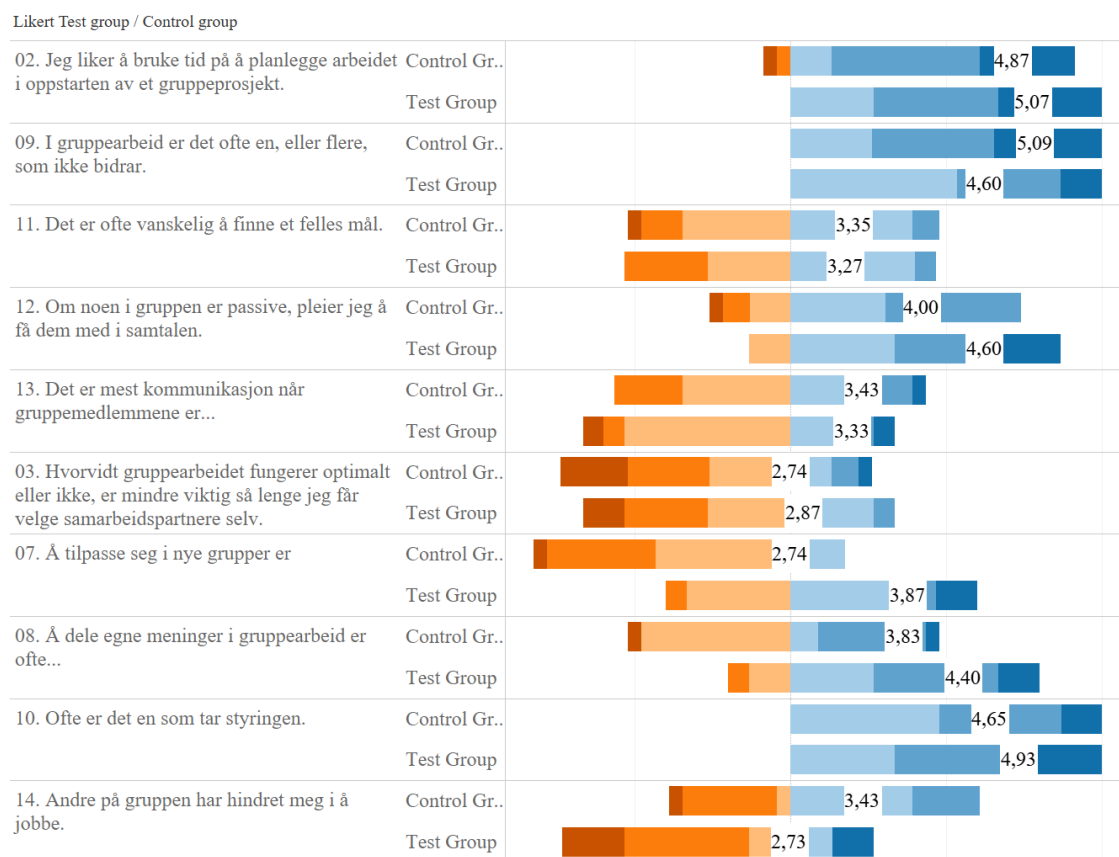
02. Jeg liker å bruke tid på å planlegge arbeidet i oppstarten av et gruppeprosjekt.	Control Gr..	4,87
	Test Group	5,07
09. I gruppearbeid er det ofte en, eller flere, som ikke bidrar.	Control Gr..	5,09
	Test Group	4,60
11. Det er ofte vanskelig å finne et felles mål.	Control Gr..	3,35
	Test Group	3,27
12. Om noen i gruppen er passive, pleier jeg å få dem med i samtalen.	Control Gr..	4,00
	Test Group	4,60
13. Det er mest kommunikasjon når gruppemedlemmene er...	Control Gr..	3,43
	Test Group	3,33
03. Hvorvidt gruppearbeidet fungerer optimalt eller ikke, er mindre viktig så lenge jeg får velge samarbeidspartnere selv.	Control Gr..	2,74
	Test Group	2,87
07. Å tilpasse seg i nye grupper er	Control Gr..	2,74
	Test Group	3,87
08. Å dele egne meninger i gruppearbeid er ofte...	Control Gr..	3,83
	Test Group	4,40
10. Ofte er det en som tar styringen.	Control Gr..	4,65
	Test Group	4,93
14. Andre på gruppen har hindret meg i å jobbe.	Control Gr..	3,43
	Test Group	2,73

Figure 5.1: Overview of the likert question analysis test group and control group.

There are a couple of outliers; in Q7 the control group was negative avg. 2.74, and the test group was positive avg.3.87. The test groups participants found it substantially easier adopting to new groups. If we divide further within the test group we can see that the participants in groups that won answered similarly to the once on the losing group too, Winning group avg. 4 and losing group 3.67. Q8 with 3.83 avg. vs 4.4 avg. the test group found it easier to share their opinion. Q12 At the same time the test group tended to, in a larger degree 4.60 vs 4.00 actively help group participants to partake in the group work.

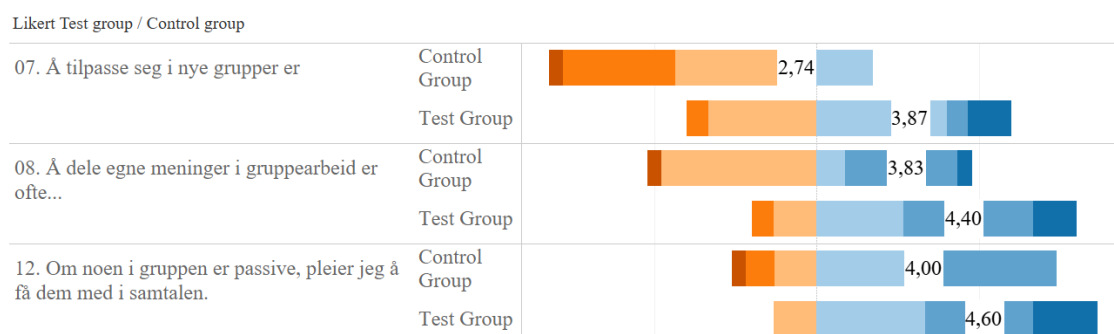|		
07. Å tilpasse seg i nye grupper er	Control Group	2,74
	Test Group	3,87
08. Å dele egne meninger i gruppearbeid er ofte...	Control Group	3,83
	Test Group	4,40
12. Om noen i gruppen er passive, pleier jeg å få dem med i samtalen.	Control Group	4,00
	Test Group	4,60

Figure 5.2: Closer look at the questions with the largest deviations Q7, Q8 and Q12

