How to Increase Boys' Engagement in Reading Mandatory Poems in the Gymnasium: Homer's "The Odyssey" as Transmedia Storytelling with the Cyclopeia Narrative as a Computer Game

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Abstract. This paper outlines how a computer game can be used within transmedia storytelling to engage boys in the Danish gymnasium to read the epic poem "The Odyssey" by Homer. The study is based on a formative evaluation with questionnaires, observations, data logging, and interviews. Interviews with classical civilization teachers were further conducted, both in the initial design stage and after participant tests. Through all stages of the transmedia storytelling, it was revealed that curiosity was the main reason behind the engagement. The aesthetics worked out well in the game, and the story was presented in a format that the boys could comprehend and had the potential to increase their engagement in reading the poem. Different elements were implemented in the program code to maintain match in game flow for the individual player. However, this study can also emphasize how well-designed game mechanics are of ultimate importance, as well as involving teachers throughout all stages in the iterative process, as they are key figures for real implementation and acceptance.

Keywords: Game-based learning · Transmedia · Serious games

1 Introduction

Serious games within game-based learning are sometimes focused too much on the game itself. However, in terms of the overall learning goals, curriculum, content, and teachers' acceptance, one perspective could be to design the game-based learning as a transmedia element, where the game is not a standalone medium but incorporated within a broader context with other types of media. In this study, we will outline an approach for engaging boys in particular in the gymnasium, shifting between two media: a poem and a computer game. The idea is to create an engaging storytelling experience, meaning that the target group loses consciousness of the medium and neither sees the poem nor the game, but only the power of the story itself [1]. The

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Danish Gymnasium offers a 3-year general academically oriented upper secondary program. Students are normally between the ages of 15 and 20. The Gymnasium is just one of several secondary education systems (others have specialized programs, such as commercial or technical) in Denmark, which all qualify students for admission to higher education. However, there are some common challenges for boys in particular in the Danish education system [2, 3]. In the gymnasium, boys struggle more with engagement in reading compared to girls. In general, there is a huge gender gap in reading, with 53% of boys who rarely or never read, compared to 29% of girls [14]. The difference in grades between boys and girls in the Danish gymnasium has also increased in favor of the girls [2, 3]. The gymnasium attracts more girls than boys, with 62% girls and 38% boys [3], and boys have a higher dropout rate (20%) than girls (15%) [3]. Boys lagging behind in education is not only a Danish challenge but also reported in other countries [4–6]. The reasons behind this gender gap are rather complex and multifaceted, but are, for example, described within genetic differences in ability, gendered learner identities and behavior, expectations of male and female identities, and the feminization of the education sector [6–8]. Common criticism is that schooling has favored female learners by using left-brain processes of fine motor skills, sequence, letters and words, and modes of teaching including "sit down and listen" [6, 9]. However, there are different initiatives for decreasing the gender gap in education, such as multifold initiatives in serious games.

Serious games are defined and used in divergent ways [10] but are commonly defined as games that have a focus on interactive computer-based software, which are developed with the intention to be more than entertainment [10, 12]. Serious games fit some of the general learning requirements like a glove, as they can provide a bridge to engage reluctant learners [11, 12]. Serious games offer intrinsically motivating game play and immediate feedback in the game environment, and the content often includes learning opportunities [10]. However, there are common examples where serious games fail within educational contexts, which could be due to poor design and a lack of knowledge about the target group. Failure could also be caused by, for example, the games not being very specific in terms of covering the curriculum, the games not simultaneously motivating and delivering a high quality of learning, the teachers not knowing how the game works or lacking IT skills, not having support to get started, and the preparation for playing the games taking too long [13].

This study is focusing on the example of the epic poem "The Odyssey" by Homer. "The Odyssey" is a part of the curriculum in the Danish gymnasium class "classical civilization." Teachers already use several alternative ways to teach classical civilization and "The Odyssey," such as watching movies, in-class role-play, drawings, YouTube clips, and going to the theater. However, there are no examples of using computer games within classical civilization in the Danish Gymnasium. The research question within this study is: How can a serious game be used in the Danish Gymnasium as transmedia storytelling in combination with Homer's "The Odyssey" to increase boys' engagement in reading the epic poem?

