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A Master Thesis: Increasing Engagement For Danish Gymnasium Students In The Subject of Fiscal Policy Through A Serious Game

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In this master thesis we propose a framework to design a serious game in the subject of fiscal policy in the field of social studies in Danish gymnasium. The thesis examines how a serious game can increase student engagement towards learning about fiscal policy. In collaboration with N. Zahles Gymnasium, a serious game was developed and a test consisting of an experimental group (n=31) and a control group (n=20) was conducted. A triangulation approach utilizing a questionnaire inspired by the UES short form and student and teacher interviews. The interviews were used to measure the attitude towards the serious game. The serious game significantly increased student engagement, but no meaningful difference in learning outcome between the experimental and control groups was observed. Future work includes a more evenly distributed balance between elements of fun and educational content, more testing involving more participants and a more even distribution of test participants and better involvement of the teachers as expert consultants.

A Master Thesis: Increasing Engagement For Danish Gymnasium
Students In The Subject of Fiscal Policy Through A Serious Game

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Contents

Abstract

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Introduction

This project is submitted as our master thesis as part of our Medialogy education. It also serves as a continuum of our previous work and publications within the field of serious games [2]–[4]

This master thesis is with collaboration with Zahles Gymnasium, with the aim to improve student engagement in fiscal policy in social studies.

In the years 2010-2018 the national average of gymnasium students in Denmark has increased from 6.6 to 7.2 [5].The Danish Gymnasium offers a 3-year upper secondary programme. This qualifies a student for admission to higher education (e.g., universities or professional education). The Danish grading system spans: -3, 00, 02, 4, 7, 10 and 12 [6]. However, there are also reported challenges for the Danish Gymnasium [7]. The Danish female students score overall higher than the Danish male students with a 7.4 average versus the male students with 6.9 [5]. According to PISA, an international evaluation of the 15 year old´s skills in reading, math and science, 10 other countries scored significantly higher than the Danish students in both reading and math and 20 countries score higher in science [8]. Almost no change has been observed in the Danish students reading skills since 2015 [8], which indicates that the problem is not being tackled in an efficient manner. Since the first PISA evaluation in 2000, the amount of "weak" readers has not changed in Denmark, whereas the amount of "strong" readers has increased significantly since 2009 [8]. However, Danish student´s reading engagement is significantly lower than the OECD (Organisation for Economic Co-operation and Development) average [8]. The Danish boys in particular has been found to score the lowest in reading engagement, which is consistent with them scoring lower in overall grades in comparison to the Danish girls [8]. If reading engagement is low, they will likely read less and this could directly affect learning outcome. With this connection we argue that all subjects involving reading in the Danish gymnasium will be affected by the lack of reading engagement on the students part. This could explain why the national average, which encompasses all subjects in the Danish gymnasium curriculum, has this major discrepancy between male and female students.

Another difference between male and female gymnasium students is that male students tend to prefer the use of computers in class more than the female students [9]. This could be explained by male students using the computer more in their free time as 96% of Danish teenage boys play video games [10]. In a more recent study it was discovered that 51% of Danish children play video games on a daily basis and that most of these children were male [11]. It was also outlined that 26% of female children tend to play 1-2 times weekly [11]. This shows a large interest for especially Danish teenage boys in the area of video games that we argue is not currently being utilized as much as it could be in the Danish Gymnasium. Furthermore, students in Denmark leisure read to a lesser extent as social media, streaming services like Netflix and YouTube has gained more and more popularity

[12]. This can limit their future be it academic or professional career as reading becomes more difficult and time consuming as they progress through school and working life. With computer use and video games taking up the students' recreational activities, one can see the benefit in incorporating learning into these activities, as the students already are engaged towards these activities. This field is known as serious games and will be explained in the coming chapter of this report.

Play is considered to be a crucial activity in not only childhood but throughout life [13], [14]. Play comprises an intense learning experience in which the participants voluntarily invest a lot of time, energy and commitment while concurrently deriving great enjoyment from the overall experience [15]. Additionally play is an important mediator for learning and is seen as a remarkable way to enhance learning procedure [16]. In our current society play is getting more and more utilized in the form of digital games [17]. Therefore using digital games as a mediator for learning situations can be beneficial in many circumstances.

Research question and success criteria:

The research question for this master thesis is as follows: *How can a serious game be designed in order to increase engagement in students in danish gymnasiums in the subject of fiscal policies as part of the curriculum in social studies*

Furthermore, we have outlined the following success criteria. The success criteria will be used to judge whether our serious game has been successful. The success criteria are linked to intended outcomes and are linked to evaluation metrics, as described in our methods.

- The teacher found the game to be a positive addition to the teachings about fiscal policy.

- 70% of the students in the experimental group was engaged while playing the game.

- 70% of the students in the experimental group were interested in learning about fiscal policy through the game.

- 70% of the students in the experimental group answered the questions regarding expansive and contractionary fiscal policy correctly.

- 70% of the students in the experimental group were motivated to continue reading about fiscal policy through the game

- 70% of the students in the experimental group answered the question regarding gross domestic product correctly.

Chapter 3

Previous Research

The use of the term serious game gained popularity in the 1990's along the increased number of video games for educational purposes [18]. However, the use of games in an educational context is not new, and has been practiced since at least the twentieth century. Clark C. Abt is credited for coining the term "serious game" in the 1970s, defined as "games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement" [18]. Abt also recognized that this *"does not mean that serious games are not, or should not be, entertaining"* [18]. There has been many studies conducted within the field of serious games and how serious games can be used to increase student engagement, learning [19]–[22] and motivation towards learning new subjects in school [23]. These studies revealed important insight into potential flaws in the design of these games and how one might improve future work in the field of serious games. These factors include: short play time, unrealistic mechanics regarding money and lack of post-play debriefing sessions [24]. The importance of early involvement of the teachers as experts has been described as crucial for the success of a serious game, along with an iterative development process and intrinsic motivational factors [19], [20]. Other important elements of the design of a serious game are game progression and feedback, as these serve as guidance for the player as they progress through the content [19]. Furthermore, a narrative may inspire narrative engagement in the player, thus potentially leading to narrative immersion, which has also proved a vital component in previous serious games, when attempting to keep the player in a flow state [19], [20]. Previous serious games have also yielded insight into how poor usability and lack of clear goals within the game, can lead to disengagement [25].

Serious games have numerous different definitions within it's field. In this project we focus of the simple definitions that a serious game is a digital game, that strives to engage and motivate the player towards comprehending information [26], [27]. With this simple definition we can merge the world of game design with the learning content material. This will result in the content being gamified and turned into a serious game.

The design of serious games has been proposed by previous research and how it is important to include elements that relate to the specific learning goals [28]. The content of the serious game being designed should revolve around the subject it is being designed for in relation to style [28], [29]. Context of the design, relatability of the players and involving all stakeholders from the early stages of development are all important aspects to ensure the success of the product [28], [30]. Furthermore, minimizing the cognitive load, helps the player stay highly engaged, attentive and aids overall playability [28], [30]. If the game is too difficult it can interfere with the intended outcome of the experience, as the player will lose motivation and engagement [28], [30]. The player should have the ability to explore at their own pace and have the freedom to do so [30]. The challenge for serious

games has previously lied in the design of the games interface and how to make this as seamless for the player as possible. A way of doing this is incorporating these aspects into the games overall narrative to make the learning process as easy and natural as possible for the user [28], [30]. The games duration should be short with several levels [30]. Any text in the game conveying information should be in compliance with the players reading level [30]. Furthermore, it is important that the game includes save and continue options, allowing the player the freedom to stop and continue at their own pace [30]. It is also important that the game aspect and the learning objectives are in balance with one another, as each aspect is crucial in the design of a successful serious game [30]. A fitting and descriptive title has also shown to be a valuable addition to a serious game, as it communicates the intentions of the game even before playing it [30].

Lastly, in the design of serious games it is beneficial to include aspects of player engagement theory. Numerous studies have proposed guidelines for doing so in previous serious games [31]–[33]. Player engagement can be broken into four distinctive components that affect one another: Objectives, activities, accomplishments and affects [31]. A game designed with these components incorporated into its gameplay should in theory increase player engagement and keep the player "hooked" throughout the experience [31]. A major reason for including player engagement theory is to affect player motivation towards playing the game, as a serious game designed within a particular subject will have no effect if the player does not engage with it in the first place [34]. Furthermore, previous studies have discovered a relationship between elements of fun and player engagement [35], [36]. Furthermore, weaving elements of fun into the gameplay of a serious game in places where learning is less significant in the gameplay, has been shown to be beneficial for a successful serious game [28], [35], [36]. One also needs to specify what type of engagement is applicable to the specific type of serious game being designed as this will create a better end result [37]. These engagement types include: *emotional engagement, sensory engagement, narrative engagement, intellectual engagement, physical engagement and social engagement [37]*

In social studies serious games have been prevalent for a long time. However not in a digital sense. Simulation type games have been a part of the social studies class for many years [38], [39] through e.g. roleplaying relevant scenarios such as political parties and their stances [40]. The use of simulations in social studies has provided an increase in student motivations [41]. Furthermore, Gamified simulations that approach the concepts of serious games have been used to teach students about economy in social studies classes with success. It is not meant to substitute the textbooks, but is intended as a tool to aid the conventional teachings [38], [39], [42].

Theoretical Contribution

4.1 Framework introduction

The design process of a serious game involves an interdisciplinary context. These disciplines being game design, learning theory, motivation and engagement theory, and the subject taught through the game. Therefore we suggest an outline of a framework, that can help other scholars create serious games for educational purposes [19], [20]. The framework spans the different major components needed in the design of a successful serious game, these being: Foundation of content, game design, prototyping and implementation and final design and evaluation. The framework will elaborate on the sub-components of each area previously mentioned and outline a development process for creating a serious game. This framework is meant as a guideline for other developers making serious games.
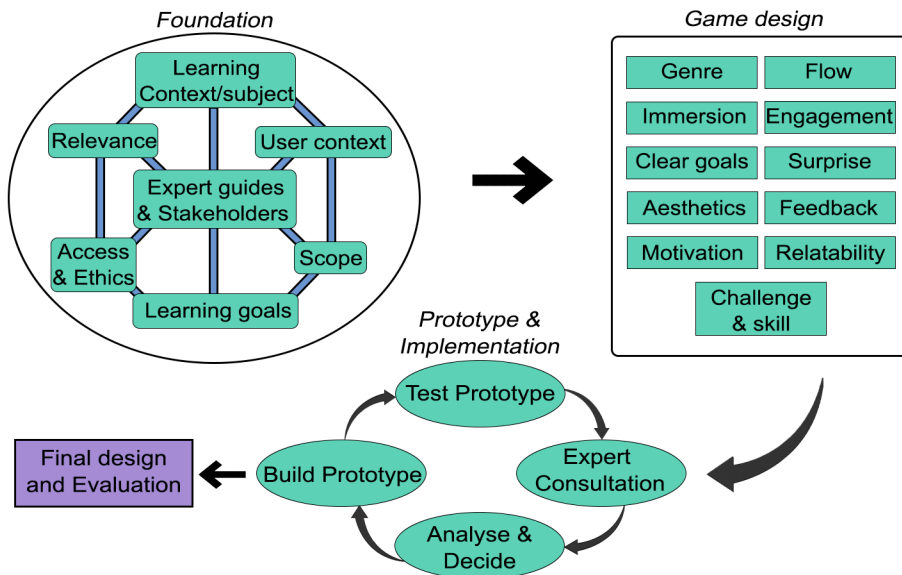

Figure 1: Framework for creating a serious game for educational purposes

4.2   Foundation

The foundation of a serious game is based on the intended users and the subject at hand. One can benefit from including pedagogical and educational factors, ethics, as well as expert guidance and knowledge about the target group in their considerations when developing a serious game [43], [44].

Expert guides & Stakeholders

It can be beneficial to create an overview of expectations from potential stakeholders in the game to ensure their expectations are met. With an overview of these expectations contacting an expert in the area of which the game should cover can be helpful to avoid mistakes [3]. Involving stakeholders and experts from the very first iteration of the games design the developer saves both time and lowers the potential risk of compromising the quality of the content [2].

Learning goals

It is important for the game designers to get a base understanding of the teachings that the game should encompass to avoid crucial design flaws [45]–[47]. One way to approach the teachings are to outline concrete goals for what knowledge the game should communicate to the player. Consulting with the expert is a great benefit to finding the desired learning outcomes and what they would prefer the students to learn. It is important to evaluate the learning goals after testing and see if the desired learning outcomes are met, since the concept of learning is a complex construct [45]–[47].

Scope

Developers must consider the scope of the project. Most productions have a limited amount of time and resources and these must be managed with care to ensure resources are spent correctly. Consult the expert in the early stages and discuss what is manageable within the set time-frame. Be realistic with the scope in terms of the size of the game and the core functionalities needed to full-fill the learning outcomes, and still manage to be fun and engaging to the students.

Relevance

Before designing a serious game, its relevance should be considered. Naturally, a serious game that has no use case does not serve a meaningful purpose. The demand for the specified topic of the game should be examined for its relevance and contribution.

Access & Ethics

Correct ethical guidelines, depending on the targeted group, should be followed. If the topic of the study is of sensitive matter, this must also be taken into ethical account, in terms of vulnerable groups, or minorities affected by the material [48]. Furthermore, the accessibility of the serious game in regards to platform and technical specification requirements need to be taken into account when planning the development process, choosing game engine, pipeline etc.

Learning Context

The context of the game is important as this limits the design possibilities quite significantly. Intended as homework for a class, an in-class activity or a break from the typical teachings, these scenarios are handled differently from each other and it can be helpful to identify the context early in the process.

4.3 Game Design

The knowledge obtained from the foundation phase should create an understanding of which game design elements are more important than others in that specific serious game.

Genre

The genre is in some cases determined by stakeholders. However, even when it is not it's a good idea to finalize early and be specific in the genre of the game. When defining the genre there are a multitude of aspects to take into account one of which is the target group.

There may be differences in the sexes and their preferences when it comes to genre and accessibility [44]. The fact that male students prefer the use of computers in class and in their free time and play more video games recreationally [9], [10] further supports this. An example of a genre that fits a target group of teenage boys could be the First Person Shooter genre as this is a popular genre for the target group [44]. The content of the genre has to match the related target group to ensure engagement is achieved.

When selecting a genre, developers must consider the target group and determine if it would be best to make a typical game of one genre, or mix genres and bring elements from multiple into the game [49]. Mixing or innovating on genres can be confusing for some target groups while it can benefit others.

Flow

The framework includes not only the elements needed for flow, but also ensures engagement through the work from Fog [31]. Some of the elements of flow has been simplified or removed due to their similarities to other design elements.

An approach to flow theory in video games uses the following elements to achieve gameflow: *concentration, challenge, skills, control, clear goals, feedback, immersion, and socials* [50]. Some of these terms has an overarching interest for the game developers to be maintained throughout, such as immersion and control. Sweetser and Wyeth [50] imprinted the importance of these factors when creating a game for player enjoyment.

Immersion

If the player is distracted or by other means not paying attention, the player is not immersed in the game, and the potential disengagement with the serious game is increased [50]. The use of the term immersion for this study is inspired by the definition from Sweetser and Wyeths Gameflow model [50]. Immersion is a deep but effortless involvement, which can often result in loss of concern for self, everyday life and an altered sense of time [50], [51]. Sweetser and Wyeth outline several criteria to strive for to achieve immersion; players should become less aware of their surroundings, players should become less self-aware and less worried about everyday life or self,

players should experience an altered sense of time, players should feel emotionally involved in the game, players should feel viscerally involved in the game [50].

Calleja outlines the "Digital Game Experience Model" with six elements of involvements which should lead to an immersive state which Calleja describes as incorporation [52]. Tactical involvement is created by the decision-making in a game [52]. Performative involvement relates to the challenge of character controls and is the actualization of tactical involvement [52]. Affective involvement deals with the players emotional state when playing games. Understimulated people are more likely to play games that are arousing, whereas overstimulated people tend to play more calm games [52]. Shared involvement happens through interacting with other agents in games. These agents could be other players or AI-controlled, and the involvement may be created through collaboration or competition [52]. Narrative involvement is concerned with two perspectives. Narrative elements can be the game world's history or the story behind a specific mission or quest in the game. This is referred to as "designed narrative". The other perspective looks at the player's interpretation of the gameplay experience and is referred to as "personal narrative" [52]. Spatial involvement is related to locating oneself within a wider game area than is visible on screen. This can take the form of in-game maps or simply getting directions from others [52]. When the player engages with these six elements, it leads to a state of deep involvement and shortens the span between the player and game environment. When this occurs, players may interpret the actions of their avatars as being actions of their own in the game world [52]. These are all elements that can be aimed for when designing a serious game, in order to achieve immersion, thus increasing the likelihood of attaining engagement [53].

Engagement

Various definitions on how to obtain and maintain engagement has been discussed by scholars [31]–[33], [37], [50], [54], and implementing flow theory to provide motivation, surprise and clear goals, contribute to maintaining engagement for the players [50]. Maintaining engagement can be difficult, and it is therefore important to ensure minimal amounts of distraction for the players, such as other media disturbances [55].

Clear Goals

As part of gameflow, clear goals needs to be given to players throughout the game [50]. These are to ensure that the players are not confused as to what their current goal is, and also to ensure people with less experience with video games can follow along. It can be beneficial to introduce an overall goal in the very beginning of the game and introduce smaller and simpler goals throughout the game [56]. When a new goal is introduced, utilizing multiple senses can be beneficial for the goal to be clear and noticeable for the player. This can for example be done through a form of "briefing" to describe the next mission through both auditory and visual stimuli [57].

Surprise

Surprise as a game design element is especially beneficial to incorporate in a serious game as it increases the learning effect achieved through the serious game [29], [58]. The stimulation of cognitive structures from a surprise helps the learning material to be remembered and used when needed [59].The reason for this has been argued to be the disruption of the users mental models about the given content [59]. This causes the brain to revise the mental model, causing the user to re-evaluate the situation and update their mental model based on the new information [59].

Challenge & Skill

When creating a serious game, the balance between challenge and the skill of the player is crucial. If the game is too difficult, the players will lose interest, and their immersion is broken, and engagement is decreased. If the game is too easy the player might get bored [50], [60].

Feedback

Feedback needs to be communicated to the players in forms of sensory cues. It is also crucial to communicate a form of reward to the player, in no means physically, but allowing them to feel accomplishment when finishing the game [50].

Motivation

To motivate the players, a story driven narrative can be a good idea, and can be introduced in serious games as a story driven tale also referred to as digital storytelling [61]. Including digital storytelling in a serious game, will allow the player to feel emotional motivation. It is important to note that creating a narrative for the game, is to make the game more engaging, interactive and have them obtain meaning full skills or knowledge throughout, without actively noticing the learning aspect of the game [50]. Conveying the learning objectives or story in a way that can be meaningful or understandable within the context of the target groups potential personal interest or societal tendencies can motivate the players. Make sure to include nuanced interests that will not only cater to one part of the target group, but several [62]–[64].

Relatability

Target group in terms of cultural context, previous knowledge, novelty, emotions and attitudes must be considered [65]. Relatable content and context can potentially help the understanding of complex concepts for the target group, as it can be easier to understand the context of something relatable and can help engage the target group [28], [30], [65]–[67]. Relatability can be distinguished from relevance in the aspect that it relates to tasks and functions within the serious game and not the relevance of the serious game as a whole.

Aesthetics

It's important that the target group finds the game aesthetically appealing, creating a game with a refined artstyle, fitting to the subject matter may cause players to pay more attention to detail, and enjoy the scenery thoroughly [3]. Previous research suggests that realistic details and world building, is noticed and well received by the targeted group [2]. Using photo-realistic design and atmosphere fitting for the target group, can be an example of well-used aesthetics since similar atmosphere and graphics were created in previous games, with well received feedback [2], [3].

4.4 Prototyping and Implementation

The foundation and Game Design elements are integrated into the prototypes of the serious game [68]. This framework suggest an agile software development method where building the specific prototype is the first step, followed by testing the prototype and including expert consultation in the testing procedure prior to analyzing

and evaluating the test.