Q5; test participants stated they usually get better results by working in groups 5.07 vs 4.13 (number scale 1-6). The control group answered the opposite, that they usually got better results with individually with 5.0 vs 4.4.
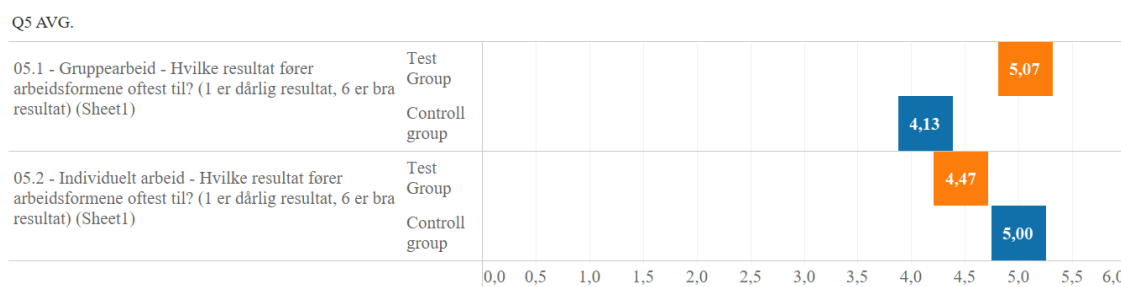

Figure 5.3: Q5 AVG. *Note Q5 uses a number scale

In general the findings does point to the fact that the test group participants have more appreciation for soft skills. All outlier answers seems to tell the same story. Still one have to keep in mind that this is a relative small study hence we can not draw any steadfast conclusions.

Next; Q17, Q19, Q22 all with an avg. above 5 and no negative answers. All participants could see see connection between the game and general group work. The importance of task sharing, and communication. This shows that participants feel that the game does expose players to relevant knowledge, and it pushes them to use soft skills. Q20 asked if they, by participating in the study had changed their perception regarding proper group structure where the scale went from unchanged in dark orange to a lot in blue. With only 2 of the 15 participants stating their perception was unchanged.
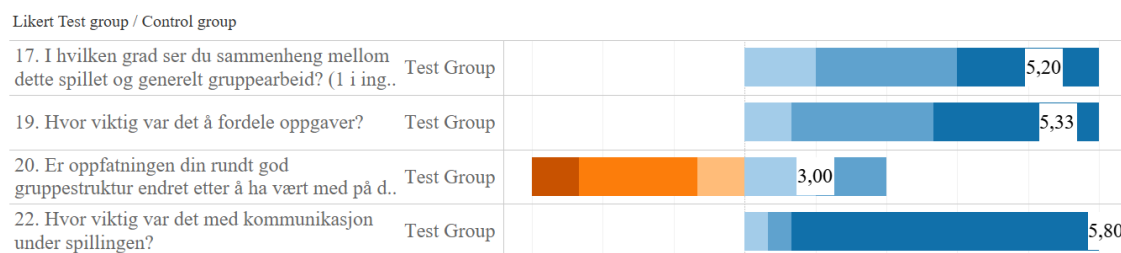

Figure 5.4: The likert question analysis, questions only asked to the test group.

Communication in the game, Q22 has the highest AVG. of all likert questions with 5.8 asking how important was communication in the game. This finding

is also supported by Q23, that was an optional field where participants could share if they learned something that they'd keep in mind in future group work. Of the 15 test group participants 9 choose to answer this voluntary question. 7 explicitly mentioned the importance communication.

At Q13 Through another split we see, regarding communication. Winning groups tend to communicate more when disagreeing compared to the groups that lost. These averages are 3.11 and 3.67. To explain, in the winning groups the participants say 77.8% of communication happened when they disagree with one another compared to 50% in the loosing groups. Winning groups also claimed to have no discussion when everyone completely agreed which was not the case in the loosing groups' answers. As the results show, communication is a key element in getting a good result. In the aforementioned (Sinding et al., 2018, p.266) list of potential problems in work teams, poor communication is listed as: "poor interpersonal skills (aggressive rather than assertive communication, destructive conflict, win-lose negotiation)".
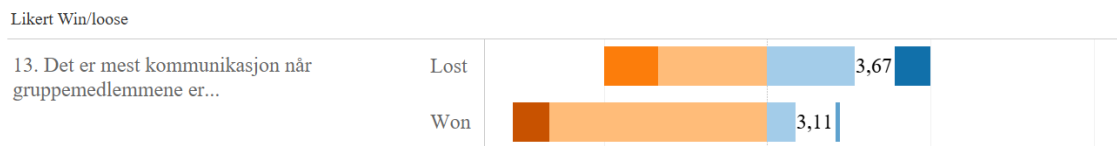

Figure 5.5: Q13 *Winning group VS loosing group. communication occurred when strongly disagree to strong agree.

On the other hand the loosing groups stated to, in a small degree, seen more of a pattern between the game and reality (Q17), and felt that communication was more even more important than the winning group (Q22). Though only a slight degree.

Figure 5.6: Q17 and Q22 *Winning group VS loosing group.

5.2 Qualitative data

Initially we planed to use this section of the study to strengthen results found in the quantitative part but we quickly saw other deeper patterns that we highlight here. In the experiments groups would often go through what looked like a speed up versions of Tuckman's theory mentioned in the theory chapter. Quasi selection made it such that participants had little, or no, previous experience in the given group. Drawing parallels to Tuckman, one could observe group's efficiency. If a group did not progress through the first stage, forming. They would be very inefficient and usually fail the game as the game gets substantially more difficult without clear communication and thought through actions. Indecisiveness and letting group members do as they pleased without planing and task delegation held groups back from winning the game.

5.2.1 Overview experiment and observations

Two of the five groups did not survive, group 2 and 4. These two groups spent much less time pre-planning and task delegation. During game play when these players decided speciality they put themselves first. "I'll take green" or "I figured I'll become a Navigator, then if we later need resources someone can be that(Gatherer)". Two groups that did survive and win, group 1 and 3, started by planing specialities. Who does what, hence gaining individual goals to progress their personal skill while playing their part in the group. These groups gained momentum from the start. The third surviving group was an interesting outlier in that they started without much planing, and progress was slow. Just like the other failing groups 2 and 4. But in the middle of round three they shifted focus from me and I (personal) to team we. From here they started longer term planning. Because of this they could move faster and safer. Where some players saved resources for "rainy days" and others saved less and progressed more.

5.2.2   Brief analysis of groups 5 and 2 through Tuckmans theory:

The reason for choosing these groups are that they provide good examples from both side of the spectrum, one winning, and one losing.