2 Engaging Transmedia Storytelling

The typology of transmedia storytelling used in this study is what Ryan defines as a one-world, many texts relation [15]. We are going to recreate an interpretation of the story of Odysseus within the original story. This is what computer games can achieve compared to the poem. The idea is to use interactive involvement to achieve knowledge within the rather complex texts of "The Odyssey," but without the cognitive load of decoding text and making meaning from a bottom-up processing [11]. By using top-down processes [11] (by setting the main character as the player), it is possible within the game to create a world revolving around the player. This makes students free to explore or proceed at their own pace, with possibilities for allowing students to create an identity and engaging learners by involving them personally in the story [11, 16, 17]. Instead of reading about Odysseus (the valiant) defeating Polyphemus (the man-eating giant), the players are the ones defeating him. We will use a 3rd-person view to represent Odysseus, and we want the players to role-play and figure out (just as Odysseus did) how to defeat Polyphemus. We want the players to gain knowledge about Odysseus's arrival to the island of Cyclops (Sicily), the transition into the cave where the dangerous Polyphemus lives, and how Odysseus manages to escape by getting Polyphemus drunk.

Based on the transmedia storytelling aspects in combination with user engagement theory [18–20] and player types [21], we have compiled an approach that aims to engage the boys in the activity of reading by a "game reward" when reaching book IX (the Cyclopeia narrative) in "The Odyssey." After playing the game, the boys should be engaged to stay within the story world and continue reading with further discussions of the poem and related issues within classical civilization.

1. Point of engagement: The story has a point of engagement [19] before the student starts reading the epic poem so he knows there is something engaging to expect later on in the text reading. This is achieved by a teaser poster located either in the classroom or placed in the epic poem before the first page. The aesthetics from the computer game let the participant know that there is a game to play when reaching book IX.
2. Reading parts of the "The Odyssey," book I to VIII.
3. Game prologue: The game prologue will have the attributes of aesthetics, motivation, and a clear goal for the game [19, 20]. The goal is to defeat Polyphemus and escape the cave. The prologue will provide the controls for the actual game. The objectives are to make the player understand that the controls are the keys WASD (to move around), the mouse (to look around), the space bar (to interact), and to invite the player to start playing ("pick up the wine by the barrels" and enter the cave).
4. Period of sustained engagement in game: For maintaining concentration and engagement throughout the game, relevant difficulty matches according to the player's skill level (game flow channel) [22] were implemented. The game adapted the difficulty to the players' skill level by measuring the time spent on each task and the performance in terms of amount of mistakes they made and amount of times they died. The game had four stages and evaluated the players' performance for

each of these stages. Based on pretests, 20 s was an average time to complete the tutorial level, and it was rare that a test session lasted longer than 50 s. Incorrect key presses had a highest value of 10, and the mode was 3. With these parameters, the system normalized a value between 0 and 1 that represents both the duration in the level and the incorrect key presses. The value was stored in the file "PlayerPrefs" instead of the memory for later use in the game (e.g., if the player died in the game, the difficulty level could revert to the previous setting). Inserted below is a code example of one of the implementations for adjusting the difficulty level during the game play:

```
public void CalculateDifficulty() {
      float diff;
      if (timeOfEnd > 20)
      diff = (timeOfEnd - 20) / 30;
      else
      diff = 0;
      gameDifficulty /= 10;
      gameDifficulty += diff;
      gameDifficulty = Mathf.Clamp(gameDifficulty, 0, 1);
  PlayerPrefs.SetFloat("GameDifficulty," gameDifficulty);
      13 }
```

At this point in the game, the main level was loading, and Polyphemus chased the player. Polyphemus' speed was adjusted based on the player's previous difficulty score. A new timer began to calculate the amount of time that the player used to advance in the game. When the player completed the first objective in the main level, a new calculation was applied in order to adjust the game difficulty. The new difficulty was based on the duration of game play along with the amount of times that the player died and had to re-spawn.

5. Game epilogue and continued book reading: The game epilogue adds positive aspects to the story, which should make the player continue reading the poem. The game epilogue will be a cut scene, where the following is going to be explained: A. Odysseus escaped with his men. B. Odysseus is cocky and says his real name, displaying hubris. C. Polyphemus prays that his father, Poseidon, avenges him.

3 Methods

The method within this study consisted of a formative evaluation [24]. Within the formative evaluation, questionnaires, observations, data logging, and interviews were used to evaluate boys' engagement in reading "The Odyssey" through transmedia storytelling, including the game as book IX. The data collection took place in May and June 2017 at Aalborg University in Copenhagen, with 37 participants. An online asynchronous interview with one classical civilization teacher before game design and

one interview with two classical civilization teachers after game design and participant test were further carried out.