Build Prototype

Building the prototype should be based on the elements in foundation and game design. Depending on the scope, prototypes can vary from minor objectives to full game levels [68]. The better the prototype has been developed the better prerequisites it has for a successful testing procedure.

Test Prototype

The evaluation of a serious game has proven a complex matter in previous studies [45], [69], [70]. The reason for this is multifaceted. Individuals learn in different ways and learning is, on its own, a very vast field. When conjoining serious games with an already established field of study, the assessment of the effects of a serious game becomes complex [44]–[47], [71]. Possible approaches include assessing the test participants ability to meet the objectives of the learning goals [46]. Since engagement is a prerequisite for learning, and also a vital component of player experience in video games, this metric seems a viable possible indicator for reflecting the learning outcome of a serious game. The prototype should also be tested, as the system of the game must work as intended, in order for the test participants to access the learning goals [68].

Expert Consultation

Involving experts in the design process of a serious game has been found to be very beneficial in previous work [2], [3], [20], [30]. We therefore outline the need for involving these stakeholders in each iteration of the design process of a serious game. This way the developer can ensure the quality of the content produced as well as maintaining the correct context and accessibility for the product, as the experts will have the relevant knowledge about the target group and the subject being gamified.

Analyse and Decide

The final step of the iterative prototyping process is to analyze and decide the direction of the current iteration of the product. If the results from the pilot test and the feedback of the experts are indicative of a successful prototype, the developer may consider the product finalized and ready for final evaluation. If the product does not meet the requirements of the stakeholders and/or the testing reveals critical shortcomings, the developer may refer back to the previous components of the framework.

Chapter 5

Methods

5.1 Participants

Participants consisted of two groups (Experimental and Control). Both groups were within a class of social studies, and in progression of learning fiscal policy. The experimental group consisted of 31 students (male = 13, female = 18), and the control group consisted of 20 students (male = 14, female = 5, other = 1). All participants was recruited from N. Zahles Gymnasium. All participants gave informed consent and were informed that they could withdraw from the study at any time and their participation did not influence their grade. In addition, all participants were provided with anonymous ID numbers, and all data were labeled with these IDs. We applied special considerations when recruiting teenagers (ages 17–19), in accordance with Danish data law, the international code of conduct [72] and ethical approval from the gymnasium.

5.2 Procedure

The test procedure included an experimental group that were playing the serious game about fiscal policy and a control group that were reading chapter '7.2 Fiscal Policy' in the book 'Økonomibogen' [73]. As part of the gymnasium students curriculum, the experimental group were also reading chapter 7.2 about fiscal policy as homework for one of their lectures. The experimental group were answering questions related to fiscal policy in-game as well. A "hotline" was available at all times, where the students could contact test conductors for any problems the students could have encountered throughout the test.
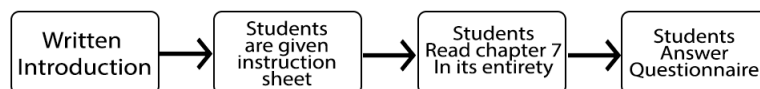
Control Group:

Figure 2: Control group test procedure

- 1. Students were given a written introduction by their teacher to read the assigned chapter about financial politics before the test.

- 2. Students were given an instruction sheet detailing the plan for the day.

- 3. Students read the chapter assigned in class if they had not already from home.

- 4. Students answered questions related to the homework, and their demographic.

Experimental Group:
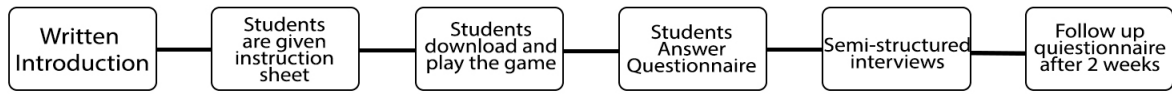
Figure 3: Experimental group test procedure

- 1. Students were given a written introduction by their teacher explaining the game as homework. The teacher also provided the instruction paper in step 2 for the students (the instruction sheet can be found in appendix section 11.5).

- 2. Students were given a written instructions form from the conductors of the test. In this document the download, and overall process of the test was written down step by step to avoid confusion and mistakes. Here the "hotline" were also available.

- 3. Students downloaded and played the game.

- 4. Students answered the questionnaire right after playing the game.

- 5. Semi constructed group interviews were conducted with students of different sex to ensure diversity in answers.

The evaluation consisted of a questionnaire inspired by the User Engagement Scale short form [1] (UES SF) and questions related to fiscal policy and semi-structured friendship pairs interview (the full length questionnaire can be found in appendix section 11.3). UES SF [1] was chosen over UES long form due to possibility of respondent fatigue. Previous studies have revealed that UES SF has, in general, demonstrated good reliability and validity [1]. The first four questions of the questionnaire covered the demographic areas: gender, age, gaming experience and self-proclaimed knowledge of fiscal policy.

The participants were asked questions regarding their obtained knowledge about fiscal policy throughout the game to ensure the understanding of the subject at hand. The participants had to correctly answer these questions

to continue the game, once again, to ensure they have understood the subject. Furthermore, this was implemented with the expectation that it would aid the accomplishment of the learning goals set by the expert and researchers.

The UES revolved around 4 core themes which include:

- Focused Attention

- Perceived Usability

- Aesthetic Appeal

- Reward Factor

The UES included 12 5-point likert scale items (1=Strongly disagree, 2=disagree, 3=neither agree or disagree, 4=agree and 5=strongly agree). The questionnaire was translated to Danish to fit the native language of the students. Two items were removed because of a language barrier when translating to Danish. Items in 'Perceived Usability' were negatively charged and their data was therefore flipped when used in the statistical tests. The items include:

- Q2.1: I was frustrated learning about fiscal policies in the application*

- Q2.2: I was confused in the application*

- Q2.3: I was distracted while playing/reading the application*

*The wording of application is changing depending on the experimental or control group, where it was replaced with 'game' for the experimental group and 'book' for the control group.

The questionnaire also included a section for fiscal policy related items, consisting of 6 items (see appendix section 11.3 or section 11.4). These items were multiple choice questions regarding fiscal policy with one correct answer, three incorrect and one 'don't know' option.

After the experimental group played the serious game and answered the questionnaire three semi-structured friendship pairs interviews was conducted with three students in each interview. A total of 17 questions were formulated in order to gain insight into the students experience with the serious game. Seven predefined themes were formulated based on the content in the framework in the theoretical contribution chapter. Researchers coded the 3 interviews based on the predefined themes. During the coding, an eighth theme of 'relatability' was formulated to encompass statements regarding the game being aimed towards the target group.

The eight themes used in coding of interviews:

- 1. Feedback: The inclusion of auditory and visual cues, as well as clear goals.

- 2. Immersion: Deep but effortless involvement, reduced concern for self and sense of time and the inclusion of flow [50].

- 3. Aesthetic Appeal: The subjective assessment of the visual impression within the serious game.

- 4. Motivation: The driving factors that propels the desire to play and the inclusion of rewards.

- 5. Usability: The extent to which the user can achieve specified goals with effectiveness, efficiency and satisfaction [74] and the level of control the user posses while playing the serious game.

- 6. Learning Outcome: The knowledge or skills the users have acquired after playing the serious game.

- 7. Novelty: Novel aspects the user would not otherwise experience with conventional teaching and lectures.

- 8. Relatability: Aspects of the game that are designed to be relatable for the specific target group and their interests.

A semi-structured interview including 12 questions was also prepared for the expert. The aim of the interview was to gain insight into the experts experience with a serious game as part of teaching fiscal policy. The coding of the teacher interview was not mixed with the student interviews and the results will be presented separately in the findings chapter.

5.3 Data analysis

UES and fiscal policy related items in the questionnaire was examined through a Shapiro-Wilk test for normality and Levene's test for homogeneity of variance. Independent samples t-test was performed on parametric data and Mann-Whitney U test for non-parametric data. Descriptive statistics was performed on the data from the UES related items through cumulative frequency analysis. The fiscal policy related items were examined through percentage frequency distribution.

All three interviews were analyzed by traditional coding [75]. The coding followed four steps: organizing, recognizing, coding, and interpretation. Researchers transcribed the interviews and organized and prepared them for data. The codes in each interview were labelled in the predefined themes (Feedback, Immersion, Aesthetic Appeal, Motivation, Usability, Learning Outcome, Novelty, Relatability) described in the procedure and was assigned a positive/negative category. Researchers acknowledged the possibility for addition of new themes while they coded the interviews. The data was examined through content analysis and interpretation [30]. Intercoder reliability (ICR) was measured through Cohen's Kappa for all of the friendship pair interviews collectively [76]. ICR is a measure to assess the agreement among multiple coders for how they assign codes to text sections and can be used to assess consistency and validity among the codes [76].

Chapter 6

Design and Implementation

6.1 Learning Material

The solution we propose in this project is a serious game covering Danish fiscal policy in the gymnasium subject Social Studies. The topic is a mandatory part of advanced Social Studies in the Danish gymnasium curriculum. The game strives to educate students on the mechanics of manipulating the Danish economy with the use of several political tools. The topics in the game include: expansive and contractionary fiscal policy, economic boom and recession.

6.2 The Foundation

To create a foundation to base our game design process on we used knowledge gained from previous work [2], [3]. To apply it to this specific scenario we utilized expert guidance from a teacher of social studies in the Danish Gymnasium. Through talks with the expert it became clear that the most important thing for the game to do is to engage the students better than their normal teaching.

Regarding the subject in social studies to base the game off of, we were not restricted by the expert. We agreed on Fiscal Policy as it was what the teachers social studies' classes were focusing on at the time the game would be ready.

With the topic in place learning objectives for the game was created in cooperation with the expert. These are the learning objectives outlined in the introduction chapter. Additionally we scheduled with the expert when we could gain access to the classes for a session where students would play the game and get interviewed.

With this foundation established we started outlining the narrative of the game to give a better idea of the scope and timeline of the game design process.

6.3 The Narrative

One of the very first things finalized was the narrative. The narrative was heavily based on conversations with our expert. An aspect that he put a lot of emphasis on was that the game was relatable for the students and spoke to the situation that they find themselves in. We therefore created a narrative based around the main character in the game who is a student the same age as our target group of gymnasium students between the ages of 17-21.

The main character (MC) is the son of the minister of finance and is left home alone. The office of MC's father is thereby left unattended and can be accessed and tampered with by MC which has consequences for the entire nations economy.

Overview of events in the story:

- **Search the living room:** MC finds a note from his father saying he will be home late and that he does not want you to enter his office and touch anything as that can have consequences for the economy of the nation.

- **Pick up the phone:** A friend calls MC and tells him he should buy a ticket to the Roskilde Festival.

- **Find the Ipad and buy a ticket for the Roskilde Festival:** MC finds out that he cannot afford a ticket.

- **Find the key to your father's office:** MC searches the house for the key and finds it hidden in a plant.

- **Infiltrate your father's office:** MC enters the office using his recently found key.

- **Read the book on your father's desk:** MC reads a book teaching him fiscal policy. (This event is repeated 3 more times with books at different locations in the house each time teaching a new aspect of fiscal policy.)

- **Use the buttons in your father's office to reduce the price of the festival tickets:** MC can choose either to apply expansive or contractionary fiscal policy. Contractionary is the right choice and will continue the story. Expansive will instead allow MC to try once again.

- **Check the price of a festival ticket on the ipad:** MC buys the ticket and gets a text message from his father who is unhappy with him for manipulating the economy.

- **(In the pilot test the game ended here)**

- **Pick up the phone:** Another friend calls you asking MC to join them on the beach and bring some beer.

- **Check your texts:** MC gets a text from his work telling him he has been fired due to the financial situation in the country.

- **Check the prices of beer on the Ipad:** Although the beer is quite cheap due to contractionary fiscal policy MC has no money due to him losing his job. He therefore needs to change the economy again.

- **Use the buttons in your father's office to get back your job:** Expansive fiscal policy is in this case the right choice and results in progressing the story. Choosing contractionary fiscal policy will result in you getting a text and having to try again.

- **Check your texts:** You have a text from your job rehiring you and a text from your father explaining why the choice can have negative consequences for the economy.

- **An Ending screen appears showing the information gathered from the books previously read around the house**

All trademarks mentioned in the table was given fictional names in the game, e.g. Roskilde = Rosbilde, to avoid copyright infringement.

6.4 Creating the Environment and Initial Systems

The game was created in the Unity Engine version 2021.2.12f1 [77] utilizing asset packs from the Unity Store for the majority of the 3D models. Code examples in this chapter will be altered slightly from the original code in the game for the sake of simplifying and visualising the code in a better manner.

It was determined not to have a save/load option for the game based on the short duration and one-level structure of the game.

The first thing we created in the game was the environment. The setting of the story was a normal family home however to not make the environment too big and confusing we confined the home to 5 rooms: Living Room, Office, Hallway, Bedroom and Bathroom. The main asset packs utilized were therefore containing furniture models [78]–[83].

Figure 4: The look of the living room in the game.

With the environment done the coding started as we were in need of some interactivity to make the application a game. The first system that we worked on was an objective system. The objective system is shown on the figure above in the top right corner and is a simple white text telling the player what they currently should do to progress the story. The objective system is created on a simple TextMeshPro Gameobject in a unity canvas to make it a 2D object appearing on top of the camera view. This gameobject has one of our two main scripts attached to it. This script does multiple things such as check if the user is pressing ESCAPE which will result in a prompt showing up asking if the user wants to leave the game (lines 8-16) and checks if the game is finished and the game end screen and sound should be played (Lines 19-20). The main thing is that it changes the text of the objective in the top right corner. It does so by having an array of strings that are the objectives and an integer counter that keeps track of the event the player is currently at in the game.

```
1   void Update()
2   {
3       //Exits game on Escape.
4       if (Input.GetKey(KeyCode.Escape))
5       {
6           TriggerBoxScript.activateMouseOnScreen = true;
7           leaveGamePrompt.SetActive(true);
8       }
9        //For endscreen
10      if (TriggerBoxScript.counter == 18 && gameDone == false)
11      {
12          endScreen.SetActive(true);
13          escPrompt.SetActive(true);
14          character.GetComponent<FirstPersonMovement>().canRun = false;
15          character.GetComponent<FirstPersonMovement>().speed = 0;
16          gameDone = true;
17      }
18
19      //Updates objective goal in upper right corner.
20      TriggerBoxScript triggerBoxScript = triggerBox.GetComponent<TriggerBoxScript>();
21      GetComponent<TextMeshProUGUI>().text = objectiveText[TriggerBoxScript.counter];
22  }
```

Figure 5: Code from the ObjectiveMasterScript.cs changing the objective based on a counter
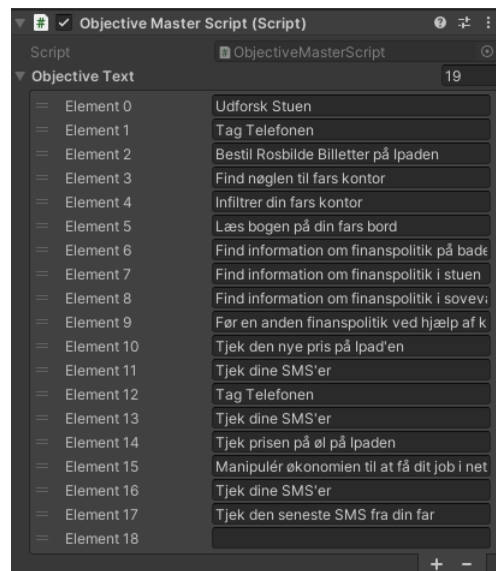
Figure 6: The array of strings used for objectives.

The objective system is basically done with the two lines of code which can be seen on the image above on line 20 and 21. In these lines the counter chooses which objective is shown.

As seen on the image above the counter variable is taken from the script triggerBoxScript.cs. This script is our second main script and is where the counter is changed depending on the actions of the player. The script is placed on a triggerBox and if that triggerbox has the ID of the current counter, the player can interact with it.

Each time a triggerbox has been interacted with the counter increases by one and another triggerbox is now interactable.

```
1   void OnTriggerEnter(Collider other)
2   {
3       if(counter + 1 == orderCounter)
4       {
5           interactable = true
6       }
7   }
8   void OnTriggerStay(Collider other){
9       //If triggerbox is supposed to be interactable and you then interact with it.
10      if (other.CompareTag("Player") && interactable == true &&
11      Input.GetButton("Fire1") && onlyVoiceTrigger == false)
12      {
13          //Specific occurrences at some events.
14          //Show Cursor of mouse.
15          if (counter == 10 || counter == 2 || counter == 9 || counter == 15){
16              activateMouseOnScreen = true;
17          }
18          //Normal read function
19          firstPageTimerStarted = true;
20          readSomething();
21      }
22      //Closing the reading image
23      if (other.CompareTag("Player") && interactable == true &&
24      Input.GetButton("Fire2") && onlyVoiceTrigger == false &&
25      reading == true && readFirstPage == true)
26      {
27          stopReading();
28          activateMouseOnScreen = false;
29          billetBought = false;
30      }
31  }
```

Figure 7: The beginning of the triggerboxScript.cs

As seen on the figure above when a triggerbox is entered it will find out whether or not the player should be able to interact with it or not. If the triggerbox has the orderCounter that corresponds to the current counter it will be interactable which means that a prompt will pop up on the screen telling you that you can press "E" to interact with the object. When you press "E" the readSomething() function will be activated (seen on line 20 above) which will make an image appear on the screen. This image differs depending on which event we are at. This image is for example the book containing knowledge about fiscal policy but also an image of the website where the player will buy a festival ticket.

To continue the player presses "Q" to make the image go away which is done in the stopReading() function (line 23-30 above) This is also the function that will increase the counter and therefore prepare the next triggerbox to be interactable and progress the events.

```
1    void readSomething()
2    {
3        //Freeze character position
4        character.GetComponent<FirstPersonMovement>().canRun = false;
5        character.GetComponent<FirstPersonMovement>().speed = 0;
6        reading = true;
7        pressE.SetActive(false);
8        interactImage.SetActive(true);
9        firstPageTimerStarted = true;
10   }
11
12
13   void stopReading()
14   {
15       //Unfreeze character position
16       character.GetComponent<FirstPersonMovement>().canRun = true;
17       character.GetComponent<FirstPersonMovement>().speed = 5;
18       interactImage.SetActive(false);
19       pressEsc.SetActive(false);
20       counter += 1;
21       interactable = false;
22       activateMouseOnScreen = false;
23   }
```

Figure 8: The readSomething() and stopReading() functions.

On the figure above the functions readSomething() and stopReading() are shown. A way to make it easier for us to avoid creating bugs and inconsistencies in the game experience we limited the players movement while interacting with triggerboxes. This can be seen on line 4 and 5 in the readSomething() function. When the player finished reading/interacting they are given their movement back (lines 16-17) and the counter increases by 1 (line 20).

The code examples and code explanations above is the base functionality of the triggerboxScript. Within this code are also multiple specific interactions at specific counter numbers. This could be that one interaction does not show an image but instead only starts a voiceover sound clip. There are also times where user input is required for example when players are buying the festival ticket they have to press the buy button with the mouse and we therefore need to specify that the mouse should show up at specifically counters: 2,9,10 and 15. Explaining these with code examples like the ones above would be too extensive but the original full scripts can be found in the ZIP Appendix.

6.5   Pilot Test

With the baseline systems in the game in place we wanted to do a pilot test to make sure it was received as intended by a user. There were aspects of the game that we already knew had to be iterated upon, the main thing being one more major choice for the player to make in the game. We had created one big choice, choosing between expansive and contractionary fiscal policy where contractionary was the right answer. We therefore needed another choice to showcase the effects of leading an expansive fiscal policy.

The pilot test consisted of having the participants play through the game while being observed. The observant would note down any difficulties the participant seemed to have. The participant was also encouraged to ask if

they were in doubt about anything or had trouble understanding aspects of the game throughout. Following the playthrough participants filled out a questionnaire (see Appendix section 11.6).