First, group 5. **Forming**, the group members meet. They spend the first portion of the game playing without showing much team-work or inter-group trust. Everyone being more self centered and careful, until round 3. **Storming**, in the end of round 3 the group spends time to go over where in the skill-tree every player is. From there they lay the first longer term plan for success while determining their group structure. **Norming**, one player can now be pointed out as a leader where he is the one that keeps everyone on track and keep bringing up long term planning. Where as all players discuss the general shorter decision making. **Preforming** These longer term plans can represent the group getting even more efficient. They build upon to compliment each others skills and as a group obtains new levels of efficiency while also preparing for potential unforeseen challenges.

Through the example above one can see the game seem to provide a simulated group work experience.

Now, a closer look at group 2, who did not survive. All group members said, in the qualitative questioner, strategic longer term planing was key to their demise. Looking through Tuckmans' theory several findings tells us this group never reached the storming stage. From one player, Q7 "contributions were Good, but again poor communication." And "too little planing before making decisions. Thought too individually." From another player Q10 "Should not have been selfish, should've remembered that it is a game of cooperation not individuals." No one took charge, that lead to unclear communication. Multiple suggestions were usually presented by the participants, but they didn't take the time to process and revise the suggestions before acting. This is yet a strong signal that the group indeed was in the forming stage. According to Tuckman's theory, when the groups are in the forming stage, players might hold back to build inter group trust, rather than delegate tasks. Though usually it won't take long before they're in the next stage and start thinking more as a group than individuals. Participants held back as to rather build trust than criticising and improving each others suggestions and in this case they did not

continue to the next stage.

5.2.3 The post experiment qualitative questions.

To assess if, after the experiment, participants had indeed gained more appreciation for soft skills and group work these questions were asked. Q16 did the game teach you anything about collaboration. Answers shows 87% yes and 13% uncertain. Q17 Everyone sees the connection between the game group work. Q21 80% of the participants said they would think more about work delegation and roles in groups forward.

Q21. Er det endringer i hvor mye du tenker på arbeidsfordeling og "roller" i en gruppe nå?
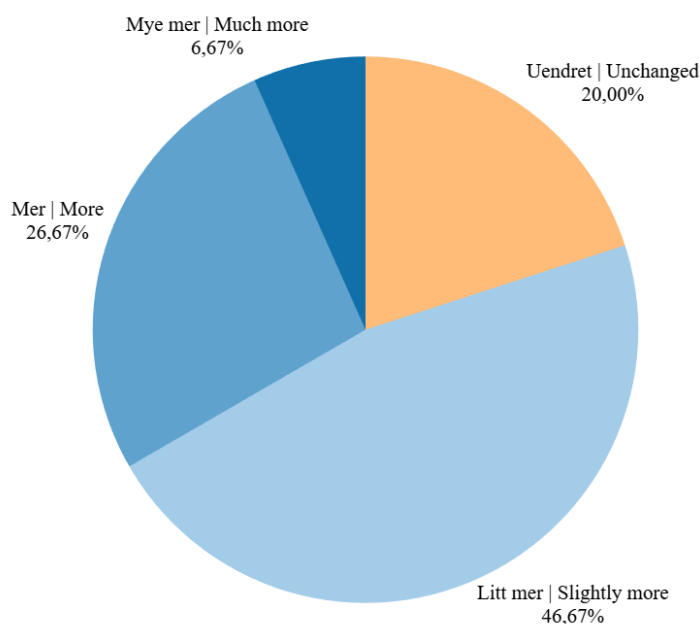
Figure 5.7: Results from Q21

Q23, an optional qualitative question; did you you learn something you'll keep in mind in future group work. 60%(9 of 15) choose to answer. 8 of 9 talked about collaboration and common goals. 7 of the answers explicitly mentions the importance of communication.

Q23. Lærte du noe du vil ta med videre i framtidig gruppearbeid?

At det er viktig med god kommunikasjon, samarbeid og at de som er gode til noe kan hjelpe andre. | That it is important with good communication, cooperation and that those who are good at something can help others.

Eg føle eg er ganske vandt med gruppearbeid til no, og veit kordan et bra gruppearbeid ser ut, men om noen ikkje er vandt med det, tenke eg dei kunne ha lært mykje av dette spillet | I feel I'm quite used to group work so far, and I know what good group w

God kommunikasjon og bruk hverandres styrker | Good communication and use each other's strengths

Godt samarbeid og felles mål gjør jobben enklere | Good cooperation and common goals make the job easier

Kommunikasjon er viktig! | Communication is important!

Kommunikasjon er viktigere enn en skulle trodd. | Communication is more important than you might think.

Kommunikasjon og is i magen er viktig. Bruk tid og tenk over ulike muligheter og utveier. | Communication and ice in the stomach (keep your head cool) is important. Spend time and think about different possibilities and ways out.

Viktig at alle får sine ideer/ tanker frem, og diskutere sammen om hva som lønner seg mest. | It is important that everyone brings out their ideas / thoughts, and discuss together what pays off the most.

Viktig å lytte til alle og planlegge og se muligheter underveis. | It is important to listen to everyone and plan and see opportunities along the way.

Figure 5.8: Results from Q23. Original first, then then translated.

Chapter 6

Discussion

Back to the research questions:

- Does playing the game affect appreciation for these "soft" skills?

- Does the feeling of comprehension of group work change by playing the game?

- Does the game transfer relevant information?

6.1 Benefits of a game context

We consider one play-through of our game to be equivalent to a micro-project, where similar challenges are presented and the goal of the exercise is to practice collaboration. Although the two are conceptually different, they are similar in terms of effects and values of well structured groups and roles. The game is the more motivating option of the two. It's better designed in order to satisfy the three required needs for motivation. Autonomy, competence and relatedness. Optimally the players play the game because they see playing games as fun. They don't give much thought of the fact that learning is a part of the activity. They are driven by intrinsic motivation.

The three bedrocks of SDT, autonomy, competence and relatedness can all be seen in the game.

Autonomy is prevalent throughout, each player has always multiple choices that impact the gameplay. From using levels to specialize skills to using actions for different purposes. By looking at the starting state of the game one can see that much information is hidden, all is accessible to all participants, and the same information can be gathered via multiple methods. At first glance one

aspect will seem counter intuitive through the autonomy mindset. This being there is only a single player-game-piece shared between all players. This is a stark contrast to the norm in most games, it's a conscious choice to promote planning and communication. Using this as a tool to force group experience. Extra time was spent to make sure enough autonomy were found other places throughout the game experience.

Competence, by letting people specialize through leveling up it affects their chances to succeed with any long-term strategy the want to use. Some aspect in the game are random, it has been ensured that there are ways to prepare or handle these events. It's more difficult without forward planning, and easier when planning. This can be seen in the test group play through, if they planned and delegated success were much more probable.