3.1 Formative Evaluation

The formative evaluation was conducted using a seven-step strategy involving the following methods:

Step 1: Introduction and consent form. The participants were informed of the study purpose, that they were free to drop out at any time, and about anonymity.
Step 2: Participants were introduced to a short pre-experience questionnaire with questions regarding basic information (age, hours spent on computer gaming per week) and the initial engagement level for "The Odyssey" based on an NRS (Numerical Rating Scale, 0–10, with 0 = do not at all want to continue, and 10 = really want to continue).
Step 3: A teaser poster was introduced as an invitation to "The Odyssey" book IX and the game. Shortly after, participants filled in a questionnaire asking about two factors: how engaged they were to continue (same NRS scale as in step 2) and what characterized their engagement. Ten different cards with different engagement characteristics were presented for the participants: Fun, Commitment, Adventure, Growth, Change, Curiosity, Knowledge, Aesthetics, Satisfaction, and Challenge. Below each of these words, there was a short description to explain the word stated. For example, below Aesthetics was the description "something pleasing to the eye".
Step 4: Data logging was performed with the following information during the play session: A. Overall time spent. B. Amount of wrong key presses. C. Number of deaths.
Step 5: One observer and note taker was responsible to make non-participant observations about everything concerning the test participants' state of mind, as well as potential struggles in the game. Moreover, it was also the note taker's responsibility to note if the test participants had any comments or feedback on elements in the game and/or the overall experience. The note taker was positioned in the background, diagonally behind the test participants to be able to see the screen with the running game and note down observations with ease while the participants remained feeling comfortable.
Step 6: Short questionnaires were administered at different stages throughout the transmedia storytelling: A. When introduced to the first shift in media (the beginning of book IX). B. After the first stage had been completed. C. After playing the game. D. After the final objective and the epilogue within the epic poem were completed.
Step 7: A semi-structured interview was conducted, where participants were asked about their overall experience in the game, suggestions for improvements, and opinions about the transmedia shifts, as well as if they felt engaged in reading "The Odyssey" after playing.

3.2 Interviews with Classical Civilization Teachers

We conducted two interviews with classical civilization teachers. The first interview was an early stage interview performed as an asynchronous structured online interview. The purpose of the first interview was to gather initial game design ideas. The second interview was performed as in-depth interview with two teachers after game development and the participant test. The purpose was to get the teachers' opinions about the developed game and if it could be implemented in their classical civilization classes to engage boys in the reading. The second interview took place at a Danish Gymnasium in June 2017, following a semi-structured interview guide and analyzed as meaning condensation [23].

4 Design and Implementation

The game was implemented in the Unity3D game engine. It is playable on both PC and Mac. The style of the game is low polygon, with the intention of aesthetically sustaining or increasing the player's engagement and initial attraction, while also requiring relatively little to create. Several camera filters, particle systems, and assets were added to further increase the aesthetic level. They are accompanied by animations to fit each character with their movement, actions, and audio lines.

The prologue starts with the camera in an overview look so the players can quickly familiarize themselves with the scenery. Then, the camera slowly transitions down and toward Odysseus and stops when it reaches a 3rd-person perspective. This makes sure that the players know that they are in control of the main character, as it is necessary to tell the players that they are the ones playing and controlling Odysseus. This was coded through a Vector3.Lerp to interpolate with steps from the starting position and rotation, toward the ending position and rotation. This runs in a loop and progresses with T from 0 to 1. The program code is below, and Fig. 1 illustrates the prologue. On the first line,

Fig. 1. Screen shot from the initial view in the game

the size of each step is specified. On lines 2–5, the starting point and ending point are defined. On lines 8–13, the process is applied.

```
1 float step = 0.002f;
2 Vector3 fromAngle = mainCamera.transform.eulerAngles;
3 Vector3 fromPos = mainCamera.transform.position;
4 Vector3 targetRot = mainCamera.transform.eulerAngles;
5 Vector3 targetPos = mainCamera.transform.position –
    new Vector3(14.46f, 5.7f, 0f);
6 float t = 0;
7
8 while (t <= 1) {
9 t += step;
10 mainCamera.transform.eulerAngles =
    Vector3.Lerp(fromAngle,targetRot, t);
11 mainCamera.transform.position =
  Vector3.Lerp(fromPos, targetPos, t);
12 yield return null;
13 }
```

5 Findings

5.1 Engagement

There was increased engagement until the completion of the tutorial (mean = 7.87). After the encounter with Polyphemus, there was a significant drop in the engagement (mean = 6.96). The reduced engagement suggests that there were some problems with that level in the game (Fig. 2).

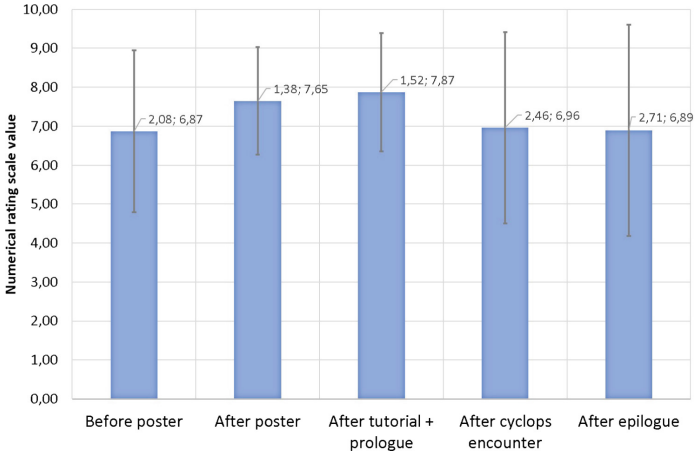

Fig. 2. Engagement level through different stages. NRS-scale 0–10, n = 37.