The changes needed in the game based on the pilot test are listed below:

- The game is missing an introductionary prompt showcasing game controls.

- The living room is missing furniture especially in one corner.

- The game has a lot of information to read at once. This should be split up into smaller sections.

- The game should include some tasks forcing you to utilize the information received from reading about fiscal policy.

- You need to be able to bring up the information read in the book at all times so you can use it to make the right decisions.

- Minor changes for certain questionnaire items were needed.

- Too many questions in the questionnaire.

6.6 In-Game Questions, Particle System and Shaders

Most of the changes following the pilot test could heavily utilize the triggerbox and event system already put in place. Therefore it was easy to create new events, a second major choice for the players and to split up the reading into 4 smaller chunks of information scattered around the house instead of having it all collected in a single book in the office.

A new addition that required some new functionality was the implementation of questions quizzing the player about the information they were supposed to learn from the text in the game. The player could only progress the game after having answered the question correctly. Were the player to answer the question wrong they would get notified that the question was wrong and could try to answer the question again until they got it right.
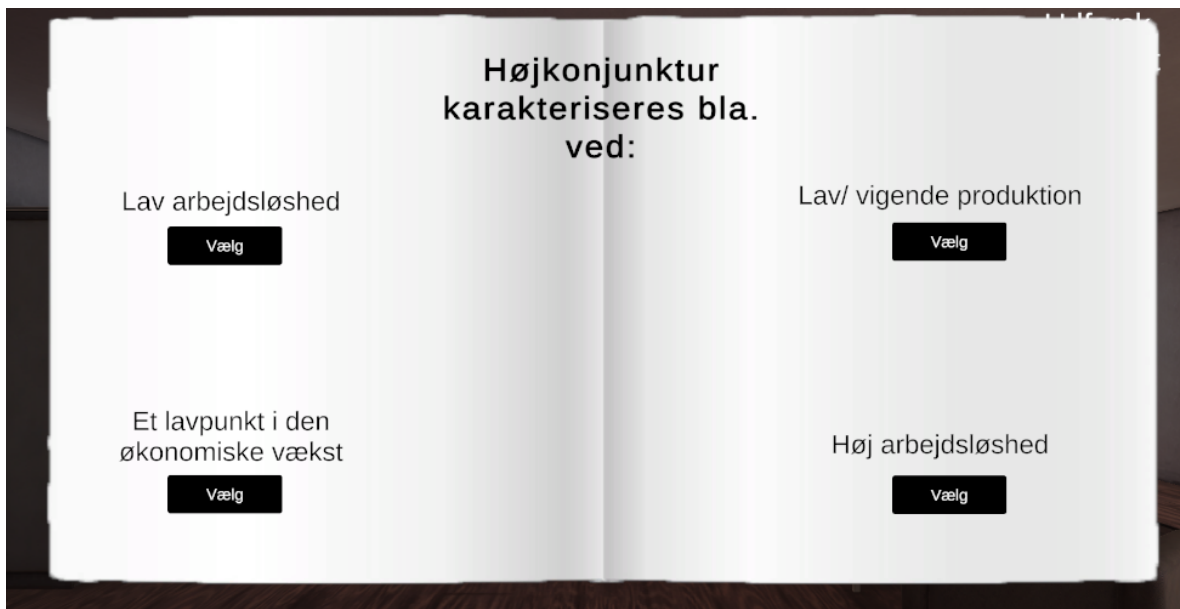
Figure 9: One of the questions players are asked through the game.

```
1   public class ButtonInteraction : MonoBehaviour
2   {
3       public GameObject Panel;
4       public GameObject[] DeactivateObject;
5       public GameObject[] ActivateObject;
6
7       public GameObject notebookUI;
8       public GameObject buyTicketTrigger;
9
10      public void OpenPanel()
11      {
12          if(Panel != null)
13          {
14              TriggerBoxScript triggerScript = buyTicketTrigger.GetComponent
15              <TriggerBoxScript>();
16              triggerScript.billetBought = true;
17              Panel.SetActive(true);
18          }
19      }
20      public void DeactiveObjects()
21      {
22          foreach (GameObject destroyObject in DeactivateObject)
23          {
24              destroyObject.SetActive(false);
25          }
26      }
27      public void ActiveObjects()
28      {
29          foreach (GameObject activateObject in ActivateObject)
30          {
31              activateObject.SetActive(true);
32          }
33      }
34      public void rightAnswer()
35      {
36          TriggerBoxScript triggerScript = buyTicketTrigger.GetComponent
37          <TriggerBoxScript>();
38          triggerScript.questionRight = true;
39      }
40      public void activateNotebookUI()
41      {
42          notebookUI.SetActive(true);
43      }
44  }
```

Figure 10: An overview of the functionality of the buttons

The code snippet above showcases the different functions that button presses will call. If the answer is incorrect the openPanel() (line 10) will be called and open a panel saying "Wrong Answer" in red text with a button "Try Again". If the answer is correct the openPanel() will also be called but with a different panel saying right answer.

The Deactive- and ActiveObjects() (Line 20 and 27) are for activating and deactivating the buttons of the question when the "wrong/right answer" screen appears.

If players were struggling to answer the question correctly they could bring up a notebook on the screen filled with notes on the information they previously had read in the game. This creates yet another opportunity for players to learn about fiscal policy. The notebook could be opened at all times by pressing the "C" button and a prompt telling the player that this is something they can do is shown throughout the game. The notebook would fill out automatically with new information as they read it in the game.
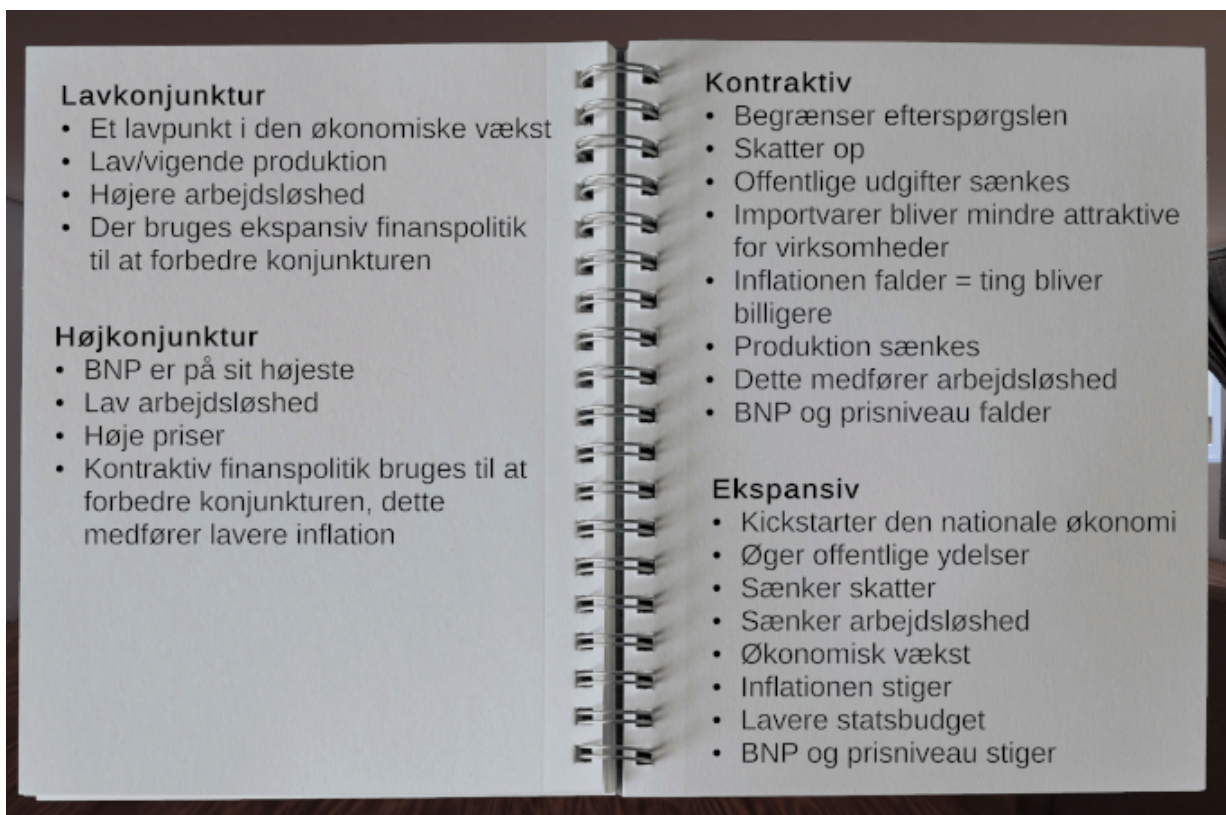
Figure 11: The notebook filled with all notes.

The final changes we made was to make the goals of the game even more clear. We did this by making the objects of which the player interacts with stand out more. To make objects stand out more we used two different solutions.
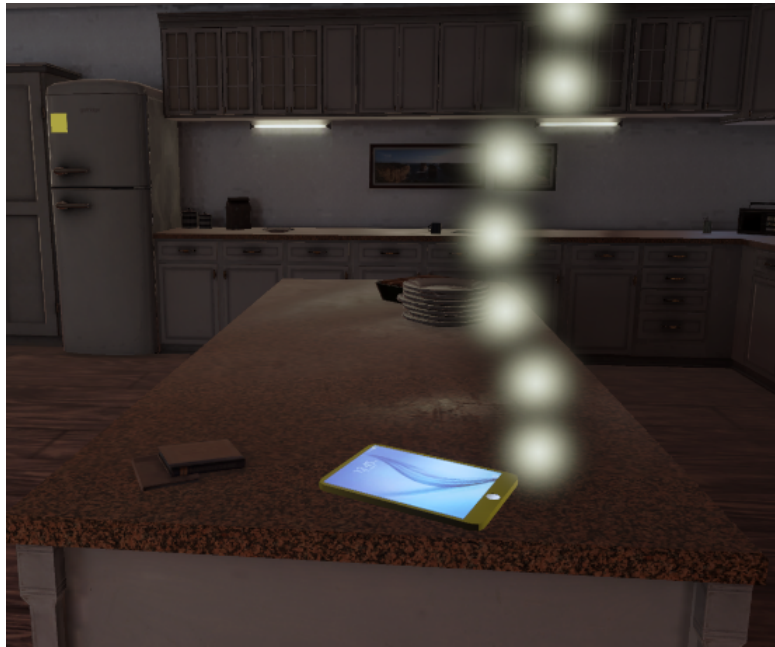
Figure 12: The shader and particle system attached to an ipad.

The particle system was a very simple default unity particle system looping until deactivated.

The shader gives objects an orange tint increasing and decreasing gradually. The shader was made in shader graph in unity.
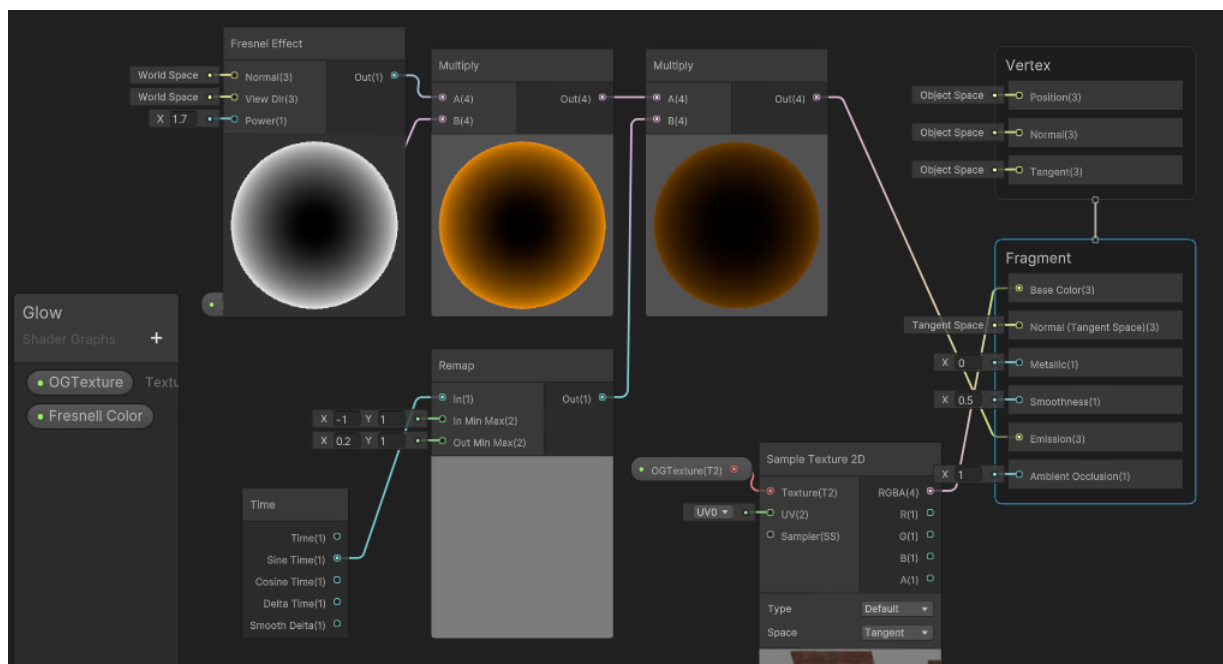
Figure 13: The shader graph explanation of the shader.

The image above showcases the steps of how the shader was made. We first used a fresnell effect which is the

effect of differing the reflectance on a surface. The fresnell effect is multiplied by the color orange and is then remapped to be a number between 0.2 and 1 instead of -1-1 as the fresnell effect does by default. This means that the glow effect never completely goes away as it goes from 20% to 100% glow. This effect is linked to the emission of the texture it should be placed on and is then ready to be applied to whatever object with whatever texture.

The objects that should at certain points glow and have the particle system on it were handled in the event script. It was handled by having duplicate gameobjects of the objects that should glow such as the ipad. One game object was the normal textured ipad and the other one was an ipad with the glow and particle system attached onto it. These two game objects were activated and deactivated based on the counter that also controlled which event was active.

```
1   //Handling of glowing shader. (Inside update function)
2   if(glowUpDone[TriggerBoxScript.counter] == false)
3   {
4       //To avoid being out of bounds at first objective.
5       if (TriggerBoxScript.counter > 0)
6       {
7           //Returns previous object to it's none shiny version.
8           glowyObjectiveItems[TriggerBoxScript.counter - 1].SetActive(false);
9           normalObjectiveItems[TriggerBoxScript.counter - 1].SetActive(true);
10          if(TriggerBoxScript.counter > 3)
11          {
12              normalObjectiveItems[3].SetActive(false);
13          }
14      }
15      // Makes the next object glow.
16      glowyObjectiveItems[TriggerBoxScript.counter].SetActive(true);
17      normalObjectiveItems[TriggerBoxScript.counter].SetActive(false);
18      glowUpDone[TriggerBoxScript.counter] = true;
19  }
20  if(TriggerBoxScript.counter == 9 && resetDone == false)
21  {
22      resetGlows();
23  }
24  else if(TriggerBoxScript.counter == 10)
25  {
26      resetDone = false;
27  }
28  if(TriggerBoxScript.counter == 15 && resetDone == false)
29  {
30      resetGlowsSecond();
31  }
32  else if(TriggerBoxScript.counter == 16)
33  {
34      resetDone = false;
35  }
```

Figure 14: The code activating and deactivating game objects each time the counter is changed.

Two arrays filled with game objects were created to handle all of the items with glow and particle system on them and all the ones that did not. In the figure above on line 17 and 18 these arrays are shown and used to activate

one specific glowing item and deactivating that specific non-glowing item. As the counter increases by one, the glowing object is deactivated and the normal one activated (seen on line 8 and 9).

6.7 Overview of Game Design Elements

Throughout the process of creating the game, the framework outlined in the theoretical contribution chapter was utilized. The foundation was outlined in the beginning of this chapter and the game design elements are touched upon in the previous sections. The game design elements in this specific instance was utilized in the following ways:

- **Genre:** The genre of this game was determined to be a narratively driven First Person Exploration game. This decision was largely based on earlier experience and success with creating a game of this genre for gymnasium students [2], [3]. One benefit of narratively driven games is that you can easily aim the narrative to be relatable and interesting for the specific target group.

- **Flow:** Flow is somewhat of an umbrella term in the framework and to accomplish a state of flow for the players multiple smaller game design elements are utilized including: Clear Goals, Immersion, Feedback and Challenge [50].

- **Immersion:** To aim for an immersive state for players it was beneficial to have an application instead of a browser game to avoid distractions from social media or other applications as this tends to be a problem for some students. Additionally the narrative should entertain the students and create an interest and narrative immersion and involvement in the story [19], [20], [52]. The major choices in the game utilized tactical involvement through the decision-making process [52] and surprising elements of screen shake and louder audio causes affective involvement. Controlling the character and the challenges risen from this also creates performative involvement [52].

- **Engagement:** Engagement is like flow an umbrella term and it is difficult to determine what exactly engages the player in each specific scenario. Flow and engagement often times heavily affect each other and engagement is therefore often also created from achieving the same game elements such as the ones listed below [37].

- **Clear Goals:** Clear goals are achieved in the game by utilizing shaders and particle systems on interactable objects (seen on figure 12). The objective prompt showcased on figure 4 in the top right corner also ensures that the next objective is clear.

- **Surprise:** Surprise can be beneficial to increase learning outcome [29], [59]. It was however difficult to implement in this specific game. An attempt to create higher arousal and create a surprise is in the very end of the game the end screen pops up showcasing the notes you gathered throughout the game (see figure 11) together with loud applause.

  Another surprising element happened as the player made their major choices between expansive and contractionary fiscal policy. As the button is pressed the whole screen shakes and apocalyptic noise is played to signify that your choice had a large effect on society as a whole.

- **Aesthetics:** The aesthetics of the game were aimed towards realism to ensure a serious tone and a relatable environment that the students could easily find themselves in.

- **Feedback:** Feedback was given to the player in multiple ways. As they completed an objective most times a voice-over would start and brief them about the next objective. Additionally the objective prompt in the top right corner would change to the next objective and the glow and particle system on the object would disappear and appear on the next object in another place.

- **Motivation:** In order to motivate the player and avoid boredom throughout the game the reading was split up into multiple smaller chunks. Additionally there were follow-up questions that would give a small sense of accomplishment progressing through and answering correctly. The narrative was also meant as a motivator for the player. To progress the story and see the relationship evolve between the character and his dad should work as a motivating factor.

- **Relatability:** Both the narrative and environment was made to ensure they were relatable for the students. It was important that they could see themselves in this scenario as this would both create more interest, but also make the learning seem more relevant to their lives.

- **Challenge & Skill:** This game was made for a gymnasium class and it was therefore crucial that everybody could participate. Therefore it was important to avoid requiring gaming experience to play the game. Every control was therefore as simple as possible and explained to the players from the beginning. This also meant that challenge and skill was not very prominent in the game design process in other ways than ensuring ease of use. This could harm some player types as they would like their skills tested but in this case it was more important for the game to be inclusive.

Before the final testing of the application the game was discussed with the teacher. It was important to make sure that the narrative was a good representation of how fiscal policies operated. It was also crucial to have the questions both in the questionnaire and in the game regarding fiscal policy to be correct which was ensured with the help of the teacher. With these questions corrected by the teacher we were ready to build and test the prototype on the class.

Findings

7.1 Statistical Analysis

The total number of participants represented throughout the findings will vary, as some participants partially answered the full questionnaire. For the experimental group n = 27 answered questions included in UES and control group n = 18. Questions related to fiscal policy n = 20 for experimental group and n = 16 for control. The experimental group had 31 participants where 20 finished, and control group had 20 starting participant where 16 finished. The t-tests described in this chapter used full questionnaire answers exclusively to keep the findings consistent.

Participants were asked a question regarding the amount of time they spend on video games on a weekly basis. The total number of participants included in the findings for this question is comprised of participants that answered the UES part of the questionnaire as it was deemed as the most relevant part of the questionnaire to compare with previous gaming experience.

Table 1: Cumulative frequency of answers for self assessment of time consumption of video games on a weekly basis: Experimental group outlined in grey and control group in white.