Lastly relatedness, given the whole game is centered around group work and collaboration this is a central theme throughout. This aspect is thoroughly covered.

We define games as systematic play defined by rules where the players get meaningful choices to influence the outcome. The game should be fun which is a sign of learning according to Koster, 2013. Therefore the players are driven by intrinsic motivation. Striking a nice balance between randomness and recognisable patterns, as well as having predictable outcomes.

Optimally regarding motivation, the players will experience group flow while playing. This will probably not be the case in a group who struggles with the collaboration, as group flow requires many of the effects of good collaboration in order to occur. Individual flow may be present simultaneously as group flow, this opens the possibility for some to experience it, even though grow flow is absent. Flow is rare and, we realise that this would be challenging to accomplish, and really depends on the game being played.

Having taken this into consideration, having all players experiencing either type

of flow is an unrealistic goal. What is a realistic goal and was observed were the occasional instances of what could be argued as close to a flow state. It can't be proved that any of the participants were experiencing this, looking at Csikszentmihalyi's list of effects, it can be strongly argued that many participants showed several of these. Typically what we observed were deep concentration, to some degree a merging of action and awareness. They were very committed to solving the most urgent tasks. This dedication to problem solving seen in combination with the participants reporting about losing track of time, could point in the direction of them experiencing flow. However we argue that what we can say for certain is that the autonomy together with the competence or feeling of mastery contributed to increased motivation.

Prensky, 2006 writes: "What motive-or motives-do our students have for learning the material presented to or required for them? There is, of course, the pure joy of connecting with the ideas and material. Unfortunately, this happens much less frequently than many educators would like. More generally, students' motives for learning are a mixture of intrinsic goals and extrinsic rewards, combined with psychological factors such as fear and need to please. If strong enough, these motives can and do pull students through to the end."(Prensky, 2006, p.84).

Using games to enhance motivation by including it in education may be done successfully even by just introducing a little gameplay, to define gameplay in this context we borrow from Prensky, 2006. "Gameplay is all the activities and strategies game designers employ to get and keep the player engaged and motivated to complete each level and an entire game."(Prensky, 2006, p.86).

As an example Prensky, 2006 cited Harvard Professor Ellen J. Langer and wrote: "Want to add game to a lecture? Just drop in a little uncertainty. Begin the lecture by telling people that some of what they are about to hear may not be true. Harvard Professor Ellen J. Langer discovered that when faced with uncertainty, students spend the time actively trying to sort out what is true from what isn't, and are more engaged, with greater retention."(Prensky, 2006, p.87).

"How does Gameplay create motivation? By keeping the player engaged at every moment. It makes every second (or nanosecond in some cases) of the game a challenge-physically, intellectually, and/or emotionally. And it is this continuous challenge-at the precise context-and-user-appropriate level-that motivates."(Prensky, 2006, p.86-87).

Given that in this thesis communication is a key component, it's clear that by creating a shell in the form of a game with less seriousness and with a bit of humour, it makes communication easier. Again compared to the alternative of a fast-paced group assignment, the shell is altered. While the gameplay, or in the case of the alternative the learning outcome is unchanged.

When played in an educational context, the probability of unmotivated players are higher. Due to this game being a coop game where the players depend on each other, it is advantageous to ensure additional motivational measures has been taken. This will prevent some players in taking the role as killer, a player that wants others to lose as much or more he himself wants to win. Furthermore it will ensure that the magic circle remains unbroken.

6.2 Transferring relevant information

We have observed that our proof of concept game does transfer relevant information to the players. By creating a semiotic domain in which the players are strongly advised to form a group of complementing roles. Even in cases where players say they didn't learn anything new, the experience might be transferred to another domain, and manifest as knowledge later. Gee, 2007 supports this statement by: "When people are faced with a new situation in the world, aspects of this situation remind them of aspects of experiences they have had in the past. They use these elements of past experience to think about the new situation. Sometimes they can just apply past experiences pretty much as is to the new situation."(Gee, 2007, p.72). In the quantitative data participants confirm that they see the connection between the game and group work, 13 saying yes, and 2 saying i don't know.

Traditional views of learning tends to generalise how we learn and treat the human mind as if it was like a computer. Gee, 2007 presents an alternative view, and states, "This view holds that humans learn, think, and solve problems by reflecting on their previous experiences in the world. That is, humans have experiences, store these experiences, and make connections or associations among them."(Gee, 2007, p.71)

Games like the one used in this research exposes the players for the challenge of group development, in addition to problems often experienced in teamwork. Being contextualised within a game the players are operating in a domain without real risks, but the activity is still real. All elements relating to the group development and collaboration are as real as in any context. The communication is real, so is the value of planning. Everything other than the risks within the narrative of the game are real. This is a learning principle called "Psychosocial Moratorium" Principle. Gee, 2007 cited psychologist Eric Erickson and wrote: ""Psychosocial Moratorium" Principle, Learners can take risks in a space where real-world consequences are lowered."(Gee, 2007, p.64)

The advantages of this approach is supported by Koster, 2013 which stated: "If we come across a problem we have encountered in the past, our first approach is to try the solution that has worked before, even if the circumstances aren't exactly the same."(Koster, 2013, p.132)

So by exposing players to the benefits of long term planning within the game they're more likely to use it once they're in a similar domain as in the game. That being, working in a group.

While one could argue that there are games, especially digital games, that is more effective in terms of teaching A good example, although an extreme comparison is how World of Warcraft teaches the importance of collaboration(Prensky, 2006, p.10). However it is a fact that games of this size might be unpractical, because classrooms and the learning environment are not designed for this.(Prensky, 2006, p.192) This is often a stated problems amongst educators, when attempting to include games as part of education and other issues as availability, demography and time consumption. If the desired purpose is

to teach collaboration efficiently, considerations need to be taken to ensure the tool for this is; easy, both to use and learn, available, and simple for people with little to no previous experience with games. with these considerations a hybrid- or analog game might be a better choice. Prensky, 2006 offers this as one of his solutions for bringing games into the classrooms: "Another solution, if you have the technology available, is to have students play individual game sessions, either by themselves or-even better-in teams of two or three on one computer."(Prensky, 2006, p.192)

6.3   Learning collaboration

Collaboration describe working together towards a common goal with a shared responsibility. Cooperation describe helping each other reaching goals, but not necessarily anything in common in regard to responsibility or ownership.