Through all stages of the test, curiosity (based on card selection) was the main reason behind the engagement to continue, especially after the poster, as well as after the tutorial and prologue stages. The curiosity card was chosen 18 times after the poster stage and 19 times after the tutorial stage. After the encounter with Polyphemus, only 8 participants selected the curiosity card as their main engagement factor. However, the number of curiosity card choices increased to 13 after the epilogue. This suggests that more participants became curious to continue after watching the epilogue, even though there were some problems in the level with Polyphemus. The drop in the curiosity engagement after the encounter with Polyphemus indicates that the participants lost some engagement after completing it and tended to continue the experience for reasons other than curiosity. Instead, they wanted to continue because of fun (6 times) or commitment (4 times). The general engagement level did not increase after the epilogue stage (mean = 6.89).

In the interviews with classical civilization teachers after game development, it was rather clear that they believed the game could have potential to engage boys more in the reading:

> "The boys are not good readers. They bridle at the poem format. With this game I am sure it could engage the boys as they feel familiar in gaming… To have challenges within the game media" (Kate: Teacher 1). "Also because they can participate in a rather interactive way" (Ann: Teacher 2).

5.2 Effectiveness

Of the observations noted in the Polyphemus encounter, 55% revolve around misunderstandings of game mechanics, while only 21% regard the mechanics as being understood. This implies that the game fails to provide the player with clear instructions, resulting in confusion. Furthermore, 21% revolve around technical problems such as bugs or program crashes. These problems could potentially have broken the engagement of the players, leading to a lower desire to continue with the game. The objective in the game that had the highest amount of misunderstandings was the stage where the player needed to help his men escape the cave. In some cases, the participants succeeded in saving some men, but usually, this was a result of pressing the interact button randomly. In the first objective, where the player would have to place the wine, most players used a lot of trial and error before figuring out the solution.

In the interviews with the participants, they also frequently mentioned the lack of guidance and the poor game mechanics. Mostly, they seemed confused when the game ended and they had yet to figure out why. Participants described the final objective in the cave as "I was frustrated that I could not figure out how to save the men", "The worst thing was the men escaping the cave", and "There was not enough time to save the soldiers". In some cases, the layout of the controls seemed unintuitive, since some expected the character to jump when using the space bar, rather than interacting. Others were confused with the functionality of interaction, stating, "It confused me that I could spam the interact button". Apart from what went particularly bad, we asked the participants, "What worked particularly well in the game?" The majority of the answers were that the aesthetics work well in the game, followed by the game play. In terms of the aesthetics, the art style seemed to fit the story well, as participants described it as

"Simple but meaningful" and "Nice and colorful" and stated, "The feel and tone of the environment was good".

6 Conclusion

Boys have a higher dropout rate in the Danish Gymnasium and are lagging behind in terms of intake and marks. The reason behind this gap is rather complex and multi-faceted, but one perspective could be to implement game-based learning as a trans-media element within some of the very specific content in the classes, and where boys in particular are struggling. This could also help the game design to be very specific in terms of covering the curriculum. This would require the game to be engaging and deliver a high quality of learning, as well as not require too long to prepare for. However, for game-based learning, it is crucial that both the target group and the teachers are involved. The teachers' knowledge is very important both in terms of how they could use the game-based learning in their classes, as well as making sure that the game content is professionally correct. In this study, we proposed a setup for increasing boys' engagement in reading Homer's "The Odyssey" through transmedia storytelling with the Cyclopeia narrative (book IX) as a computer game. Classical civilization teachers liked the idea behind this study and could see potential for real implementation in their classes to engage the boys in particular in the poem format. However, much further collaboration with the teachers through the iterative process would have improved the setup. We found that the participants had increased engagement after looking at a poster as the very first thing before reading. This suggests that an invitation for later gaming could work as an engagement factor for reading. Through all stages of the transmedia storytelling, it was revealed that curiosity was the main reason behind the motivation to continue. It was also revealed that the aesthetics worked out very well in the game, and the story was presented in a format that the boys could comprehend and had potential to increase the engagement in reading the poem. However, the game needed more clear objectives and some adjustments in terms of controls and further guidance, as there were too many misunderstandings within the game mechanics.

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