1=0-5 hrs weekly. 2=6-10 hrs weekly. 3=11-20 hrs weekly. 4=21-30 hrs weekly. 5=30+ hrs weekly.	1	2	3	4	5	Total
How much time do you spend on video games on a weekly basis?:	15	3	7	2	0	27
	6	3	6	2	1	18

Participants were also asked questions regarding their self assessed level of skill and interest in social studies. The total number of participants included for this finding consist of participants that answered the questions related to fiscal policy in the questionnaire.

Table 3: Cumulative frequency of answers for self assessment of level of skill in social studies: Experimental group outlined in grey and control group in white.

1=Strongly Disagree. 2=Disagree. 3=Neither Agree or Disagree. 4=Agree. 5=Strongly Agree.	1	2	3	4	5	Total
I am interested in social studies:	0	0	4	9	7	20
	0	0	2	5	9	16
I can answer correctly to most social stuies related questions:	0	0	5	13	2	20
	1	0	7	6	2	16

7.1.1   User Engagement Scale

The participants were asked questions about user engagement in the questionnaire with the aim of finding out whether the experimental group experienced an increased state of engagement in the game compared to the text book for the control group.

The data from the UES is separated into four categories, focused attention, perceived usability, aesthetic appeal and reward.

A Shapiro-Wilk test was performed on the data for both the experimental and control group to test for normality

Table 5: Normal distribution UES

Group	N	Statistic	df	Sig.
Experimental	20	.924	20	.117
Control	16	.925	16	.206

A test for normality indicates that the null hypothesis, that the data comes from a normally distributed population, can not be rejected for experimental group $p = .117$ and control group $p = .206$, and it can be assumed that the data from both groups stems from a normally distributed population.

A levene's test with the resulting p value = .249 suggest homogeneity of variance and the data was examined through independent samples t-test in SPSS (Statistical Package for Social Sciences) [84].

Table 7: Results of the student's T-Test for UES related items

Group	N	Mean	SD	t	df	Sig.	d
Experimental	20	3.68	.50	-2.48	34	.018	.46
Control	16	3.29	.40				

Significant difference was found in the UES t-test for the experimental group ($M = 3.68$, $SD = .50$) and the control group ($M = 3.29$, $SD = .40$) conditions; $t(34) = -2.48$, $p = .018$, ($d = .46$). The findings suggest that the use of a serious game supporting the classic textbook teachings about fiscal policies among gymnasium students, significantly enhanced the students engagement towards learning about the subject. The results are similar to the findings from previous research [2], [3], which also showed an increase in engagement and used an evaluation methods based on the UES. It can be argued that the significant difference in engagement is linked to the proposed framework from the theoretical contribution chapter and suggests that the framework can be used as a tool to synthesize a serious game for increased engagement among danish gymnasium students.

Table 9 presents the cumulative frequency of answers for the UES related items for both the experimental and control group.

Table 9: Cumulative frequency of answers for UES serious game based items: Experimental group outlined in grey and control group in white.

1=Strongly Disagree. 2=Disagree. 3=Neither Agree or Disagree. 4=Agree. 5=Strongly Agree.	1	2	3	4	5	Total	Mean	SD
Focused Attention:								
Q1.1: The time flew by while i learned about fiscal policies in the game/book	0	3	13	14	1	31	3.42	0.72
	0	4	11	5	0	20	3.05	0.69
Q1.2: I was immersed while learning about fiscal policies in the game/book	0	5	10	12	2	29	3.38	0.86
	0	4	10	4	2	20	3.20	0.89
Perceived Usability								
Q2.1: I was frustrated learning about fiscal policies in the game/book	3	14	7	5	0	29	2.48	0.91
	4	5	9	2	0	20	2.45	0.94
Q2.2: I was confused in the game/reading the book	6	9	6	7	1	29	2.59	1.18
	0	5	13	1	1	20	2.90	0.72
Q2.3: I was distracted while playing the game/reading the book	5	13	5	6	0	29	2.41	1.02
	0	1	8	9	2	20	3.6	0.75
Aesthetic Appeal								
Q3.1: Learning about fiscal policies in the game/book was interesting	0	2	7	18	1	28	3.64	0.68
	0	0	8	9	2	19	3.68	0.67
Q3.2: Learning about fiscal policies in the game/book was visually well communicated	0	0	6	15	6	27	4.00	0.68

	0	0	9	9	0	18	3.50	0.51

Reward								
Q4.1: Learning about fiscal policies in the game/book was worthwhile	0	2	8	13	4	27	3.70	0.82
	0	0	8	10	0	18	3.56	0.51
Q4.2: It was a rewarding experience to learn about fiscal policies in the game/book	0	0	9	17	1	27	3.70	0.54
	0	2	9	6	1	18	3.33	0.77
Q4.3: I became interested in the game/book	0	0	9	16	2	27	3.74	0.59
	0	3	9	6	0	18	3.17	0.71

The item from the UES that yielded the highest mean score (M = 4.00, SD = 0.68) was Q3.2 ("Learning about fiscal policies in the game was visually well communicated") from the 'Aesthetic Appeal' category for the experimental group that played the serious game. A total of n = 6 strongly agreed, while 15 agreed and 6 neither agreed or disagreed, that learning about fiscal policies in the game was visually well communicated. There were 0 negatively related answers to the question and it indicates that the aesthetics of the game was well fabricated. In the theoretical contribution chapter it was stated that aesthetic appeal is important to the target group [3]. While the mean score (M = 3.50, SD = 0.51) for the same question (Q3.2) was lower for the control group, the findings suggest that it can be potentially easier to increasing engagement through aesthetic appeal in a serious game and the students found the game aesthetically appealing.

The negatively loaded items in 'Perceived Usability' (Q2.1, Q2.2, Q2.3) yielded a lower mean score (M = 2.49) for the experimental group than for the control group (M = 2.92). In the item Q2.3 ("I was distracted while playing/reading the game/book") the mean for the experimental group (M = 2.41, SD = 1.02) was substantially lower than for the control group (M = 3.6, SD = 0.75). This indicates that the students were more prone to distraction while reading the book, than when playing the game, and the media of a serious game can potentially be utilized to keep the students engaged and not distracted while studying a subject. Also the item Q2.2 ("I was confused while reading the book") had a lower mean score (M = 2.59, SD = 1.18) for the experimental group, than the control group (M = 2.90, SD = 0.72). The findings suggest that the serious game were better at communicating clear goals as the students were less confused while playing the game than while reading the book.

While the experimental group scored better in 'Perceived Usability' than the control group, it does not seem to have carried over into the learning aspect as there was no significant difference between the two groups for the learning objectives. The experimental group answered correct on 57% of the questions related to fiscal policy (M = .57), while the control group scored 55% (M = .55), the serious game does not seem to have had any significant impact on the students learning capability compared to the textbook. This can potentially come down to how learning objectives were incorporated into the game. Even though the game was approved by the expert in terms of its fiscal policy related content, it does not seem to have had a significant effect on the students learning outcome.

In the 'Focused Attention' category for the UES, the experimental group had a small increase in the mean score (Q1.1: M = 3.42, SD = 0.72, Q2.2: M = 3.38, SD = 0.86) compared to the control group (Q1.1: M = 3.05, SD = 0.69, Q2.2: M = 3.20, SD = 0.89). While the increase is not a substantial amount, it still shows that the game were better at immersing the students, than the textbook. While most of the students (Experimental: Q1.1: n = 13, Q2.2: n = 10, Control: Q1.1: n = 11, Q2.2: n = 10) answered 3 (Neither Agree or Disagree) to the items

related to 'Focused Attention', there were more students that answered 4 (Agree) in the experimental group (Experimental: Q1.1: n = 14, Q2.2: n = 12, Control: Q1.1: n = 5, Q2.2: n = 4) and expressed a positive opinion towards the category. The students in the control group do not seem to have a strong opinion or know if the textbook immersed them while reading, which could also relate to their score in Q2.3 (M = 3.6) about their level of distraction while reading.

Again, in the category 'Reward' the experimental group ranked higher in mean score for all items related to 'Reward' (Experimental: Q4.1: M = 3.70, SD = 0.82, Q4.2: M = 3.70, SD = 0.54, Q4.3: M = 3.74, SD = 0.59), compared to the control group (Control: Q4.1: M = 3.56, SD = 0.51, Q4.2: M = 3.33, SD = 0.77, Q4.3: M = 3.17, SD = 0.71). Item Q4.3 ("I became interested in the game/book) had the biggest difference in mean score between the two groups (Exp M = 3.74, Con M = 3.17) among the items in the 'Reward' category. These findings indicate that the game is a more rewarding experience than the textbook in relation to engagement.

7.1.2 Learning Objective Items

The participants were asked some questions about fiscal policies in the questionnaire with the aim of finding out whether the experimental group better recalled the correct answers for the questions.

In the table below is shown the percentage of correct answers for each question: Q1-Q5 for both the control and experimental group. The questions are described more in detail below the table.

Table 11: Percentage of correctly answered questions about fiscal policy

Group	Q1	Q2	Q3	Q4	Q5	Mean
Experimental	45%	75%	50%	25%	90%	57%
Control	56%	50%	56%	19%	94%	55%

The questions in the table above are as follows:

- Q1: How do you lead an expansive fiscal policy?

- Q2: What effect does an expansive fiscal policy have?

- Q3: How do you lead a contractionary fiscal policy?

- Q4: What effect does a contractionary fiscal policy have?

- Q5: What is the gross domestic product?

These questions are used to investigate success criteria outlined in the Introduction chapter. Questions Q1 and Q2 are the questions aimed towards success criteria 4, Q3 and Q4 are also aimed towards success criteria 4 and Q5 is aimed towards success criteria 6.

Statistical analysis was made on these questions to find out whether or not the difference between the control and experimental group are significant.

Table 13: Normal Distribution for learning objective related items

Group	N	Statistic	df	Sig.
Experimental	20	.823	20	.002
Control	16	.917	16	.149

A Shapiro-Wilk test indicates that the null hypothesis, that the data comes from a normally distributed population, can be rejected for experimental group $p = .002$ and can not be rejected for control group $p = .149$, and it can be assumed that the data from both groups does not stem from a normally distributed population.

A levene's test $p = .184$ suggest homogeneity of variance, but due to the experimental group not being normal distributed, the data did not meet the requirements for a parametric statistical test. Therefore the data was examined through a Mann-Whitney U Test

Table 15: Results of the serious game based and textbook-based group for learning objective related items

Group	N	Mean Rank	Sum of Ranks	Mean	U	Z	Sig.	r
Experimental	20	18.58	371.50	.57	294.500	-.049	.962	.008
Control	16	18.41	294.50	.55				

The mean value represents the percentage for the amount of correct answers the participants had. Significant difference was not found among the items related to the learning objectives for the experimental group ($M = .57$, $n = 20$) and the control group ($M = .55$, $n = 16$) $u = 294.500$, $z = -.049$, $p = .962$, $r = .008$. The results indicate that the experimental and control groups are similar to each other regarding their knowledge about fiscal policy.

In the introduction we outlined 5 success criteria. The table below is evaluating upon these:

Table 17: Results and assessment of success criteria

Success Criteria	Results	Assessment
The teacher found the game to be a positive addition to the teachings about fiscal policy.	The teacher found the game to be a positive addition to the teachings about fiscal policy.	The teacher was positively outspoken towards the game and was satisfied with the coverage the game had on appropriate areas of fiscal policy and how the policies affects the economy. The teachings in the game was well fitted to the curriculum and had an appealing aesthetic. The teacher also stated that an aspect of competition could make the game more appealing to the male students.
70% of the students in the experimental group was engaged while playing the game	60% of the students in the experimental group was engaged while playing the game	The students in the experimental group was not engaged to the extend set by the success criteria. Inclusiveness is difficult to achieve and with multiple students types that prefer different teaching methods it is a hard success criteria to attain. The game was more successful at engaging the students than the textbook, which the findings from the t-test revealed, where the experimental group were significantly more engaged than the control group. The game can still be improved upon in terms of engagement and taking inclusiveness into account can benefit the outcome.
70% of the students in the experimental group were interested in learning about fiscal policy through the game	70% of the students in the experimental group found learning about fiscal policy through the game to be interesting	The serious game has helped students to find it interesting to learn about fiscal policy
70% of the students in the experimental group answered the questions regarding expansive and contractionary fiscal policy correctly	59.5% of the students in the experimental group answered the questions regarding expansive fiscal policy correctly 37.5% of the students in the experimental group answered the questions regarding contractionary fiscal policy correctly	The serious game failed to teach the students about expansive and contractionary fiscal policy to an adequate extend. Early testing with focus on fiscal policy could have given insight on where the implementation of fiscal policy went wrong. The students did not manage to pick up the teachings about fiscal policy that were taught throughout the game, to a satisfactory degree.

70% of the students in the experimental group were motivated to continue reading about fiscal policy through the game	65% of the students in the experimental group were motivated to continue reading about fiscal policy through the game	The serious game were not capable of motivating the students to continue reading about fiscal policy through the game, to a satisfactory level. A more extensive implementation of fiscal policy into the game could have benefited the outcome.
70% of the students in the experimental group answered the question regarding gross domestic product correctly	90% of the students in the experimental group answered the question regarding gross domestic product correctly	The serious game has helped students understand the term gross domestic product

The results from Table 17 were grounded in items included in the questionnaire that were added with the purpose of answering the success criteria. All of the fiscal policy related success criteria had dedicated questions aimed at answering the individual success criteria, whereas the engagement related success criterion result was derived from the UES items. All of the positive entries in the UES for the experimental group was summed (172) and compared to the total amount of answers for each item (283)

$$\frac{172}{283} * 100 = 60.78\% \tag{1}$$

The questionnaire for the experimental group also contained 10 usability related items. These items were added to the questionnaire in order to measure the students ability to play the game. They were intended to be compared with the additional findings (UES, learning objective items) and see if the results match. If the students had an exceptionally low score in both UES and learning objective items, we could expect the usability score to also be in the low end.

Table 19: Cumulative frequency of answers for usability related items

1=Strongly Disagree. 2=Disagree. 3=Neither Agree or Disagree. 4=Agree. 5=Strongly Agree.	1	2	3	4	5	Total
I would recommend the game to other students that needs to learn about fiscal policy	0	2	11	12	2	27
I think the game was fun	0	1	11	12	2	27
It was easy to navigate in the game	1	1	8	13	4	27
It was easy to play the game with WASD/arrow keys	0	3	6	10	8	27
I understood the assignments i was given in the game	0	1	3	17	5	26
It was easy to read the text in the game	0	0	3	15	8	26
The teachings about fiscal policy was easy to understand	0	0	4	16	6	26
I always knew what to do in the game	0	3	5	11	6	25

The game left me with a good understanding of booming economy	0	0	5	17	3	25
The game left me with a good understanding of economic recession	0	0	5	16	4	25

The game received an overall positive usability score with 0 to maximum 3 negative scores for each item. It also matches with the significant increase in engagement for the experimental group. The findings also suggest that it was most likely not due to usability issues that the students did not score well in the learning objective related items.

7.2 Qualitative Analysis

The qualitative data consists of interviews conducted with test participants right after they had played the game and answered the questionnaire.

Transcriptions of the interviews were coded by two coders. One of whom had been a part of the interview process and the other one not. The themes in the coding were predefined and found together by the coders looking through the transcriptions and finding relevant themes for statements before the coding process began.

Table 21: Content analysis showcasing frequency of statement types. Examples are given followed by the ID of the interviewee who said it.

Themes	Category	Frequency	Examples
Feedback	Positive	7	It was manageable and easy to navigate and find out what you needed to do. (ID: 1 (Male))
	Negative	1	There was a time where it said, "infiltrate your dads office" and i didn't know what that meant (ID: 3 (Female))
Immersion	Positive	21	I was very immersed. From the very start I was already deep in the game, so I found myself being easily immersed in the game. (ID: 1 (Male))
	Negative	4	There was a lot of walking back and forth which could get a bit homogeneous. (ID: 4 (Male))
Aesthetic Appeal	Positive	6	I feel that the graphics were realistic and were directed at us, opposed to if it had been cartoonish. (ID: 8 (Female))
	Negative	3	It would have been cool to see some of the characters in the story. (ID: 8 (Female))
Motivation	Positive	21	The fact that i was required to answer correctly to progress in the game motivated me to learn. (ID: 6 (Female))
	Negative	5	It could have been cool if when I finished, I was able to progress to further levels. (ID: 8 (Female))
Usability	Positive	12	I did not experience any bugs or inconsistencies in the game. (ID: 1 (Male))
	Negative	14	It was like the game was not tuned to my screen size. Sometimes text went out of the screen. (ID: 3 (Female))
Learning Outcome	Positive	27	The game relates well to what we were taught in class so the difficulty was fine. It was pretty easy but not to a degree of boredom. (ID: 2 (Female))
	Negative	10	I don't think the game would yield the same return as from reading 10 pages. I would find it more fun but not learn as much. (ID: 6 (Female))
Novelty	Positive	36	The game was a good introduction to the material instead of having to read it. It was a lot cooler to learn about it through the game. (ID: 8 (Female))
	Negative	0	
Relatability	Positive	11	I liked the texts in the game. You could feel the game was targeted towards us which was nice. (ID: 4 (Male))
	Negative	0	

From the table above it is clear that some of the most discussed topics in the interviews were: Novelty, Learning

Outcome and Usability. Statements about novelty were mostly about comparing the game to the traditional learning style in the school and how the game compared to this style. An example of these statement:

"I just think that the idea is really good. It can make classes a bit different and it is a good way to avoid always having to bury your head in a book" (ID: 2 (Female)).

Learning Outcome statements often revolved around comparing what was learnt from the game and how efficiently it was learnt, to the traditional learning outcome from reading in a book. Many statements mentioned that the game works well as an introduction to the subject but does not give as in-depth knowledge as a book has the potential to do. An example of such a statement:

"One thing that was not optimal was that the game could not cover the subject as well as a textbook. At least not in the same way" (ID: 4 (Male))

Usability was the only theme that had more negative statements than positive ones. This was due to multiple issues regarding the game. A big issue was that the game was created for screens with a resolution of 1920x1080. Most laptops share this resolution but there are some that don't. Laptops with another resolution could when playing the game experience text that were not fully on the screen and therefore not being able to read it. This caused issues for some as they would not know how to progress the game due to a lack of information. An example of a statement regarding this:

"I am not sure if it was due to me having an old PC or if I accidentally zoomed in, in the game but I could not see the 'Press Q' prompt that I needed to continue" (ID: 7 (Female)).

Another usability issue was the process of downloading the game. The link the students had been sent by their teacher to download the game was not sent as a hyperlink. This meant that a long URL had to be typed in manually by the students. This resulted in many students not having played the game as homework and instead had to play it in class. An example of a statement talking about this:

"I think the reason many had not played the game as homework was the download process. If they had known what to do and done it before more people would have played the game as homework. (ID: 2 (Female))

By calculating Cohen's kappa we found the reliability to be 0.86, which according to Burla et al. [85] suggests a perfect agreement. Satisfactory agreement for Cohen's kappa lies between a value of 0.40 and 0.60. If the value becomes higher than 0.80, perfect agreement is achieved. To calculate Cohens kappa we followed the equation:

$$K = Ao - Ae/1 - Ae$$

Using our data from the intercoding the equation becomes this:

$$K = 16 - 110/1 - 110$$

16 being the amount of statements the coders categorized differently, and the 110 amount is the amount of agreement found by chance.

Summary of The Main Findings from the student interviews:

- The students were pleased with the aesthetic design of the game.

- The students were immersed throughout the game experience.

- To see the consequences of your actions in the game was rewarding.

- Ease of access and use is crucial especially if the game is part of a homework assignment. Small inconveniences can quickly result in students deciding not to play.

- Usability issues with screen size caused issues for some students. Especially for those with an older laptop.

- The game works well as an introduction to the subject or a supplement to use together with the book as the book is more elaborate.

- The students were very interested in finding alternatives to the classic ways of learning through a book and listening to lectures.