We argue that collaboration in it's most basic form is something people start learning early in life. Based on our interpretation of socio-constructivism.(Imsen, 2020, p.191). It could be argued that we learn it through a process of trial and error as children. One way in which we learn it's during play. This is only one aspect of what play teaches us, but discovering the fact that certain tasks are either easier accomplished, or impossible, on our own is relatable for most. Like simply lifting something large or heavy. This trial and error approach of learning rely on feedback, as supported by Mäyrä, 2008: "In a fundamental sense, playing is a form of understanding. we can decode messages that carry information in unconventional forms by simple trial-and-error behaviours, as the feedback we derive from our interaction tells us whether we have understood each other or not."(Mäyrä, 2008, p.14)

This way of learning collaboration is due to our inherent desire to play as children. It is intrinsically motivated activities we do because they are fun and enjoyable. Undeniably a crucial part of our fundamental understanding of collaboration, it's important to emphasise that we only learn the basics. In an

educational context, students need more in-depth knowledge. Even pretty early on in school, students are introduced to teamwork. Often in the form of group assignments. At that point one might argue that most people still rely on trial and error, in order to improve their collaboration skills. While there is individual differences in terms of new challenges, some are shared amongst most. One of these is the dependency between the members of the group. This introduces new dynamics. Differences in terms of skills, knowledge and motivation may create friction or even frustration.

Often in what we consider traditional education the students are told who to work with and what the goal is, rather than being able to influence this themselves. Students rely on their collaborative abilities on a level that is similar to a work environment. Without a learning platform which grants simulated experience, the students will gain experience only through work. This can lead to a change in motivation as, extrinsic motivation may be a result of forced learning.

One might argue that learning by doing is the best approach, and that iterating this process in a work or study related context grants the best learning outcome. That taken into consideration, there should be no good reason not to facilitate an additional approach. We argue that it would be advantageous to include a playful approach without the risks that follow work or study related work. Games and motivation have several connections to pedagogical approaches. The argument is that by playing a game in small groups, we see the connection between the social constructs of the game and Vygotsky's Zone of Proximal Development. As in both these cases the knowledge starts with the social environment, and is later processed by the individuals.

The goal is to be able to facilitate more in-depth learning, and bringing back the playfulness. This in-depth learning must include a certain number of theories and principles. One of which is group-development, as mention earlier the theory chosen is Tuckman's Five Stage Theory. Furthermore it must include examples of roles, and the development of norms. This thesis does not explore the extensive literature of named roles, but rather on the fact that there is

value in knowing that certain roles may be more, or less, suited for certain tasks. The chosen approach were to let the players choose freely to advance in, either the role all of them share, to pick and advance in a specialist role, or a combination. All of which is meaningful choices which will contribute to the forming of norms within the group. In addition to this the players are exposed to challenges that represent typical problems experienced in team work. To what degree these potential problems may be experienced within a game context can be argued, although they can be experienced without any real risk involved. We found that several of the aforementioned problems in team work, are encountered relatively often in a coop game. In view of the fact that these contexts are close in nature. This close relation adds to the value of the game as a learning tool, in order to prepare students for when risk is involved.

Knowledge of common problems were used throughout the thesis, both in the game and research. These problems pointed at what elements might be important to bring up. And potentially how or where they should be brought up.

Dealing with obstacles without giving up are important as that is one of the potential problems listed in the list of typical problems experienced by team members by Sinding et al., 2018. This can be simulated by presenting a challenge that feels feasible. Another potential problem listed is "too much emphasis on result, not enough on team processes and group dynamics"(Sinding et al., 2018, p.266). Several participant groups in our research showed a tendency of this in the early rounds. This is a result of the players being goal-oriented, as well as them trying to grasp all aspects of the game. In groups that did well, this problem is addressed rather quickly. The players will realise the importance of long-term planning to be able to reach their common goal, and that they on some point will have to rely on each other. Often this is combined with another problem, which is "team tries to do too much too soon"(Sinding et al., 2018, p.266). In some cases this is the result of the downside of players being able to do as many actions as they want. Even though there are limited amount of actions, if one does them all, it will be costly for the player in terms of resources.

As the results show, communication is a key element in getting a good result. In the aforementioned list of potential problems in work teams, poor communication is listed as: "poor interpersonal skills (aggressive rather than assertive communication, destructive conflict, win-lose negotiation)".

Although Implicit learning is key, by choosing a game as the approach, there is a need for rules. Rules are vital in order to be defined as a game. In the process of presenting the rules, there is important to find a balance regarding what information is needed. More specifically, the importance of collaboration should be implicitly recognised amongst the players. Making it clear that this is a coop-game could be argued as a missed opportunity, although hiding this fact would be over-complication and thereby defeats the purpose. Considering the relevance and wanted similarity to real life group work, detailed rules works. The implicit part of the learning comes in the form of group structure and group dynamic.

Regardless of the result of the game, either winning or losing, the game still transfers relevant information. Results show that all groups learned, different things depending on outcome, especially a gap between winning or losing. Groups that completed the game naturally experienced more of the group development stages. The importance of communication is mentioned by most players, regardless the outcome of the game. Another important group trait commonly mentioned is planning. Often by players that lost the game, as an afterthought regarding their lack of planning. The latter example proves the importance of being able to "practice" without risks.

Role distributions are another aspect mentioned especially by losing groups, and their lack of it. Some came to the realisation that they should have helped each other to late. This is an important lesson. Supported by Prensky, 2006 as, "One of the most important lessons video game teach is the value of people working together and helping each other."(Prensky, 2006, p.106).
Students were asked "did you learn anything? If so, please elaborate." one answered "As I said before, it was a bit small in the beginning, but when we

understood that communication was possible and an important part of the game, we got better at it. Sharing thoughts means that we reach the goal we set ourselves more effectively, especially when we divided into different classes. One on full General, one Navigator and in our case two on Gathering. Then we got enough resources to survive, the opportunity to repair the boat, etc. If everyone went separately, the game would not go as well as it did." A participant from one losing answered regarding What role they felt they had in the game "Did not feel I had any special role."

Collaboration so far in the thesis is talked about as a net positive, for anyone experienced with collaboration they know that common problems do occasionally occur. To strengthen ties with the semiotic domain both positive, and negative sides can occur in the game. "The only real difference between games and reality is that stakes are lower with games."(Koster, 2013, p.34).

Chapter 7

Conclusions

The findings show that general knowledge of group work and communication is known to a degree. It seems the issue of students not developing groups does not occur because of lacking general group knowledge. We argue that focusing on increasing general comprehension, and skill level, of group work won't lead to social changes within the university. Still, by playing the game it looks like the general group work comprehension is increased for participants. Experience is an important factor. Even if people know the theory it doesn't mean they'll do what they think is correct. With experience the probability of doing what one think is right increases. By playing the game participants gain a simulated experience of most group stages, in the time span of one hour. This is a good result, compared to an average group task that usually has a deadline of weeks. We observed participants go through four of Tuckmans' stages and by adding a post session debrief one can simulate the fifth too. The question then stands on whether this simulated experiences weighs in as much as real experiences, and to what degree.