- The narrative in the game worked well and the students really enjoyed that it seemed relevant and relatable for their own life.

- The gameplay was too repetitive for some students.

Following the student interview we interviewed the teacher of the social studies class who had helped throughout the process of designing the game. The interview was aimed to evaluate on the process and find out if he found this type of activities to be a worthwhile part of his class.

The Main Findings from the Teacher Interview:

- The game was well fitted to the learning objectives of fiscal policy from the curriculum.

- The students are very interested in trying new forms of learning activities in class such as this game.

- Most other subjects in the gymnasium has the same lack of student motivation that could potentially be addressed with new forms of learning e.g. through a game.

- The boys in the class could potentially have been much more motivated had there been an element of competition in the game.

- There are many different student types and not all would benefit from a game. It is however important to accommodate the different student types and their preferred way of learning.

- It is important for the students to relate to the subject. This can be difficult to ensure as a teacher.

- The game created discussion amongst the students which helped increase learning as students had to explain what they had learned to each other.

The interview made it clear that the teacher found the game to be a success for his class. It also became clear that many students enjoys alternative forms of learning in class and that the best ways for students to learn differs widely from student to student as described in the following statement:

There are different types of students who learn differently from each other. Some student types probably learn really well from the game and others do not. (Teacher)

The teacher also explained how it was not only in social studies that students had a lock of motivation and engagement towards learning and that a game could also potentially be helpful in other subjects:

I could imagine that the lack of motivation probably is the same in all subjects, but perhaps it would be easier to create games for subjects that are more exact with more precise answers. (Teacher)

Discussion

The difference in mean score for the items related to fiscal policy in the 'Reward' category of UES (Experimental: Q4.1: M = 3.70, Q4.2: 3.70, Control: Q4.1: M = 3.56, Q4.2: 3.33) is less impactful than Q4.3 (Experimental: M = 3.74, Control: M = 3.17). It elicits the question if the students experienced the game more as an engaging gaming experience, rather than an engaging learning experience. This is also supported by the insignificant difference in mean score for the learning objective related questions about fiscal policy in the questionnaire. Why the serious game did not manage to fulfill the success criteria outlined in the introduction can be argued. It is possible the implementation about fiscal policy in the game was done poorly and the game failed at conveying the theory behind fiscal policy. The game was played through with the observance of the teacher and every aspect about fiscal policy and the game as a whole was approved by the teacher. It is, however, noteworthy to mention that the game did not perform worse than the textbook. Another possibility is the performance and work morale of the students in the classes. The students were all in progression of learning about fiscal policy and according to the teacher, would have already covered the topic of fiscal policy. If the students did not do their assigned homework prior to the testing of the game, they can be expected to perform poorly. To reiterate, the game was not designed to stand alone, but should assist the teachings that have already been established by the teacher. Therefore, it was expected that the students already had prior knowledge about fiscal policy. Another notable condition is the fact that as part of the testing the students had been instructed to play the game from home and answer the questionnaire in preparation for a lecture. One student managed to do so, and it was therefore decided in collaboration with the teacher, that researchers would help the students in class with completion of the game and questionnaire. One of the reasons that only one student managed to play the game and answer the questionnaire from home can possibly be explained by the fact that several students complained about complications with downloading and getting the game to work. 31 students were part of the experimental class and 20 managed to complete the game and questionnaire. The students were informed that the participation in the test would not influence their grades. This can possibly be one of the reasons behind the low participation rate and the students might not have been interested in participating in the test, since it would give them no incentive to complete the test. The students might have found the gaming experience fun and engaging but neglected the parts of the game that taught them about fiscal policy.

Another possibility can be the wording of the fiscal policy theory in the game and fiscal policy questions in the questionnaire. In Q2.1 ("I was frustrated learning about fiscal policies in the game") 5 students out of 29 answered 'agree' to the statement. Even though the students did not generally have a frustrating experience learning about fiscal policies in the game they still had a low percentage of correct answers of 57%. Naturally one

would think that given the low percentage of correct answers students would have a hard time understanding the theory behind fiscal policy that was taught in the game, and therefore have a frustrating experience, which is in contradiction to the findings of just 5 students feeling frustration. One of the elements leading to the contradicting findings could potentially be respondent fatigue as the fiscal policy related questions were in the latter part of the questionnaire. In combination with the fact that student were explicitly informed that the test would not affect their grades in any form, the students might not have bothered with the questionnaire as they grew tired of answering the questions. Even though we utilized the UES SF to counter this problem, it might not have been sufficient.

One of the shortcomings when creating the serious game, was the involvement of the teacher. We were given a lot of freedom to create the game. Boundaries in terms of the implementation of the fiscal policy theory into the game could potentially have helped with disseminating the theory. It is possible the teacher viewed the project as a different input to the conventional teaching methods, that could motivate the students, and therefore were not too concerned about the educational content. When interviewing the teacher it was clear that an important aspect for him was to access a different form of learning as there were many students wanting alternatives to the classical forms of learning. In the interview the teacher also focused on students having different preferred forms for learning and therefore the more options he had the better education he could give to a larger amount of students.

With the different student types in mind this could be an aspect to look at when creating games. In this specific case there was a lot of focus on making the game inclusive and be approachable for everyone. This benefited unexperienced gamers but came at the cost of the more experienced gamers. To make games with a target group of specific student types could potentially increase the chances of success with both enjoyment, engagement and learning outcome. Interviewing the teacher made an example of this clear.

"I think the boys typically appreciate a little competition while some girls may find it unpleasant" (Teacher Interview)

This example shows that including competitive elements in a serious game can greatly increase engagement from certain student types while on other students it will have the opposite effect. It is therefore important to know exactly who the game is for and to narrow down the target group as much as you can when building the foundation that you will base the design of the game upon.

The approach with student interviews utilizing friendship pairs was overall successful and it seemed as if students had good conversations and were not afraid to express themselves. The friendship pairs also resulted in an inflation of statements in the way that the students would often say that they agreed with a previous statement. This would be counted as a statement in itself and resulted in some very high frequencies in e.g. positive novelty statements. It could be argued whether or not these agree statements should count or not but they definitely do suggest their attitude and was therefore counted.

Intercoder reliability was used on the coding of the student interviews as a measurement for how much the two coders agreed on the codings. The use of the ICR resulted in a score of 0.86 and while this suggests perfect agreement the coding should still be discussed. ICR was in this case also used as a way to ensure that codings that differed between the two coders was focused on and discussed to utilize the aspect of having multiple people with slightly different outlooks looking through the transcriptions. This can highlight potential themes that may be too similar or not as well defined as they should be. A critique of using the ICR is that even though multiple coders are used their unique or diverse perspectives do no come to fruition in such a rigid approach.

The questionnaire for the experimental group was designed with additional questions for usability purposes. The idea was to use them as control questions if the other findings had shown to fail miserably. The questionnaire contained 10 usability questions and the results was positive. Some of the questions were targeted at how well the game conveyed the teachings of fiscal policy. One of the questions ("The teachings about fiscal policy was easy to understand") had 0 negative responses, and out of the 26 responses, 16 agreed to the statement and 6 totally agreed. However, when it came to the results for the learning objective items, the students had 57% correct answers on average. The findings from the usability question and learning objectives are conflicting. The students states that they found the theory easy to understand but failed to get the answers correct to the questions involving the same theory. Also when examining another question from the questionnaire ("I can answer correctly to most social studies related questions") the students seem confident about their knowledge regarding fiscal policy as 13 students agreed to the statement and 2 totally agreed out of 20 students in total. It elicits the questions if the learning objective questions were poorly formulated to the extend that the students could not fathom the questions. The learning objective questions were formulated and approved with help from the teacher over multiple iterations, but it is possible that they still were not good enough for the students to comprehend. Having multiple teachers or experts formulating the questions in collaboration could possibly benefit the outcome. Early testing of the questions on the target group could also assist with validity of the questions and make sure the students understand them. It can be challenging to produce the same learning outcome when transition from one media to another, such as the example for this project (from textbook to game). Another approach could be illuminating thematics rather than trying to achieve the same goal with a game, as a textbook does.

Conclusion

We conclude this report with a summary of the primary findings. We outlined several objectives in the introduction of this report that can now be evaluated.

- The teacher explained in an interview that the game was a positive addition to his teachings about fiscal policy.

- 60% of the students in the experimental group was engaged while playing the game, which did not fulfill the success criteria set to 70%, however findings still showed that the game was significantly better at engaging the students compared to the textbook.

- 70% of the students in the experimental group found learning about fiscal policy through the game to be interesting. The success criteria was therefore met as it was set to 70%.

- There was no significant difference in the students knowledge of fiscal policy in the control and experimental groups (E=57%, C=55% correctly answered the questions regarding fiscal policy). The success criteria at 70% was therefore not met.

- 65% of the students in the experimental group were motivated to continue reading about fiscal policy through the game. The success criteria at 70% was therefore not met.

- 90% of the students in the experimental group answered the questions regarding gross domestic product correctly and exceeded the success criteria at 70%.

Furthermore, it can be concluded that the serious game developed by using the proposed framework of this report, did significantly increase the engagement of the students in learning about fiscal policy in social studies in a danish gymnasium. While this does not guarantee the framework a success, it indicates a possibility of the framework being a positive and usable tool in the design process of a serious game intended to increase engagement. Based on participants responses the game was well fabricated visually, caused students to be less distracted and was a more rewarding experience than reading the textbook. This did however not lead to an increase in learning outcome. As the focus of this report was exploring the possibility of a serious game to increase student engagement and not necessarily learning outcome, we recognize this project as a positive presence in social studies in the danish gymnasium. We can conclude that the learning content in this serious game, did not produce an increase in student knowledge of fiscal policy. The teacher approved of the game and saw it as a positive addition to the teachings in fiscal policy.

In research, there also remains much more attention towards how to evaluate serious game targeting students in the gymnasium. There are still some important challenges in how to increase the validity and reliability when evaluating serious games when gymnasium students are the users and the form of evaluation should be considered. Participants, including the teachers, should be motivated and want to participate – also in the evaluation part. Further, which method should be used, and how to ask the right type of questions, aligned with the students' capacity for being reflective (or not) in relation to his or her behavior and habits. There are also limitations to generate significant evidence and insights regarding students' learning of fiscal policy via serious gaming. First, a much higher number of participants is needed, and further experimental and control groups should be included in the research design. Second, further details on the identification of the participants are needed (e.g., their confidence in serious gaming and game genre preferences, current knowledge, motivation, expectations, and technology acceptance). It is important to emphasize that there is no established taxonomy of serious gaming, and serious games are still diverse in their outcomes and certainly understudied as a means to provide knowledge about fiscal policy. It would also be interesting to create different options in the game design for targeting different kinds of learning styles, as well as to make the game more personalized with the inclusion of the participants' own knowledge and motivation.

Chapter 10

Future Works

In order to iterate on this project, we outline issues in our attempt to increase engagement in students in the Danish gymnasium in the subject of fiscal policies as part of the curriculum in social studies. These issues include:

- A lack of emphasis on the use of expert consultation.

- Small sample size of both evaluation groups.

- Maintaining a suitable balance between elements of fun and educational content in the design of the serious game.

Future work should recognize these issues to achieve a better result.

As outlined by previous work [2], [3], [20], [30], proper involvement of teachers when designing a serious game for educational purposes can be a vital component to ensure the products success. With further development of this game it would be beneficial to facilitate workshops with teachers to ensure the quality of the educational content in the game instead of having the teacher accept an example made by the designers.

Another factor in this project that could pose a problem to the findings was the small sample size. The smaller the sample size the more inaccurate the p-value from the t-test will be. In order to better assess the outcome of the p-value, future work should include more participants and an equal distribution of control and experimental test participants.

We recognize that the serious game did not increase student knowledge in regards to fiscal policy and the experimental group and control group scored roughly the same in this category (57 % and 55 % respectively). We argue this being the result of a lack of educational content in the game. Unfortunately, this relates to a limited dialogue with the teacher and resulted in minor feedback and therefore fewer iterations of the educational content in the game. It is therefore clear, that better involvement of experts in future work is evident in order to improve this metric. Furthermore, future work should emphasise educational content in the serious game to better communicate the curriculum of fiscal policy.

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Chapter 11

Appendices

In addition to this Appendix a ZIP file will be delivered alongside the report. This will contain additional documents such as full length scripts from the game, calculations of statistical tests and the AV Production.

11.1 Student Interview Transcriptions

11.1.1 Students Interview 1

Interview 1. Participant ID's 1-3.

Daniel: Hvad synes i overordnet om spillet?

Person 1 (Mand): Jeg kunne godt lide det og grafisk så det godt ud i den grad. Det var overskueligt og nemt at finde rundt og finde ud af hvad man skulle.Men jeg ved ikke om det var en demo, men det var lidt kort også til gengæld.

Daniel: Det var det, det er lidt hurtigt lavet, vi havde ikke alverdens tid til at lave det, og vi havde en tidsramme at det skulle være færdig til den her uge, så der var nok lidt bugs med hvor det ikke virkede 100

Person 1 (Mand): Det oplevede jeg ikke

Person 2 (Kvinde): Jeg synes også bare at helt generelt ideen er mega god. Det kan godt være lidt forskelligt i undervisningen og det er en god måde at gøre det på så man ikke bare altid sidder med hovedet nede i en bog

Person 3 (Kvinde): også fordi man kunne se konsekvenserne af det man gjorde

Person 2 (Kvinde): Ja lige præcis

Person 3 (Kvinde): Hvis man lige var lidt i tvivl, så "nåh jah så blev billetten dyrere så"

Daniel: Okay, og det kunne i godt lide med det der visuelle?

Person 2 (Kvinde): Så husker man det lidt mere, så får man det lige banket ind i hovedet

Person 3 (Kvinde): At der ikke bare står, skatten bliver hævet

Daniel: Okay, så man faktisk kan se konsekvenserne af de valg man tager?

Person 2 (Kvinde): Ja præcis.

Daniel: Var det nemt at læse teksten i spillet?

Person 2 (Kvinde): Altså instruktionerne osv? eller bare alt?

Daniel: Ja bare alt tekst i spillet

ALLE: *taler i enighed i munden på hinanden*

Person 2 (Kvinde): Ja det var meget godt man ikke blev overvældet af alt mulig tekst i spillet men det var meget kortfattet og godt

Person 3 (Kvinde): Der var på et tidspunkt hvor der stod, "infiltrer din fars kontor" og jeg anede ikke hvad det betød, men det var bare sådan en lille ting, man kunne sagtens læse hvad der stod på selve teksten

Daniel: Ville i spille spillet igen for at forstå emnet bedre, eller ville i hellere læse det igennem bogen?

Person 2 (Kvinde): Det var jo ret lidt opgaver man fik ift begreber, men de 4 der var, dem har jeg nogenlunde styr på nu, både på grund af undervisningen, men nu også på grund af spillet. Men hvis der var flere forskellige ting kunne jeg godt tænke mig at spille det igen.

Person 3 (Kvinde): Vi ville nok ikke spille den her version igen, fordi nu ved vi jo godt hvad det er, så ville det være nemmere bare lige at slå op i en bog, men man kunne godt putte flere begreber ind i samme spil.så der var nogle andre ting fx i køkkenet eller lignende

Daniel: Så det var lidt for generelt spillet? Der var for få begreber, ville i gerne have haft det lidt mere udvidet?

Person 3 (Kvinde): Man kunne godt til en 2'er hvis det skulle være

Person 2 (Kvinde): Ja præcis, jeg tror man kunne bruge det i mange situationer, fordi, med samfundet og politik der er mange forskellige ting der bliver påvirket af forskellige ting

Person 1 (Mand): Jeg ville sige det samme

Daniel: Okay, Så går videre til næste. Fungerede spillet godt i undervisningen og ville i anbefale det til andre lærere som undervisningsmateriale?

Person 1 (Mand): Jeg tænker da at min bror han sagtens kunne spille det der og lære noget af det.

Person 2 (Kvinde): Jeg synes også det var en ret god måde det var lavet på, for da man hørte det var et spil så var jeg lidt bange for det var sådan et eller andet børnespil. Men det var faktisk meget godt og jeg huske at da man var mindre var man jo meget glad for sådan noget som matematik i måneby fordi det var lidt en pause fra det normale, så sådan noget som det har man faktisk savnet lidt.

Person 3 (Kvinde): Det tog måske lidt langt tid i forhold til at lave det i undervisningen, der var meget langt mellem tingene, fra telefonen til kontoret, det tog lang tid imellem. Men man gik meget frem og tilbage, så hvis man skulle spille det i undervisningen så gøre afstanden kortere, så man ikke skulle ud på toilettet (i spillet)

Daniel: Altså når du nu siger undervisningen, mener du så i selve klassen?

Person 3 (Kvinde): Der var lidt spildtid, så man holdt piletasterne nede og gik ind i rum.

Daniel: Så du ville bare gerne hurtigere til sagen eller?

Person 3 (Kvinde): Ja eller bare gøre så alt er i et rum så man ikke skal så langt.

Person 2 (Kvinde): Men det kunne også være en fed ting at have for som lektie, i stedet for at sidde og læse i en bog fordi du ender med bare ikke at få det gjort.

Person 3 (Kvinde): Det var hyggeligt at sidde og spille

Person 2 (Kvinde): ja det synes jeg også

Daniel: det var godt at høre. Blev i opslugt af spillet?

Person 1 (Mand): Altså jeg blev i den grad. Jeg skabte mig først et overblik og så kom beskeden med hvad man skulle og så var jeg allerede dybt inde i spillet. Så jeg synes jeg blev rigtig nemt opslugt af det

Person 3 (Kvinde): Man blev indtil man var færdig

Person 2 (Kvinde): Ja det synes jeg også jeg blev

Daniel: Var der nogle ting der distraherede jer? Enten inden eller udenfor spillet? Nu sad vi jo i en klasse var alle snakker osv, men ja

Person 1 (Mand): Nej jeg blev nemt opslugt, men det kan godt være det bare er mig

Person 3 (Kvinde): Det var meget overskueligt

Daniel: Ja okay, så i føler ikke der var noget der tog jer væk fra selve oplevelsen?

Alle i enighed: Nej

Daniel: Synes i spillet var for nemt?

Person 2 (Kvinde): Nej det synes jeg faktisk ikke

Daniel: Det kan både være sådan navigerings mæssigt, men også fagligt

Person 2 (Kvinde): Ja. Altså fagligt det relaterer sig jo meget godt til det vi har om, så selve niveauet var fint og det var også nemt at finde ud af hvad man skulle, men ikke sådan så man sad og tænkte at det var kedeligt at trykke rundt.

Person 3 (Kvinde): Jeg synes samfundsfag passede meget godt i niveau, jeg synes det var lidt svært til at begynde med for at få spillet til at virke, men nu spiller jeg heller ikke så meget computer. Men jeg så på en andens computer, at hun havde tryk q for et eller andet eller e for noget andet, men det ved jeg ikke om det var ikke var på min computer, men jeg sad sådan og prøvede at trykke på alle knapperne uden at finde ud af.

Daniel: Der kom ikke nogle instrukser frem i starten?

Person 3 (Kvinde): Der stod man kunne bruge piletasterne, men der stod ikke man skulle trykke på e og q som var de man skulle trykke på

Person 2 (Kvinde): man skulle rykke tættere på

Person 3 (Kvinde): Men så da jeg kom til køleskabet stod der tryk på e, men jeg startede bare med at gå rundt så jeg tænkte bare "hvad fanden skal jeg herinde"

Daniel: Okay så du ville gerne have vidst fra start at man skulle trykke e og q på de forskellige ting?

Person 3 (Kvinde): ja, men det kunne bare stå under det med piletasterne

Person 2 (Kvinde): Ja det er faktisk rigtigt nok det kunne man godt

Person 3 (Kvinde): Ja for jeg trykke vitterligt på hele tastaturet før der var noget der virkede.

Daniel: var spillet sjovt?

Person 1 (Mand): Ja igen, jeg synes det fangede min opmærksomhed så selvfølgelig var det også sjovt.

Person 2 (Kvinde): Jeg synes også det var meget godt tænkt med at det var en roskilde billet og det var med øl osv. i stedet for det bare var i en bog så jeg synes det var meget godt tænkt

Daniel: så det var fedt med nogle relaterbare emner der passede til målgruppen man laver spillet til?

Alle i enighed: Ja det var

Daniel: Synes i det var en ny måde at lære emnet på?

Person 1 (Mand): Ja i den grad. Normalt skulle vi kigge i en bog og kun kigge på teksten, mens her der skulle vi nærmest opleve det hvis man kan sige det sådan

Person 2 (Kvinde): Det synes jeg også

Person 3 (Kvinde): Det var fedt at se konsekvenserne af ens handlinger

Daniel: Det var måske en af de største take-aways fra spillet? At man kunne se hvilke konsekvenser det havde ved at føre en af de her forskellige politikker?

Alle i enighed: Ja

Daniel: Kunne i så lide at lære om det på den her måde?

Alle i enighed: Ja det kunne vi

Daniel: Hvad synes i om at det var en lektie og ikke en del af undervisningen? Nu var der jo mange der ikke havde lavet det som lektie så det blev en del af undervisningen.

Person 2 (Kvinde): Jeg tror den eneste grund til at de fleste ikke havde lavet det var fordi det skulle downloades, men hvis man på forhånd vidste hvordan man gjorde osv ville flere gøre det. Daniel: Så hvis spillet var mere tilgængeligt og man ikke skulle igennem en masse forskellige instrukser for at få gang i spillet?

Person 3 (Kvinde): Ja og hvis man ikke skulle skrive linket til dokumentet med alle tegn osv.

Daniel: Ja forståeligt

Person 3 (Kvinde): Det tog lidt tid at få skrevet ind, var det et stort i eller et lille L. Men det var meget rart at lave det derhjemme, bare at have fin tid til det. Man hørte ikke spoilers fra de andre, man var nødt til selv at finde ud af det hele

Daniel: Så det er det gode ved at have det hele for sig selv?

Alle siger ja i enighed

Daniel: Havde i nogle problemer ved at styre rundt i spillet?

Person 3 (Kvinde): Ja

Daniel: Ja du havde, det var noget med nogle problemer med at interagere med ting

Person 3 (Kvinde): Ja men det løste sig hurtigt

Daniel: Ja okay men du ville måske gerne have haft at det var lidt mere brugervenligt fra start?

Person 3 (Kvinde): Ja hvor der bare stod hvad tasterne gjorde

Daniel: Var der noget der gjorde det irriterende eller sværere for jer at komme igennem spillet?

Person 2 (Kvinde): For dig (Person 3 (Kvinde)) var det måske lidt det med at finde ud af tasterne, men jeg oplevede ikke noget

Person 1 (Mand): Nej samme her, jeg oplevede ikke noget der var irriterende

Person 3 (Kvinde): Ikke andet end afstanden fra kontoret til spisebordet, men det var bare det. (griner), men nej det var fint, det var meget fint

Daniel: Var der noget i synes fungerede mindre godt i spillet som i mener man kunne have forbedret?

Person 2 (Kvinde): ikke sådan nogle store ting, kun småting.

Person 3 (Kvinde): Ja der var ikke nogle store ting, kun de små som vi nævnte. Det ville fungere fint sådan her, men fedt hvis man havde mere tid til at finpudse det. Det er måske bare en lille detalje, men det var som om at det ikke var afstemt til skærmen. På min skærm så stod der nogle gange noget tekst uden for skærmen. Daniel: Ja det er et problem, det kommer lidt an på hvilken aspect ratio man kører på sin egen computer

Person 3 (Kvinde): Altså man kunne sagtens se det, det var bare en lille detalje

Daniel: Har i ellers nogle andre kommentarer til spillet? Eller oplevelsen?

Person 1 (Mand): Jeg har sikkert sagt det men, jeg synes det var meget kreativt og en meget god og anderledes måde at tage undervisningen på.

Daniel: Var det noget i kunne tænke jer, hvis vi nu ikke kun tager udgangspunkt i vores spil, men måske bare spil generelt, ville det så være en måde at lære på i kunne tænke jer at prøve igen?

Person 2 (Kvinde): Helt klart, helt klart

Person 3 (Kvinde): Ja og altså også som lektier, altså at sidde derhjemme, i stedet for at sidde og læse noget, det ville måske ikke fungere så godt hvis man sidder ovre i skolen og laver det, fordi det tager så lang tid, men at sidde derhjemme og se nå jeg skal have styr på de her to begreber, sætter lige lidt tid af til at spille

Person 2 (Kvinde): Man opfatter det ikke som lektie på samme måde

Person 3 (Kvinde): Ja det var faktisk rigtig godt

Daniel: Så det her med at have det som et spil i stedet for noget man skal læse som lektie, det kunne helt klart være noget i gerne ville prøve igen?

Alle i enighed

Daniel: Super, men i skal have tusind tak for jeres hjælp

11.1.2   Student Interview 2

Interview 5. Participant ID's: 4-6

Gustav: Det her er en fri dialog så i er frie til at komme med jeres meninger og holdninger omkring spillet og i skal ikke være bange for at sige noget forkert eller tale i munden på hinanden, men selvfølgelig også give plads til at alle kan få lov til at sige noget. Hvad synes i overordnet om spillet?

Person 4 (Mand): Jeg synes det var sjovt at spille, jeg kunne godt lide de der beskeder. Man kunne mærke at vi var modtagergruppen og det var fint ramt. Det eneste jeg vil sige er at der var meget gåen frem og tilbage og det kunne godt blive lidt ensartet

Person 5 (Kvinde): Jeg synes det var formidlet ret godt til vores målgruppe det der med at det er relaterbart, og man tænkte ikke rigtig over at man lærte ting men man prøvede at klare sig igennem så godt man kunne og det synes jeg fungerede meget fint.

Gustav: nu siger du det der med at du ikke lagde mærke til du lærte noget

Person 5 (Kvinde): Ja men det var ikke sådan, jeg lærte stadig

Gustav: Så det var passiv læring?

Person 5 (Kvinde): Ja lige præcis

Gustav: Synes i det var nemt at læse teksterne i spillet, som sms'erne og den gule seddel?

Alle siger ja i munden på hinanden

Person 6 (Kvinde): Ja, men lidt småt måske

Gustav: Ville i spille spillet igen for at forstå emnet lidt bedre, eller ville i læse om det i bogen

Person 4 (Mand): Jeg ville nok ikke spille det igen, og nu er det fordi vi allerede har lært om det her, men jeg tror at for folk der aldrig har haft om det her, så ville det være en god introduktion til emnet, men jeg tror desværre ikke vi fik den samme effekt fordi vi allerede har lært om højkonjunktur og lavkonjunktur så ja helt klart, hvis man ikke ved hvad det er i forvejen så ville det fungere meget fint

Person 6 (Kvinde): Ja det er jeg også enig i

Gustav: Ville i anbefale andre der skulle igennem det her emne, også at spille spillet?

Alle siger ja i munden på hinanden

Person 6 (Kvinde): Jeg synes det underbyggede ens viden, man fik bekræftet at vi for vores vedkommende har lært om det, og at der kom den der quiz op af og til fungerede meget godt for at få bekræftet at du forstod hvad der skete og hvad der stod

Gustav: De der spørgsmål der poppede op efter hvert emne?

Person 6 (Kvinde): Ja lige præcis Gustav: Synes i spillet fungerede godt i undervisningen og ville i anbefale det til andre lærere til at bruge det som undervisningsmateriale?

Person 4 (Mand): I så fald skulle det være længere, eller jo det skulle det nok være, for det var lidt besværligt at få det downloadet og sådan. Men jo jeg kunne forestille mig en længere udgave af det her kunne man godt bruge.

Person 6 (Kvinde): Ja eller som introduktion til emnet, der ville det også fungerer meget fint, for det er en meget god overordnet viden man får, og så kan man selvfølgelig læse videre om det i undervisningen.

Gustav: Så i synes ikke det kan stå alene, men det er et godt supplement til den undervisning i får?

alle i kor: Ja

Gustav: Følte i at i blev opslugt af spillet?

Person 4 (Mand): Ikke decideret, der var de der tasks oppe i hjørnet og det motiverede lidt, men det kunne godt føles lidt mere som et spil, hvor der var lidt mere over det, det var meget at gå frem og tilbage

Person 5 (Kvinde): Jeg er også rimelig enig

Gustav: Var der nogle ting der distraherede jer enten inden eller udenfor spillet?

Person 6 (Kvinde): Ikke for mig

Person 4 (Mand): nej heller ikke for mig,

Person 5 (Kvinde): Nej samme her

Gustav: Synes i at spillet var for nemt?

Person 4 (Mand): Ja men det er nok kun fordi vi har haft emnet før

Person 6 (Kvinde): Ja enig

Gustav: Så i forhold til den challenge der var i spillet, hvordan var den så?

Person 4 (Mand): Jamen der var ikke den store udfordring

Person 5 (Kvinde): Ja det var ret ligetil med nogle klare opgaver

Person 6 (Kvinde): Ja jeg synes mest det var svært at finde rundt, eller finde ud af hvor man skulle gå hen

Gustav: men det fandt du ud af undervejs? Person 6 (Kvinde): Ja

Gustav: Super, nu kommer nok næsten det vigtigste spørgsmål, synes i spillet var sjovt?

Alle i kor: Ja

Person 6 (Kvinde): Ja specielt i forhold til at det har været lektier for os og det har været undervisning, så synes jeg spillet var sjovt

Person 4 (Mand): Ja det synes jeg også der kunne godt være lidt fokus på den der dialog, altså de der beskeder, de var sjove nok

Gustav: Synes det var en ny måde at lære et emne på?

Person 6 (Kvinde): Ja

Person 4 (Mand): Ja enig

Person 5 (Kvinde): Ja meget

Person 4 (Mand): Jeg tror rigtig aldrig jeg har spillet computerspil i undervisningen, det var mere sådan en ting man havde i 0. klasse, med matematik i måneby

Gustav: Kunne i så lide at lære det på den her måde, frem for at læse det i en bog?

Person 4 (Mand): Måske ikke frem for, men igen et godt supplement, for nogle gange når man læser en bog så lader man øjnene glide over ordene, og det gør man ikke lige så meget her, fordi man skal anvende det på samme tid

Gustav: Ja kan du uddybe det en lille smule mere

Person 4 (Mand): altså ja, for at komme videre i spillet kræver det at man har opmærksomheden på læringen, men når man læser en bog, kan du altid gå videre til næste side uden egentlig at have styr på hvad du lige har læst.

Gustav: Så du synes din aktive læring, blev mere aktiveret på denne her måde?

Person 4 (Mand): Jo sådan kunne man vel egentlig godt sige det

Gustav: Hvad synes i om at spillet var en lektie og ikke en del af klasseundervisningen, nu ved vi godt at det blev det lidt alligevel fordi, der var var nogen linket ikke virkede hos, men hvis det var en lektie frem for i undervisningen, hvad ville i så synes om det?

Person 6 (Kvinde): Jeg havde syntes det var ret underholdende at have som lektie, altså frem for at læse

Gustav: Ville i have mere lyst til at lave den her lektie, frem for at læse i en bog?

Person 5 (Kvinde): Ja

Person 6 (Kvinde): Ja, men samtidig tror jeg ikke man får samme udbytte som hvis man skulle læse fordi det tager længere tid end hvis jeg skulle læse 40 sider som vi normalt skal, så jeg ville selvfølgelig have syntes det var sjovere, men jeg ville nok ikke have fået ligeså meget ud af det.

Gustav: Spændende. Havde i nogle problemer med at styre karakteren i spillet?

Alle i kor: Nej

Person 4 (Mand): Der var ikke noget problem

Gustav: Det var meget ligetil?

Alle i kor: Ja

Gustav: Var der noget der gjorde det irriterende eller sværere at komme igennem spillet?

Person 4 (Mand): Nej ikke rigtig

Person 6 (Kvinde): Altså min computer laggede lidt, men det er måske også bare fordi jeg har en mac

Gustav: Hvad med dig (Person 5 (Kvinde)) du nævnte tidligere at du havde lidt svære ved at finde rundt.

Person 5 (Kvinde): ja altså nu virkede det ikke helt på min computer, men jeg tror bare jeg blev lidt forvirret over hvor man sådan skulle gå hen, men altså man fandt ud af det.

Gustav: Hvad synes i generelt om spillet der fungerede godt eller mindre godt?

Person 4 (Mand): Jeg ved ikke, men jeg synes det fungerede godt det der med at anvende det på sig selv og ligesom gå ind og ændre finanspolitikken så man ligesom kunne forstå hvad det indebar lidt bedre. Og det der virkede mindre godt var at det ikke ville kunne dække en grundbog i samfundsfag. Ikke på samme måde ihvertfald

Person 5 (Kvinde): Jeg synes også det gjorde læring sjovt, men også at man ikke fik ligeså meget ud af det som man kunne ved at læse

Gustav: Så i synes det kan være et godt supplement til undervisningen?

Alle i kor: Ja

Gustav: Men det kan ikke stå alene?

Alle i kor: Ja

Gustav: Føler i jer mere engagerede ved at skulle lære det på den her måde frem for at skulle læse det i bogen?

Person 4 (Mand): Ja det kan man vel godt sige

Person 6 (Kvinde): Ja jeg tror også det man var tvunget til at skulle videre skulle man svare rigtigt, sådan så der er en ende på spillet, så du er tvunget til at lære det, så derfor er du også bare mere motiveret til det.

Gustav: så du var faktisk også motiveret til at finde slutningen på spillet?

Person 6 (Kvinde): Ja

Gustav: har i nogle andre kommentarer eller noget i føler i ikke har sagt endnu?

Person 5 (Kvinde): Ikke rigtig

Person 6 (Kvinde): Nej

Gustav: Jamen så vil jeg sige tusind tak for hjælpen.

11.1.3   Student Interview 3

Interview 3. Participant ID's 7-9.

Niklas: Hvad synes i samlet set om spillet?

Person 7: Jeg synes det var godt jeg føler det var en god måde at lære det på.

person 8: Det var en god indgangsvinkel i forhold til at sidde og læse det, som jeg også skrev i spørgeskemaet. I stedet for at læse det, så var det federe at lære om det i spillet

Niklas: Så i synes det var mere engagerende?

Alle i enighed: ja

Person 8 (Kvinde): Altså man kunne få lov til at interagere lidt og det var fedt.

Person 9 (Kvinde): For folk der ikke er så gode til at læse lektier er det en smart måde at lære noget på.

Niklas: Var det nemt at læse teksten i spillet?

Person 7 (Kvinde): Altså jeg ved ikke, jeg tror det er fordi jeg har en ældre macbook så kunne jeg fx ikke se når jeg skulle trykke q for at komme ud af ting, men jeg kunne ikke finde ud af det. Men jeg bare lige til en af de andre og så forklarede de det for mig. Men jeg ved ikke om det var fordi jeg var kommet til at zoome ind på noget, eller om det bare var min computer der var for gammel.

Niklas: men du kom videre?

Person 7 (Kvinde): Ja det gjorde jeg

Niklas: Ville i spille spillet igen for at forstå emnet bedre, eller ville i læse om det i bogen?

Person 9 (Kvinde): Jeg ved ikke om jeg ville spille det igen, for det er fedt hvis man allerede har forstået det, så var det federe at spille.

Person 7 (Kvinde): Jeg tror det er meget godt til at starte med, for der stod jo alt det man havde brug for at vide for at svare på spørgsmålene, så jeg tror det er godt som en start på emnet, så man får sig et hurtigt overblik over tingene. For jeg føler hvis jeg skal læse op til noget og jeg skal vide hvad en bestemt ting er ville jeg nok slå op i en bog, men hvis det er til noget hvor man skal starte ud med det i undervisningen, så synes jeg det fungerede meget godt

Niklas: Altså det er en god ide at starte ud med spillet?

Person 7 (Kvinde): Ja hvis man nu skal starte op på emnet om finanspolitik og så spille det spil. så bliver alle sat ind i det med det samme.

Niklas: Så en måde at sætte rammen på?

Person 7 (Kvinde): Ja præcis

Niklas: Ville i anbefale spillet til andre der skulle igennem samme emne?

Alle enige i at de ville

Person 9 (Kvinde): Ja, jeg synes det var en meget god overordnet forståelse man fik for finanspolitik

Niklas: fungerede spillet godt i undervisningen og ville i anbefale det til andre lærere som undervisningsmateriale?

Person 8 (Kvinde): Ja det tror jeg og jeg tror også det ville kunne passe til en yngre målgruppe, spillet er virkelig fedt synes jeg, folk i 9. klasse ville også synes det var fedt

Person 7 (Kvinde): jeg synes bare altid spil er godt til at motivere folk, en del nemmere end at læse 70 sider.

Person 8 (Kvinde): Matematik i måneby det synes jeg er sådan er ret smart til at lære om matematik. Man kunne lave videre på jeres spil og udvide det en del

Niklas: Og i mener også det ville kunne fungere i de mindre klasser?

Alle i kor: Ja

Person 9 (Kvinde): Ja helt sikkert, så kunne man jo også lave det om mindre komplekse emner og så videre

Niklas: Blev i opslugt af spillet

Alle i kor: Ja

Person 8 (Kvinde): Ja altså jeg blev ved med at spille, og spillede indtil vi var færdige

Niklas: Så i ville sige at i mistede den overordnede tidsfornemmelse og bare spillede?

Person 8 (Kvinde): Ja man var meget underholdt

Niklas: var der nogle ting der distraherede jer enten inden eller uden for spillet?

Person 9 (Kvinde): Det føler jeg ikke for man kunne ikke rigtig se andet på sin skærm end spillet. Så hvis man lige fik en besked, man kunne ikke lige blive distraheret

Niklas: Så det var en god ting at det var full screen?

Alle: ja det fungerede faktisk meget godt. (og) det er jeg enig i

Niklas: Hvad med sværhedsgraden, synes i det var for nemt?

Person 8 (Kvinde): måske lige let for os, men det er også fordi vi lige har haft om det. Hvis det var sådan som Person 7 (Kvinde) sagde, at det var noget vi startede ud med som det første, så ville det være perfekt, det var mest fordi vi havde haft om det.

Niklas: Så i følte jer måske lige godt klædt på til det?

Alle: Ja præcis

Niklas: Var spillet sjovt?

Person 9 (Kvinde): Ja det synes jeg, jeg synes det var en god måde at lære det på.

Niklas: I må godt være helt ærlige

Person 7 (Kvinde): Der kunne måske godt have været lidt flere udfordringer, det kunne have været meget sjovt.

Niklas: Var det en ny måde at lære et emne på for jer?

Person 8 (Kvinde): Ja det var helt anderledes, ví har aldrig spillet sådan et spil.

Niklas: I har aldrig spillet spil?

Alle i kor: Nej

Person 8 (Kvinde): Det var ret fedt i samfundsfag, for det kan godt blive meget af det samme

Person 7 (Kvinde): Jeg føler det var en god lektie.

Person 8 (Kvinde): Læse lektier kan godt blive lidt "arh, det går nok at jeg ikke lige laver det", men det her var meget mere overskueligt

Niklas: hvis i skulle vurdere spillet ift at det er et nyt element i undervisningen, hvor stor en effekt tror i så det har haft på jeres læring?

Person 9 (Kvinde): Det er svært at sige fordi vi lidt har haft om det, men jeg synes virkelig stadig det var noget man fik under huden og man fik det fra et andet perspektiv og en anden vinkel. Jeg følte at jeg stadig skulle tænke mig om selvom jeg vidste noget af det på forhånd. Så det var positivt

Person 7 (Kvinde): Ja også det med at det var konkrete eksempler, altså opgaver man skulle løse og finde ud af hvad man skulle bruge for at løse de forskellige problemer

Niklas: kunne i så lide at lære om emnet på den her måde?

Alle i kor: Ja helt sikkert

Niklas: Spillede i, i timen eller hjemmefra? Alle: Hjemmefra

Niklas: Hvad synes i om spillet som lektie i stedet for at spille det i undervisningen?