The questionnaire results shows that even the short intervention of playing one round gives subjects more understanding of group work. The game that has been made seem to be found entertaining and motivating. We see that the participants that showed more familiarity to group work had more disagreements that seemingly lead to better decisions and them winning in the end. Participants that argued less did not succeed, to make up for this the losing groups stated to have learned more from the game session. This reflects the importance of communication, regardless of the whether the group tends to agree or disagree.

7.1 Future Work

There are several ways one could expand on this work, these some of the ways that stand out to us.

7.1.1 Expanding on our work

Some shortcoming in our thesis, or areas we see there should've been more depth, are closer ties between the quantitative data and motivation and SDT. Using quantitative questions to prove, or disprove, these connections. While we see connections in this thesis, we tend to use qualitative data to see it.

As of now what we have looked at is the perceived benefits of playing one round. Long term results could be interesting. Letting a group of randomly selected students play the game in the beginning of a semester to see in if one can later see a difference with this group compared to a control group.

Using the current game as a tool and modify it to introduce common group problems. By giving one or more players hidden tasks, one could expose groups to issues that the members will likely experience in the future, outside of the game session. Thereby giving them valuable lessons and letting them develop personal tools to solve issues. Challenges like bad communication, giving up early on, or never express trust to your group members. Of course there are important considerations to account for if going this path, like the question whether the group will still be engaged if they have to contend with inter group issues. If there should be some limits? And so on.

As of now, the game touches firmly on four of Tuckmans' five stages. Implementing the fifth stage is probably doable, though gameplay wise it's a difficult task. Perhaps implementing some type of legacy functionality and simulate the adjourning stage. An interesting approach for this could be to let the players keep their player boards, e.g. give them a "character" and then let them play with a new group. This way one could simulate the adjourning stage of group development.

7.1.2 Looking into diversity of games and social life

While what we did was develop a purpose built game, it would be interesting if any game with some collaboration would do. It would probably be natural to mainly look into coop games, perhaps team-based games in general could work. By comparing one could take a deeper look into mechanics, see what mechanics or functions that encourages different types of learning. By switching the shell from one game to another game. Furthermore if what students are missing to form groups, is a platform that has a low bar of entry in a social settings. By playing any game in new groups and getting to know fellow students might be just as effective as the purpose built game. Following this train of thought, maybe the value of gathering students semi voluntary, could result in larger social improvement that would be an enabling factor leading to students themselves form groups for future work. And using these groups for both group work and collaborate on individual tasks. Continuing on more of a tangent here; what would happen if we facilitated a whole class with the goal of creating real social bonds, and not as what is normally done today, which is socializing after school.

7.1.3 Looking into diversity of learning group work

By going beyond games. Comparing the game created in this thesis with other solutions that's structured towards the same goal, efficient group development and learning. Comparing it with a purpose-built short group tasks as mentioned previous in the thesis. Or one could use learning theories as a starting point. Behaviourist learning-theory with lectures only or cognitive learning-theories with more inclusive lessons with tasks.

Appendix A

Quantitative Questionnaire

Spørreskjema etter spill

Svar så utfyllende du selv ønsker. Dette er helt anonymt.
Spørreskjema handler om spillet du nettopp spilte og varer ca 5 - 30 min.

* Required

Spillet/runden/opplevelsen:

1. Kan du si litt om hvordan spill-runden var?

```
```

2. Kom dere i mål?

- ◯ Ja
- ◯ Nei

3. Hvilke "Class" var du i spillet? (Husk "General" kan kombineres med en av de andre) *

- ☐ General
- ☐ Gatherer
- ☐ Navigator

4. Lærte du noe, isåfall kan du skrive litt om hva?

```
```

5. Kan du skrive litt om hvordan kommunikasjon og deling av tanker var under spillingen?

```
```

A - Quantitative Questionnaire

Gruppesamarbeidet:

6. Har du noen tanker rundt hvordan samarbeidet i gruppen var?

7. Hvordan var bidraget til gruppemedlemmene?

8. Hva følte du din rolle i gruppen var? (Her menes ikke hvilken "class" i spillet.)

9. Kan du beskrive noen valg som var ekstra betydningsfulle?

10. Hvilke egne valg gjorde du hvor du kunne påvirke utfalle (positivt eller negativt)?

A - Quantitative Questionnaire

Etterpåklok

11. Er det noen valg du nå ville gjort annerledes?

12. Hvilken rolle i gruppen ville du hatt dersom du skulle spille igjen? (Her menes ikke hvilken "class" i spillet.)

13. Hvordan tror du opplevelsen ville vært dersom det hadde vært en annen gruppe?

A - Quantitative Questionnaire

Ekstra informasjon eller spørsmål?

14. Noe du ønsker å legge til?

A - Quantitative Questionnaire

Takk for hjelpen

Vi ønsker dere lykke til videre i studiene.
Vi, Tony Berholtz og Emil Nybro Berg setter stor pris på at dere ville delta og hjelpe oss med vår masteroppgave.

Appendix B

Qualitative Questionnaire

Spørreskjema ⠦

Svar så utfyllende du selv ønsker. Dette er helt anonymt.
Spørreskjema vil ta ca 5 - 30 min.

* Required

:::

1. En god gruppe har kjennetegn som (Ranger fra viktig, til mindre viktig) *

| Består av flere personlighetstyper |
| Består av gode venner |
| Alle jobber like mye gjennom hele prosessen |
| Arbeidsoppgaver blir fordelt etter hvilke styrker man har |
| Alle i gruppen vil oppnå et felles mål |
| En i gruppen har en tydelig lederrolle |
| Alle i gruppen har innflytelse |
| Roller og ansvarsområder må være tydelig |
| Gruppen har åpen kommunikasjon rundt problemløsning |

2. Jeg liker å bruke tid på å planlegge arbeidet i oppstarten av et gruppeprosjekt. *

Veldig uenig	Uenig	Litt uenig	Litt enig	Enig	Veldig enig
○	○	○	○	○	○

3. Hvorvidt gruppearbeidet fungerer optimalt eller ikke, er mindre viktig så lenge jeg får velge samarbeidspartnere selv. *

Veldig uenig	Uenig	Litt uenig	Litt enig	Enig	Veldig enig
○	○	○	○	○	○

B - Qualitative Questionnaire

4. Ranger metoder for gruppesammensetning (Ranger fra best, til dårligst)
*

| Grupper bestemt av foreleser. |
| Grupper dannet av studenter. |
| Helt tilfeldig opprettet grupper. |

5. Hvilke resultat fører arbeidsformene oftest til? (1 er dårlig resultat, 6 er bra resultat) *

	1	2	3	4	5	6
Gruppearbeid	◯	◯	◯	◯	◯	◯
Individuelt arbeid	◯	◯	◯	◯	◯	◯

B - Qualitative Questionnaire

6. Hvor lang tid tar det å komme i gang (å oppnå effektiv arbeidsflyt)? (1 er lang tid, 6 er raskt) *

	1	2	3	4	5	6
Kjent gruppe	◯	◯	◯	◯	◯	◯
Ny gruppe	◯	◯	◯	◯	◯	◯
Individuelt	◯	◯	◯	◯	◯	◯

B - Qualitative Questionnaire

7. Å tilpasse seg i nye grupper er *

Veldig utfordrende	Utfordrende	Litt utfordrende	Litt Enkelt	Enkelt	Veldig enkelt
◯	◯	◯	◯	◯	◯

8. Å dele egne meninger i gruppearbeid er ofte... *

Veldig utfordrende	Utfordrende	Litt utfordrende	Litt enkelt	Enkelt	Veldig enkelt
◯	◯	◯	◯	◯	◯

9. I gruppearbeid er det ofte en, eller flere, som ikke bidrar. *

Veldig uenig	Uenig	Litt uenig	Litt enig	Enig	Veldig enig
◯	◯	◯	◯	◯	◯

10. Ofte er det en som tar styringen. *

Veldig uenig	Uenig	Litt uenig	Litt enig	Enig	Veldig enig
◯	◯	◯	◯	◯	◯

11. Det er ofte vanskelig å finne et felles mål. *

Veldig uenig	Uenig	Litt uenig	Litt enig	Enig	Veldig enig
◯	◯	◯	◯	◯	◯

B - Qualitative Questionnaire

12. Om noen i gruppen er passive, pleier jeg å få dem med i samtalen. *

Veldig uenig	Uenig	Litt uenig	Litt enig	Enig	Veldig enig
○	○	○	○	○	○

13. Det er mest kommunikasjon når gruppemedlemmene er... *

Veldig uenige	Uenige	Litt uenige	Litt enige	Enige	Veldig enige
○	○	○	○	○	○

14. Andre på gruppen har hindret meg i å jobbe. *

Veldig uenig	Uenig	Litt uenig	Litt enig	Enig	Veldig enig
○	○	○	○	○	○

B - Qualitative Questionnaire

15. Har vært med på den praktiske delen av denne forskningen *

- ◯ NEI, jeg har ikke vært med på praktisk del

- ◯ JA, jeg deltok på Praktiske delen av forskningen

B - Qualitative Questionnaire

Til de som deltok på den praktiske delen av forskningen

16. Lærte spillet deg noe om samarbeid? *

- ◯ Ja
- ◯ Nei
- ◯ Vet ikke

17. I hvilken grad ser du sammenheng mellom dette spillet og generelt gruppearbeid? (1 i ingen grad, 6 i stor grad)
*

1	2	3	4	5	6
◯	◯	◯	◯	◯	◯

18. Hvor mye tid følte du at dere måtte bruke på planlegging underveis?
*

Veldig lite	Lite	Litt lite	Litt mye	Mye	Veldig mye
◯	◯	◯	◯	◯	◯

19. Hvor viktig var det å fordele oppgaver?
*

Veldig uviktig	Uviktig	Litt uviktig	Litt viktig	Viktig	Veldig viktig
◯	◯	◯	◯	◯	◯

20. Er oppfatningen din rundt god gruppestruktur endret etter å ha vært med på dette?
*

Veldig lite	Lite	Litt lite	Litt mye	Mye	Veldig mye
◯	◯	◯	◯	◯	◯

B - Qualitative Questionnaire

21. Er det endringer i hvor mye du tenker på arbeidsfordeling og "roller" i en gruppe nå?
    *

Uendret	Litt mer	Mer	Mye mer
○	○	○	○

22. Hvor viktig var det med kommunikasjon under spillingen?
    *

Veldig uviktig	Uviktig	Litt uviktig	Litt viktig	Viktig	Veldig viktig
○	○	○	○	○	○

23. Lærte du noe du vil ta med videre i framtidig gruppearbeid?

    Utdyp gjerne

B - Qualitative Questionnaire

Takk for hjelpen

Vi ønsker dere lykke til videre i studiene.
Vi, Tony Berholtz og Emil Nybro Berg setter stor pris på at dere ville delta og hjelpe oss med vår masteroppgave.

Appendix C

Experiment start-script

Towards a playful approach to learning collaboration

Hei velkommen

Skriv under på dokumentet "**vil du delta i forskningsprosjekt**"

Dette vil ta fra 45 - 90 min da vil vi få alt vi trenger i forhold til vår masteroppgave.

Vi starter med spilling. Dere får alt dere trenger, men vi er også tilstede for å hjelpe med eventuelle spørsmål rundt regler.
Dere spiller en gang, det er mulig at alle dør da er spillet over og vi går til neste fase.
Neste fase, vi prater litt sammen i plenum. Dere får noen enkle spørsmål om spillrunden.
Til sist, to individuelle spørreskjemaer.

Spillet er et type "Coop spill" det betyr at dere i utgangspunktet vinner, eller taper, sammen.
Snakke over bordet og dele alt av informasjon er helt lov. Alle bestemmer selv.

NR. 1

NR. 2

Takk for hjelpen.

Appendix D

Group Interview Guide

Intervjuguide

Innledning:
Dette er et semistrukturert intervju. Det betyr at vi snakker relativt løst, det er en sjans vi leder samtalen noen veier. Vi vil snakke om spill seansen dere har vært gjennom og tilhørende tema. Det vil ta rundt 15 minutter.

Antall deltagere:

Icebreaker. Åpningsspørsmål:
- Hei, hva syns dere om spillet?
- Er brettspill noe dere spiller ofte?

Aktuelle tema:
Starter med det som ligger friskt i minnet, utfall.
- Hvordan de følte det gikk.
- *(brukte dere mye tid på diskusjon?*
  - *Hvor mye av tiden var produktiv 20,50,90%?)*

Oppklare usikkerheter så vi trygt kan trekke konklusjoner i ettertid
- Trekke frem konkrete situasjoner dersom noe oppstod.