Person 8 (Kvinde): Jeg synes det fungerede meget fint *De andre deltagere er enige*

Niklas: og i foretrak det frem for klasseundervisning eller at have det i klassen?

Alle: ja meget

Person 9 (Kvinde): Ja og så lang tid var det heller ikke, så det var meget overskueligt synes jeg

Person 7 (Kvinde): Det kunne også være sådan en når læreren kan mærke at nu er eleverne trætte så duer det ikke at sætte dem til at læse en masse sider, så kunne det godt være en ting at sætte eleverne til det i stedet hvor vi stadig lærer noget, men ikke sådan så vi skal læse en masse sider, som vi ikke kommer til at læse alligevel.

Niklas: hvor længe tog det jer cirka at komme igennem spillet?

Person 9 (Kvinde): Et kvarter

Person 8 (Kvinde): omkring 70 minutter

Person 7 (Kvinde): Jeg har lyst til at sige 80. Så deromkring måske

NIklas: Så et kvarter-80 min, virkede som en passende god længde for sådan et spil?

Person 8 (Kvinde): Ja det må helst ikke være længere, som fx en halv time, jeg synes det fungerede meget fint

Niklas: havde i nogle problemer med at styre i spillet?

Person 7 (Kvinde): Kun lige det jeg nævnte tidligere, ellers så havde jeg ikke (den gamle mac med aspect problemer)

Person 9 (Kvinde): Jeg havde lidt i starten med musen, men jeg fandt ud af det.

Niklas: Men i kom igennem og læringskurven var okay?

Person 9 (Kvinde): Ja det var til at forstå

Niklas: okay, var der noget der gjorde det irriterende eller sværere at komme igennem spillet, du snakkede noget om din mac

Person 7 (Kvinde): Ja jeg tror bare det er mig, men jeg er heller ikke så god til computer i det hele taget, så måske er det bare mig der er dårlig

Person 8 (Kvinde): Jeg synes det ville være ret fedt hvis man så nogle af de karakterer der bliver nævnt, hvis nu for eksempel at faderen var der

Niklas: Så man altså så karakteren?

Person 8 (Kvinde): Ja bare der var en karakter eller noget på et eller andet tidspunkt føler jeg kunne være ret fedt

resten af gruppen er enige

Niklas: okay så noget animation og nogle karakterer?

Alle i kor: Ja

Niklas: Hvad synes i fungerede godt og mindre godt i spillet?

Person 9 (Kvinde): Jeg føler det var godt med nogle udfordringer i spillet. Nu skal du gøre sådan her for at ændre på det her og det gør så sådan her. læg 8 og 8 sammen så hvad sker der hvis jeg gør det osv.

Niklas: Så udfordringerne var gode?

Person 8 (Kvinde): ja, men jeg føler også at selve animationen at det var realistisk og det henvendte sig lidt mere til os, hvis det havde været sådan en tegneserie stil havde det ikke passet så godt ind.

Niklas: Så det at det var fotorealistisk var godt?

Person 8 (Kvinde): Ja jeg synes det var godt, jeg blev faktisk sådan ret overrasket at det var så realistisk

Niklas: Okay og nogle mindre gode ting?

Person 8 (Kvinde): Det med manglen på mennesker tror jeg, der måtte gerne komme en ind, eller et overraskelseselement

Niklas: har i andre kommentarer overall?

Person 8 (Kvinde): Det kunne være ret fedt at når man så havde spillet den del, så var der et andet level, eller at der var sådan et level system

Niklas: Okay, sådan et progressions system?

Person 8 (Kvinde): Ja eller at der var flere emner det tror jeg ville være virkelig fedt

Person 7 (Kvinde): Ja så kunne man bygge videre på det

Person 9 (Kvinde): ja og bygge det større Niklas: Okay, super, jamen tusind tak skal i have

11.2 Teacher Interview Transcription

11.2.1 Teacher Interview

Gustav: Synes du spillet leverede det det skulle rent undervisningsmæssigt?

Lærer: Ja det synes jeg jeg synes det var netop lige de ting vi havde haft om finanspolitik og forskellige måder man kan styre efterspørgslen i samfundet og det var jo lige præcis det spillet handlede om

Gustav: Levede spillet op til dine forventninger?

Lærer: ja det gjorde det, jeg var imponeret over grafikken og man gik rundt der i et lokale og jeg forestillede mig lige der kom et gevær op men det gjorde der så ikke, men eller så var jeg imponeret over det visuelle i det

Gustav: Har nogle af dine elever givet udtryk for at de gerne vil have den her slags undervisningsform igen allerede nu eller bare haft et ønske om det på forhånd?

Lærer: Altså jeg har ikke, nu har vi jo lige haft den time der så jeg har ikke hørt at de gerne vil prøve det igen, men generelt vil de bare gerne have noget der er anderledes end det de plejer at få, så alt andet end at læreren står og tegner på tavlen er fedt, og generelt så synes de jo at spil er sjove og mange bruger meget tid på det derhjemme

og enhver afveksling i timen er velkommen og især hvis det er noget de kan sidde med alene, så synes jeg et spil virker meget motiverende. Så tror jeg også det er meget fedt de kan konkurrere lidt med hinanden, og det element var der jo ikke

Niklas: Så det ville faktisk være noget du synes kunne være fedt i en fremtid?

Lærer: Altså jeg kunne godt forestille mig at mange elever, eller rettere nogle elever synes er fedt, andre bliver lidt stresset over det og netop ikke vil have det

Niklas. Tror du det er størstedelen af dem der ville synes det var fedt med et konkurrenceelement?

Lærer: Med fare for at lyde gammeldags...

Daniel: Jeg havde om præcis det der i mit bachelorprojekt og det var meget stereotypisk at det var drengene der godt kunne lidt konkurrence elementet og det var pigerne der var lidt mere neutrale

Lærer: Jeg er glad for det var dig der sagde det, jeg skulle lige til at sige det samme, jeg tror nemlig at drengene tænder lidt på en rask lille konkurrence og at pigerne synes det er, eller nogle af dem kan godt synes det er lidt ubehageligt.

Niklas: Så der er klar forskel på det element ihvertfald i forhold til kønnene?

Lærer: Jeg bliver ikke citeret her vel? Men jo der er en klar forskel. Jo det må i gerne citere. Og så må jeg sige at jeg er rimelig gammel selv og har aldrig prøvet de spil hvor man går igennem en bane, og jeg gætter på at eleverne faktisk synes det er rigtig sjovt, det virkede ihvertfald sådan da jeg gik rundt i lokalet.

Gustav: Hvad synes du generelt om spillet? Nu nævnte du lidt med grafikken, men hvad med helt generelt?

Lærer: Jamen, altså , jeg synes det var godt og spændende at se, og jeg tror at som en elev også sagde, at det her med at det de læser inde i spillet, det skal de bruge til noget lige bagefter, det tror jeg er meget motiverende, ihvertfald i forhold til at læse det i en bog og ikke rigtig vide hvad man skal bruge det til. Så det her med at der er et mål, med læringen tror jeg virker godt. Prøv lige at gentage spørgsmålet

Gustav: Bare hvad du synes generelt om spillet?

Lærer: Ja, nå men det var det ja

Gustav: Ser du denne undervisningsform for værende relevant?

Lærer: Meget, det synes jeg faktisk. Nok som et supplement, i gymnasieskolen der er det jo ret præcist hvad man skal kunne, der er pensumkrav, og sideantal krav, så som lærer kan man måske føle at man lidt mister overblikke tover hvad de faktisk har lært, så derfor kunne jeg måske godt have brug for og supplere det med noget andet og at de også skulle læse i bogen og overhøres i det, men og dog kunne man jo også bruge et spil netop som, en slags test af hvad de så har lært, så det har jeg egentlig ikke overvejet, men det kunne man jo også bruge spil til, altså kan de gennemføre eller kan de ikke, hvis de kan gennemføre det så har det lært det

Gustav: Nu kom jeg så også til at tænke på en ting som der også var en elev der sagde før: Jeg ville bare lige høre hvad dine tanker var om det. I forhold til det med at synes det var relaterbart at det blev sat op med at de var nødt til at ændre finanspolitikken for at få lov til at købe en roskilde billet. Hvad synes du om det med at man drejer undervisningen eller læringsmetoden, til at være noget som eleverne kan forstå virke i den releve verden gennem et spil på den her måde?

Lærer: Jamen det er jo mega vigtigt i undervisningen at de kan se sig selv i det og forstå hvad det handler om, så det tror jeg er mange læreres hovedpine på daglig basis, at få eleverne til at forstå hvordan det har noget med

dem at gøre, og når man er en gammel lærer kan man jo også blive lidt i tvivl om hvad der er relaterbart for dem. Så der synes jeg spillet var ret godt

Gustav: synes du denne undervisningsform via spil kunne være mere relevant i et andet fag frem for samfundsfag?

Lærer: Altså, jeg kunne forestille mig at det med motivationen er nok det samme i alle fag, men måske i fag der er lidt mere eksakte altså hvor der er et rigtigt svar kunne være nemmere at lave spil til, men det ved i måske lidt mere om, men jeg kunne da godt forestille mig at i matematik eller at naturvidenskabeligt fag kunne det godt være nemmere at lave et spil, eller grammatik hvor der også er rigtig eller forkert, kunne være nemmere at lave et spil til.

Niklas: Sprogfag måske? Lærer: ja måske

Gustav: Hvilke mangler ser du en undervisningsform som det her kan have?

Lærer: Altså der kunne være noget med at forskellige elevtyper lærer forskelligt og der er måske nogle elevtyper der lærer rigtig godt på den her måde og andre der ikke gør det, altså hvis de ikke er vant til at spille, og synes selve det at åbne et spil og komme i gang med det er ubehageligt, så er det jo lidt synd at de heller ikke lærer økonomi, hvis det nu er det spillet handler om, og så er det måske svært at få alle mulige små detaljer med i den viden de skal have omkring økonomi, altså kan man komme hel vejen rundt, kan man få alle detaljerne, ned det kunne jeg godt være lidt i tvivl om. Altså på den anden side, det kommer an på hvor stort spillet er, men ja altså som lærer er der en masse præcise pensumkrav som man skal være helt sikker på man kommer igennem, og der kan man jo godt være lidt i tvivl om et spil kan indeholde det hele

Gustav: Synes du spillet kunne være blevet lavet bedre på en anden måde?

Lærer: Nu er jeg ikke gamer, så derfor har jeg ingen fantasi til at forestille mig hvordan det kunne være anderledes, må jeg ærligt sige.

Niklas: Hvis vi kigger på formidlingen af emnet?

Lærer: Altså det har jeg meget svært ved at svare på, men som vi snakkede om tidligere, så det her element af konkurrence kunne måske godt være sjovt for en del elever, eller hvis man kunne spille sammen. Jeg lagde også mærke til at der er jo en hel masse læring i det at snakke sammen om noget fagligt og løse en opgave sammen, det kender i fra jeres studie. Så jeg lagde mærke til at hvis der var nogen der ikke kunne få det til at fungere på deres egen computer så sad de sammen med naboen og kiggede dem over skulderen og lavede det, og det tror jeg faktisk der kunne være endnu mere læring i, for nogle af dem. Både for den elev der får det forklaret af den lidt dygtigere elev, men også for den dygtige elev der er nød til at sætte ord på sin viden over for den elev der ikke har forstået det. Så samarbejde kan også være lærerigt. En anden gang kunne man også bygge et spil på at man skal snakke sammen om et eller andet

Gustav: Har der være nogle elever der reagerede negativt på oplevelsen? Nu har vi godt nok lige haft dem, men hvis du nu måske havde hørt noget imens vi var ude?

Lærer: Nej, det synes jeg egentlig ikke. Altså selve det at spille spillet tror jeg egentlig de synes var sjovt, også de elever der ikke er specielt fagligt dygtige, spillede spillet og havde det sjovt med det. Der er måske noget i forhold til det med at downloade noget og finde det rigtige link osv. det er der jo nogle der har meget lidt tålmodighed med. Men selve spillet der oplevede jeg ikke noget negativt.

Gustav: I forhold til en normal samfundsfags time, hvordan synes du så elevernes engagement så ud i forhold til det her format med at inkludere spil, synes du så de virkede mere eller mindre engagerede sammenlignet med en normal undervisningstime?

Lærer: Interessant spørgsmål. Nogenlunde det samme vil jeg sige, men det der nok var den store forskel var, at de jo nok var igang med lidt forskellige ting, fordi nogle af dem jo skulle downloade spillet og sad og ventede lidt på det, mens andre var i fuld gang, så i modsætning til en normalt time lagde jeg mærke til nogle kunne sidde totalt koncentrerede og fokuserede samtidig med at nogle sad og ventede på at få spillet downloadet eller tastet den rigtige kode eller hvad det nu var, så jeg oplevede mer differentiering mellem eleverne at nogle var meget på og nogle zonede lidt ud.

Niklas: Så det ville faktisk hjælpe måske at provide spillet på en anden måde hvis man nu kom med et USB hvor det er hurtigere og nemmere at få spillet ned

Lærer: Ja, og jeg kan også sige til referat at skolens net måske ikke er mega hurtigt så, ja det var jo lidt et handicap at nogle af eleverne skulle sidde og vente 10 minutter på at downloade og når man er teenager kan man jo godt komme til at fokusere på alle mulige andre ting på de 10 minutter og have lyst til at åbne alt muligt andet op på computeren og egentlig glemme at holde øje med om den er i gang med at downloade, men det er jo skolens net der var langsomt i netop denne time

Daniel: Ja det virkede ihvertfald til at den største barriere var det der med at få spillet downloadet, ihvertfald med dem jeg interviewede der sagde de alle sammen at da de var igang med at spille, at inden de kom i gang med at spille der var de opslugt af selve oplevelsen

Lærer: og det var lige præcis også det jeg observerede at når de først var i gang så virkede det fint, men det var ventetiden der var frustrerende

Gustav: Spillet hedder finanspolitik spillet, hvad synes du om den titel?

Lærer: Perfekt

Gustav: hvis du skulle komme med en alternativ en, hvad ville du så kalde det?

Lærer: Jamen som lærer ud i det her så synes jeg det er meget rammende, det er jo lige præcis det det handler om, det handler om finanspolitik og det er et spil, jeg synes ikke det behøver hedde noget mere fancy for at appelere til en samfundsfags lærer, hvis nu man er elev kan det godt være det lyder lidt kedeligt, men jeg kan ikke forestille mig noget mere interessant.

Gustav: Det her spørgsmål er jo lidt svært når der var mange der ikke kunne klare det som lektie, men hvad synes du om at spillet var en lektie og ikke en del af klasseundervisningen? Nu blev det, det jo så alligevel fordi der var nogle problemer

Lærer: Jamen det synes jeg helt generelt er perfekt hvis sådan noget er en lektie, i gymnasiet generelt døjer vi måske lidt med at mange elever føler det kan være tungt at læse en læselektie derhjemme, altså det med at læse 5 sider derhjemme som man ikke rigtig ved hvad skal bruges til og hvad er vigtigt og hvad er ikke vigtigt osv. Og som i også fortæller om det her flipped classroom koncept, så er det egentlig meget fedt at de skal lave noget mere konkret derhjemme og så hører om det oppe i skolen, så egentlig generelt kunne jeg godt tænke mig selv at gøre mere på den her måde, at de laver noget mere konkret derhjemme, for eksempel spiller et spil, og så gennemgår vi det teoretiske og får styr på hvad de skal vide før eller efter.

Gustav: Til sidst har du så nogle andre kommentarer eller ting du ikke føler du er blevet spurgt om som du gerne vil sætte nogle ord på?

Lærer: Hvad kunne det være... Ikke lige umiddelbart. når nu i skal starte jeres firma herefter i er blevet færdige kunne man jo lave et kæmpe spil om alt muligt indenfor økonomisk politik generelt og inddrage andre

politikområder og andre økonomiske mål osv. og i kan inddrage det her konkurrenceelement, så der er noget at arbejde videre med når i starter firmaet.

Gustav: Ville du selv inddrage spil i undervisningen igen?

Lærer: Ja det kunne jeg faktisk rigtig godt tænke mig, altså min udfordring er at jeg på ingen måde selv er gamer og derfor er det ikke noget der kommer helt naturligt til mig, så det skal sådan lidt serveres for mig, men jeg synes det er super fedt og jeg ved eleverne godt kan lide det og at det er en rigtig god afveksling, så det vil jeg gerne.

Gustav: Så siger vi tusind tak for hjælpen

11.3   Experimental Group Questionnaire

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Køn

	Respondenter
Mand	43%	15
Kvinde	54%	19
Andet	3%	1

0% 25% 50% 75% 100%

Hvor lang tid bruger du på videospil om ugen?

	Respondenter
0-5 timer om ugen	59%	20
6-10 timer om ugen	12%	4
11-20 timer om ugen	24%	8
21-30 timer om ugen	6%	2
30+ timer om ugen	0%	0

0% 25% 50% 75% 100%

	Respondenter
Jeg er interesseret i samfundsfag	33
Jeg kan svare rigtigt på de fleste spørgsmål om finanspolitik	33
Tiden fløj af sted imens jeg lærte om finanspolitik i spillet	32
Jeg blev opslugt i læren om finanspolitik i spillet	30
Jeg blev frustreret i læren om finanspolitik i spillet	30
Jeg blev forvirret i spillet	30
Jeg blev distraheret undervejs i spillet	30
Læren om finanspolitik i spillet var interessant	29
Læren om finanspolitik i spillet var godt visuelt formidlet	28
Læren om finanspolitik i spillet var umagen værd	27
Det var en givende oplevelse at lære om finanspolitik i spillet	27
Jeg blev interesseret i spillet	27
Jeg vil anbefale spillet til andre der skal lære om finanspolitik	27
Jeg synes spillet var sjovt	27
Det var nemt at finde rundt i spillet	27
Det var nemt at styre med WASD/piletasterne i spillet	27
Jeg forstod opgaverne jeg blev givet i spillet	26
Det var nemt at læse teksten i spillet	26
Læren om finanspolitik var nem at forstå i spillet	26
Jeg var altid sikker på hvad jeg skulle i spillet	25
Spillet gav mig en god forståelse af højkonjunktur	25
Spillet gav mig en god forståelse af lavkonjunktur	25

Legend: Meget uenig · Uenig · Hverken enig eller uenig · Enig · Meget enig

Hvordan fører man Ekspansiv finanspolitik?

Respondenter

Svar	%	Respondenter
Øger offentlige udgifter	46%	11
Øger skatten	8%	2
Sænker offentlige udgifter	38%	9
Begrænser efterspørgsel	4%	1
Ved ikke	4%	1

Hvilken effekt har det at anvende Ekspansiv finanspolitik

Respondenter

Svar	%	Respondenter
BNP falder	4%	1
Produktionen falder	13%	3
Arbejdsløsheden falder	75%	18
Importen falder	8%	2
Ved ikke	0%	0

Hvordan fører man Kontraktiv finanspolitik?

Respondenter

Svar	%	Respondenter
Øger de offentlige udgifter	13%	3
Sænker skatten	4%	1
Øger efterspørgsel	13%	3
Øger skatten	57%	13
Ved ikke	13%	3

Hvilken effekt har det at anvende Kontraktiv finanspolitik

Respondenter

Svar	%	Respondenter
Arbejdsløsheden falder	10%	2
Inflationen stiger	19%	4
Statens budget bliver negativt påvirket	19%	4
Importen falder	29%	6
Ved ikke	24%	5

Jeg har en god forståelse af begrebet BNP

	%	Respondenter
Meget uenig	5%	1
Uenig	0%	0
Hverken enig eller uenig	14%	3
Enig	48%	10
Meget enig	33%	7

0%   25%   50%   75%   100%

Hvad er BNP?