Avsluttning:
- Åpen spørring fra deltakerne

Appendix E

NSD - Data Consent Document

Qualitative Vil du delta i forskningsprosjektet
"Towards a playful approach to learning collaboration"?

Dette er en forespørsel til deg om å delta i et forskningsprosjekt. Formålet er å undersøke hvorvidt verdien av godt gruppesamarbeid kan tydeliggjøres ved bruk av spill. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
Effektene og verdien av god struktur og roller i gruppearbeid er undervurdert av studenter. Ved å sette elementene av prosjektarbeid inn i en spill kontekst, kan vi simulere opplevelsen og vise viktigheten av disse effektene og verdiene.

Denne masteroppgaven ønsker å besvare tre forskningsspørsmål:

- Does playing the game affect appreciation for these "soft" skills?
    - Er det mulig å påvirke verdsettelsen av de ovenfor nevnte evner gjennom å spille spillet?
- Does the feeling of comprehension change by playing the game?
    - Forandrer følelsen av forståelse seg ved å spille spillet
- Does the game transfer relevant knowledge?
    - Overfører spillet relevant kunnskap?

For å besvare disse spørsmålene vil vi samle inn data fra studenter. Studentene vil først få en spørreundersøkelse. Deretter vil aktuelle kandidater spille et spill vi har utviklet som har samarbeid som viktigste element. Kandidatene vil så gjennomgå et intervju om opplevelsen av spillet. Resultatene vil bli sammenlignet mot en kontrollgruppe.

Hvem er ansvarlig for forskningsprosjektet?
Universitetet i Agder er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Du er tilfeldig utvalgt ettersom du inngår i gruppeutvalget, student på UiA.

Hva innebærer det for deg å delta?

Dersom du velger å delta innebærer det en spørreundersøkelse, og opp til to tilleggsundersøkelser hvor ett er gruppeintervju og siste er spørreskjema. Tidsmessig er det snakk om, spørreskjema opp til 30 min, gruppeintervju opp til 60 min. Du vil være anonym gjennom hele prosessen med unntak av under eventuelle gruppeintervju hvor vi samler flere personer, her blir det også tatt opptak av lyd og bilde. Alt av lagret informasjon blir anonymisert fortløpende og slettet ved prosjektets slutt.

E - NSD - Data Consent Document Qualitative

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

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Det er kun oss som vil ha tilgang til dine opplysninger. Ingen informasjon som blir publisert vil kunne identifisere deg direkte. Ditt navn og din underskrift vil kun brukes til samtykkeerklæring. Navnet ditt og kontaktopplysningene dine vil erstattes med en kode som lagres på en egen navneliste adskilt fra øvrige data. Du har rett til innsyn i dataene vi samler om deg, og om du føler at du kan identifiseres kan du ta kontakt for å fjerne eller endre opplysninger.

Kontaktinformasjon:

Emil Nybro Berg
emilnb15@student.uia.no
Telefon: 91335528

Tony Bergholtz
tonyb16@student.uia.no
Telefon: 41459930

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Opplysningene anonymiseres når prosjektet avsluttes, noe som etter planen er i slutten av juni 2022.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene,

- å få rettet personopplysninger om deg,

- å få slettet personopplysninger om deg, og

- å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

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

På oppdrag fra Universitetet i Agder har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

E - NSD - Data Consent Document Qualitative

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med: Universitetet i Agder ved å kontakte:

Emil Nybro Berg
emilnb15@student.uia.no
Tony Bergholtz
tonyb16@student.uia.no

Veiledere:

Morgan Konnestad
morgan.konnestad@uia.no

Christian Robere Simonsen
christian.simonsen@uia.no

Vårt personvernombud:

Ina Danielsen
ina.danielsen@uia.no

Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:

NSD – Norsk senter for forskningsdata AS på epost (personverntjenester@nsd.no) eller på telefon: 55 58 21 17.

Med vennlig hilsen

Emil Nybro Berg & Tony Bergholtz

(Veiledere: Christian Robere Simonsen & Morgan Konnestad)

E - NSD - Data Consent Document Qualitative

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet *Towards a playful approach to learning collaboration* og har fått anledning til å stille spørsmål. Jeg samtykker til:

□ å delta i observasjon

□ å delta i et skriftlig intervju før observasjon

□ å delta i et ustrukturert intervju etter observasjon

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

_____

(Signert av prosjektdeltaker, dato)

Appendix F

NSD - Data Consent Document Quantitative

Vil du delta i vårt forskningsprosjekt

Dette er en forespørsel til deg om å delta i et forskningsprosjekt i forbindelse med vår masteroppgave.

Formål
Formålet er å undersøke aspekter rundt gruppe og prosjektarbeid blant studenter. I dette skrivet gir vi informasjon om hva deltagelse vil innebære for deg og hvordan de innhentede dataene vil bli behandlet.

Hvem er ansvarlig for forskningsprosjektet?
Universitetet i Agder er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Du er tilfeldig utvalgt ettersom du inngår i gruppeutvalget, student på UiA.

Hva innebærer det for deg å delta?
Dersom du velger å delta innebærer det en spørreundersøkelse. Tidsmessig er det snakk om, spørreskjema opp til 10 min. Du vil være anonym gjennom hele prosessen. Alt av lagret informasjon blir anonymisert fortløpende og slettet ved prosjektets slutt.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Alle data vil bli slettet ved prosjektets slutt.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi behandler all data konfidensielt og i samsvar med personvernregelverket. Det er kun oss som vil ha tilgang til denne data. Om du føler at du kan identifiseres kan du ta kontakt for å fjerne eller endre opplysninger.

Kontaktinformasjon:

Emil Nybro Berg
emilnb15@student.uia.no
Telefon: 91335528

Tony Bergholtz
tonyb16@student.uia.no
Telefon: 41459930

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Opplysningene anonymiseres når prosjektet avsluttes, noe som etter planen er i slutten av juni 2022.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

F - NSD - Data Consent Document Quantitative

- innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en
  kopi av opplysningene,

- å få rettet personopplysninger om deg,

- å få slettet personopplysninger om deg, og

- å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

På oppdrag fra Universitetet i Agder har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med: Universitetet i Agder ved å kontakte:

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Vårt personvernombud:

Ina Danielsen
ina.danielsen@uia.no

Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med:

NSD – Norsk senter for forskningsdata AS på epost (personverntjenester@nsd.no) eller på telefon: 55 58 21 17.

Med vennlig hilsen

Emil Nybro Berg & Tony Bergholtz

(Veiledere: Christian Robere Simonsen & Morgan Konnestad)

Appendix G

Digital component

First commit on at this repository:

https://github.com/TBergholtz/TheBoatDigitalComponent

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