	%	Respondenter
Værdien af et lands samlede produktion	90%	19
Hvor mange penge der er i statskassen	0%	0
Hvor meget et land eksporterer	10%	2
Hvor meget et land importerer	0%	0
Ved ikke	0%	0

0%   25%   50%   75%   100%

	Hverken enig eller uenig	Enig	Meget enig	Uenig	Respondenter
Spillet gav mig en god forståelse af finanspolitik	35	55	10		20
Jeg var motiveret til at læse teksten i spillet for at tilegne mig viden om finanspolitik	20	55	10	15	20
Jeg var mere motiveret til at læse teksten i spillet frem for bogen	35	45	15	5	20
Læren om finanspolitik i spillet var interessant	25	60	10	5	20

0%   25%   50%   75%   100%

■ Meget uenig ■ Uenig ■ Hverken enig eller uenig ■ Enig
■ Meget enig

Skriv meget gerne hvis du har andre kommentarer eller noter til spillet som ikke var inkluderet i spørgsmålene

- Det virkede og fungerede helt fint, det var dog lidt kort i længden.
- :)))))))<33333333
- det var godt

Jeg kunne ikke færdiggøre spillet på grund af et problem. Du må meget gerne specificere hvilket problem

- jeg havde intet problem med spillet

E-mail

Samlet status

		Respondenter
Ny	0%	0
Distribueret	3%	1
Nogen svar	47%	17
Gennemført	50%	18
Frafaldet	0%	0

0%   25%   50%   75%   100%

11.4   Control Group Questionnaire

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Køn

		Respondenter
Mand	68%	15
Kvinde	27%	6
Andet	5%	1

0%   25%   50%   75%   100%

Hvor lang tid bruger du på videospil om ugen?

		Respondenter
0-5 timer om ugen	27%	6
6-10 timer om ugen	18%	4
11-20 timer om ugen	36%	8
21-30 timer om ugen	9%	2
30+ timer om ugen	9%	2

0%   25%   50%   75%   100%

	Respondenter
Jeg er interesseret i samfundsfag	21
Jeg kan svare rigtigt på de fleste spørgsmål om finanspolitik	21
Tiden fløj af sted imens jeg lærte om finanspolitik i bogen	21
Jeg blev opslugt i læren om finanspolitik i bogen	21
Jeg blev frustreret i læren om finanspolitik i bogen	21
Jeg blev forvirret imens jeg læste i bogen	21
Jeg blev distraheret undervejs da jeg læste i bogen	21
Læren om finanspolitik i bogen var interessant	20
Læren om finanspolitik i bogen var godt visuelt formidlet	19
Læren om finanspolitik i bogen var umagen værd	19
Det var en givende oplevelse at lære om finanspolitik i bogen	19
Jeg blev interesseret i bogen	19
Jeg vil anbefale bogen til andre der skal lære om finanspolitik	17
Jeg synes det var sjovt at læse i bogen	17
Det var nemt at læse teksten i bogen	17
Læren om finanspolitik var nem at forstå i bogen	17
Bogen gav mig en god forståelse af højkonjunktur	16
Bogen gav mig en god forståelse af lavkonjunktur	16

Legend: ■ Meget uenig ■ Uenig ■ Hverken enig eller uenig ■ Enig ■ Meget enig

Hvordan fører man Ekspansiv finanspolitik?

	Respondenter
Øger offentlige udgifter	56%	9
Øger skatten	13%	2
Sænker offentlige udgifter	31%	5
Begrænser efterspørgsel	0%	0
Ved ikke	0%	0

0% 25% 50% 75% 100%

Hvilken effekt har det at anvende Ekspansiv finanspolitik

	Respondenter
Inflationen falder	19%	3
BNP falder	13%	2
Arbejdsløsheden falder	50%	8
Importen falder	13%	2
Ved ikke	6%	1

0% 25% 50% 75% 100%

Hvordan fører man Kontraktiv finanspolitik?

	Respondenter
Øger de offentlige udgifter	6%	1
Sænker skatten	6%	1
Øger efterspørgsel	19%	3
Øger skatten	56%	9
Ved ikke	13%	2

0% 25% 50% 75% 100%

Hvilken effekt har det at anvende Kontraktiv finanspolitik

	Respondenter
Arbejdsløsheden falder	19%	3
Importen falder	19%	3
Inflationen stiger	19%	3
Statens budget bliver negativt påvirket	25%	4
Ved ikke	19%	3

0% 25% 50% 75% 100%

Jeg har en god forståelse af begrebet BNP

		Respondenter
Meget uenig	0%	0
Uenig	0%	0
Hverken enig eller uenig	13%	2
Enig	50%	8
Meget enig	38%	6

0% 25% 50% 75% 100%

Hvad er BNP?

		Respondenter
Værdien af et lands samlede produktion	94%	15
Hvor mange penge der er i statskassen	0%	0
Hvor meget et land eksporterer	6%	1
Hvor meget et land importerer	0%	0
Ved ikke	0%	0

0% 25% 50% 75% 100%

		Respondenter
Bogen gav mig en god forståelse af finanspolitik	25 / 63 / 13	16
Jeg var motiveret til at læse teksten i bogen for at tilegne mig viden om finanspolitik	25 / 50 / 25	16
Læren om finanspoltik i bogen var interessant	6 / 63 / 31	16

0% 25% 50% 75% 100%

■ Meget uenig ■ Uenig ■ Hverken enig eller uenig ■ Enig
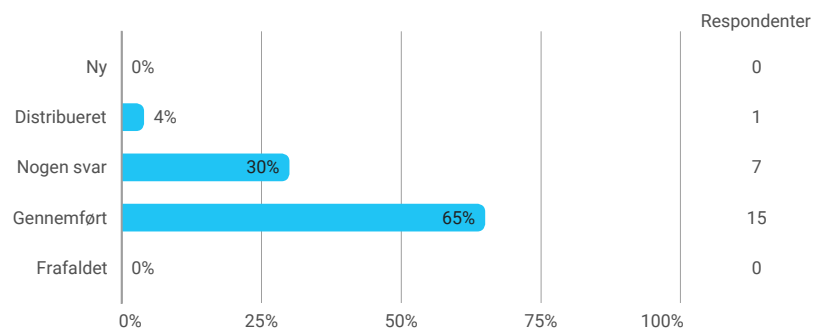■ Meget enig

Skriv meget gerne hvis du har andre kommentarer eller noter til bogen som ikke var inkluderet i spørgsmålene

- I dette spørgeskema var der for mange spørgsmål som lød 'fandt du bogen sjov?' 'fandt du bogen interresant?' osv. Jeg havde det som om jeg svarede 10 gange på det samme spørgsmål :))

Jeg kunne ikke færdiggøre kapitlet på grund af et problem. Du må meget gerne specificere hvilket problem

E-mail

Samlet status

	Respondenter
Ny	0%	0
Distribueret	4%	1
Nogen svar	30%	7
Gennemført	65%	15
Frafaldet	0%	0

0% 25% 50% 75% 100%

11.5 Student Instruction Sheet

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Tusind tak for at vi må bruge jeres tid til vores spil
For at spillet skal kunne virke er det **MEGET VIGTIGT** du følger disse instruktioner:

Hvis spillet ikke kører eller du har problemer med at downloade eller åbne spillet, så kontakt os på 26132813 eller 51514374 så er vi klar til at hjælpe.

Spillet handler om finanspolitik, du kan gå frit rundt i spillet.
Det er vigtigt, at du har lyden slået til og skruet godt op, så du kan høre voice-overen i spillet.

Herunder vil du finde instruktioner til hvordan du henter og starter spillet til både mac og pc.
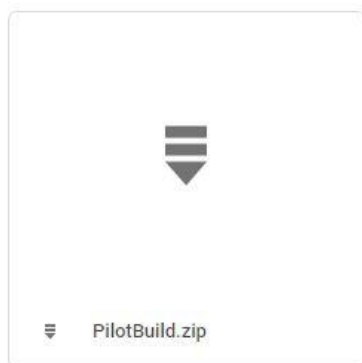
Download spillet
(Instruktion til PC er længere nede i dokumentet)

Instruktioner til mac:

Tryk på linket forneden
https://drive.google.com/drive/u/1/folders/1omw93IO6yueTHD_kI5WyBKHlxHAjv57S
Højreklik på ikonet som set forneden og tryk på download

PilotBuild.zip

Du kan også dobbeltklikke på ikonet og trykke på download ikonet der vil komme oppe i højre hjørne

Vent til filen har downloadet og dobbeltklik på den når downloaden er færdig.
Spillet vil formentlig ikke åbne fordi vi er en ukendt udvikler, så din computers firewall beskytter din mac. Der vil formentlig komme dette vindue frem som kan ses på næste side.
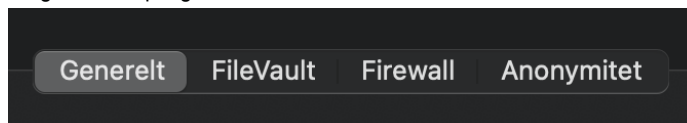
Tryk på OK

Tryk på æblet i toppen af venstre side på jeres skærm.

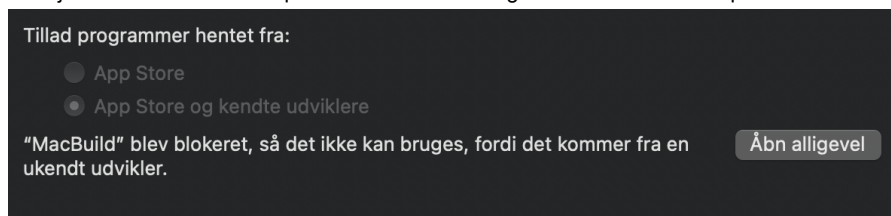Tryk derefter på 'Systemindstillinger'

Tryk derefter på bankboksen der hedder "sikkerhed og anonymitet"

Sørg for du er på 'generelt' efter du har klikket.

I bunden af denne fane vil der nu stå "MacBuild blev blokeret, så det ikke kan bruges, fordi det kommer fra en ukendt udvikler".

Til højre for det er der en knap hvor der står "åbn alligevel" den skal i klikke på.

Der vil formentlig komme et nyt vindue op som siger nogenlunde det samme som før.

Denne gang trykker i på "Åbn" som set på næste side.

Nu burde spillet køre.Hvis spillet ikke kører eller du har problemer med at downloade eller åbne spillet, så kontakt os på 26132813 eller 51514374 så er vi klar til at hjælpe.

Du må nu begynde at spille indtil du er færdig med spillet.

Når du er færdig med at spille er der et link til et spørgeskema du meget gerne må besvare. Det er vigtigt du svarer på det lige efter du er færdig med at spille.

Når du har spillet færdigt:
Efter at du har spillet har vi et spørgeskema vi meget gerne vil have dig til at svare på. Det er vigtigt du svarer på spørgeskemaet lige efter du er færdig med at spille.

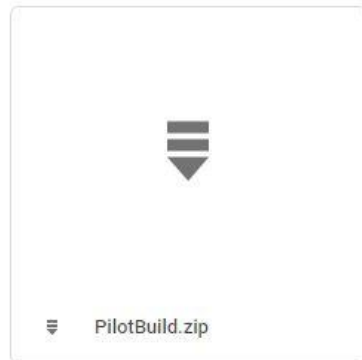**Spørgeskema:https://www.survey-xact.dk/LinkCollector?key=FMCUNZGEJK3J**

Instruktioner til PC:

Tryk på linket forneden
https://drive.google.com/drive/folders/1EUrS71TS3I5sMIDRiXUfZkL6yb3Jqory?usp=sharing
højreklik på ikonet som set forneden og tryk på 'Download'

Du kan også dobbeltklikke på ikonet og trykke på download ikonet der vil komme oppe i højre hjørne

Vent til filen har loadet (kan tage et stykke tid, spillet fylder ca. 343 mb som ZIP)

Når filen er downloadet skal du unzippe den. Derefter åbner du mappen og dobbelt klikker på filen der hedder "ThesisGame". Hvis du ikke har unzipped mappen inden du klikker på den fil, vil den spørge dig om den skal pakkes ud. Her klikker du bare på "pak ud". Du kan også blive mødt af denne besked efter du har pakket mappen ud.

Hvis denne besked popper op, så klikker du bare på 'Flere oplysninger' så vil der komme en hvid knap i bunden der siger "kør alligevel", og det er den du skal klikke på. Bare rolig, du får

ikke en virus ved at åbne filen. Det er udelukkende fordi vi ikke er en kendt udvikler, så din computers firewall beskytter din PC

Hvis spillet ikke kører eller du har problemer med at downloade eller åbne spillet, så kontakt os på 26132813 eller 51514374 så er vi klar til at hjælpe.

Du må nu begynde at spille indtil du er færdig med spillet.

Når du har spillet færdigt:
Efter at du har spillet har vi et spørgeskema vi meget gerne vil have dig til at svare på. Det er vigtigt du svarer på spørgeskemaet lige efter du er færdig med at spille.

Spørgeskema:https://www.survey-xact.dk/LinkCollector?key=FMCUNZGEJK3J

På forhånd mange tusind tak fra os fra Medialogi på Aalborg Universitet København.

11.6 Pilot Test Questionnaire

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Køn

	Respondenter
Mand	40%	2
Kvinde	60%	3
Andet	0%	0

0%　25%　50%　75%　100%
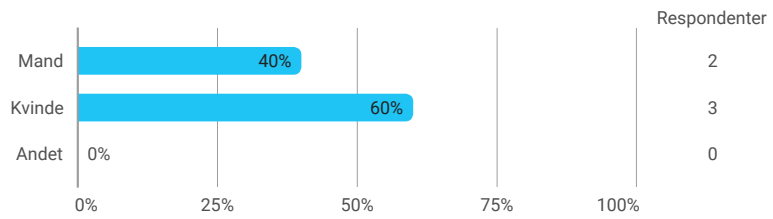
Hvor meget gamer du?

	Respondenter
0-5 timer om ugen	50%	2
6-10 timer om ugen	50%	2
11-20 timer om ugen	0%	0
21-30 timer om ugen	0%	0
30+ timer om ugen	0%	0

0%　25%　50%　75%　100%
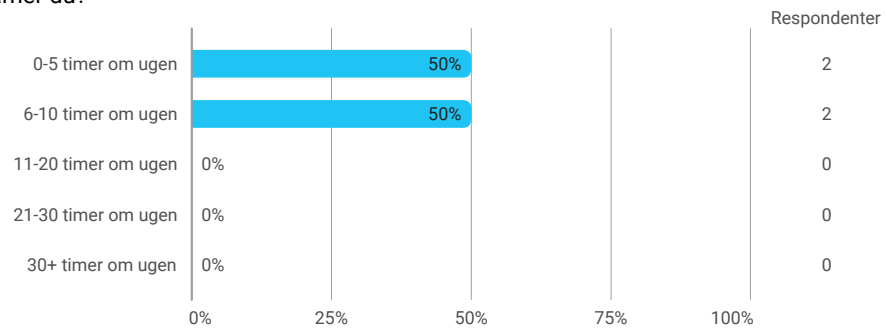
					Respondenter
Jeg føler mig sikker i min viden omkring finanspolitik	25	25	25	25	4
Jeg er interesseret i samfundsfag	50		25	25	4
Tiden fløj af sted imens jeg lærte om finanspolitik	25	25	25	25	4
Jeg blev opslugt af spillet.	25	25	50		4
Jeg var frustreret imens jeg spillede.	25	50		25	4
Jeg blev forvirret da jeg spillede.	50		25	25	4
Spillets grafik var tiltalende	25	25	50		4
Det var en givende (rewarding) oplevelse at spille spillet.	25	50		25	4
Jeg var interesseret i at spille spillet.	25	25	50		4
Jeg synes spillet var sjovt	25	25	50		4
Jeg ville anbefale spillet til andre der skal lære om finanspolitik	25	25	25	25	4
Det var nemt at finde rundt i spillet.	25	50		25	4
Det var nemt at styre med WASD i spillet.	50		50		4
Det var nemt at interagere med objekterne i spillet.	25	25	50		4
Jeg forstod opgaverne jeg blev givet igennem spillet.	25	50		25	4
Jeg havde kontrol over min karakter i spillet.	25	50		25	4
Det var nemt at finde hvor jeg skulle hen ved de forskellige opgaver	25	25	50		4
Det var nemt at læse teksten i spillet	25	25	50		4
Spillet var for mørkt.	25	50		25	4
Informationen om finanspolitik var nemt at forstå.	50		25	25	4
Jeg synes at spillet var flot.	25	25	25	25	4
Det var nemt at læse den næste opgave (i højre hjørne)	25	25	25	25	4
Det var nemt at forstå hvem der snakkede.	25	50		25	4
Det var tydeligt at forstå hvad der blev sagt i voiceovers	67		33		3

Hvilken effekt har det at anvende Ekspansiv finanspolitik

Respondenter

Lavere arbejdsløshed	33% — 1
Inflationen falder	33% — 1
Produktionen falder	33% — 1
Skatten hæves	0% — 0

Hvordan fører man Ekspansiv finanspolitik?

Respondenter

Øger skatten	0% — 0
Sænker de offentlige ydelser	100% — 3
Sætter kommune projekter på hold	0% — 0
Bruger flere penge på importvarer	0% — 0

Hvilken effekt har det at anvende Kontraktiv finanspolitik

Respondenter

Skatten sænkes	33% — 1
Skatten hæves	67% — 2
Inflationen stiger	33% — 1
Statens økonomi/saldo/budget bliver negativt påvirket.	33% — 1

Hvordan fører man Kontraktiv finanspolitik?

Respondenter

Øger de offentlige udgifter	33% — 1
Sænker skatterne	33% — 1
Sætter offentlige projekter på hold	33% — 1
Hyrer en masse mennesker til jobs	0% — 0

Jeg har en god forståelse af begrebet BNP

	Respondenter
Meget uenig	0%	0
Uenig	67%	2
Hverken enig eller uening	33%	1
Enig	0%	0
Meget enig	0%	0

0% 25% 50% 75% 100%

Hvad er BNP?

	Respondenter
Værdien af et lands samlede produktion	33%	1
Hvor mange penge der er i statskassen	0%	0
Hvor meget et land eksporterer	67%	2
Hvor meget et land importerer	0%	0

0% 25% 50% 75% 100%

Jeg lærte noget om finanspolitik.
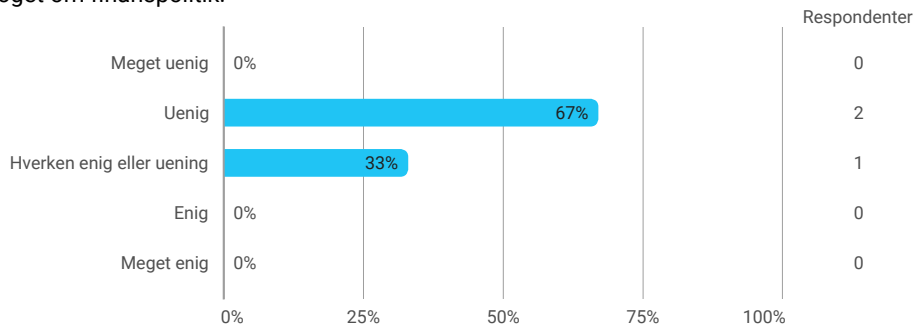
	Respondenter
Meget uenig	0%	0
Uenig	67%	2
Hverken enig eller uening	33%	1
Enig	0%	0
Meget enig	0%	0

0% 25% 50% 75% 100%

Skriv meget gerne hvis du har andre kommentarer eller noter til spillet som ikke var inkluderet i spørgsmålene.

- nej
- Det kunne være meget fedt, hvis det måske blev læst op for som en stemme i hovedet. Desuden tror jeg det kunne vælre godt med flere figurer, der viser at ekspansiv hører sammen med dit og det hører sammen med dat. Så man lige skal igennem en parringsøvelse inden man skal trykke på knapperne.

Jeg kunne ikke færdiggøre spillet på grund af et problem. Du må meget gerne specificere hvilket problem.

- nej
- Jeg kom igennem uden problemer. Jeg troede dog indledningsvist at jeg skulle tage telefonen på ipaden.

E-mail

Samlet status

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		Respondenter
Ny	17%	1
Distribueret	0%	0
Nogen svar	50%	3
Gennemført	33%	2
Frafaldet	0%	0

0%   25%   50%   75%   100%