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How to engage young adults in reading H. C. Andersen's fairy tale *The Little Mermaid,* through a serious game

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Abstract. For this study, the authors designed a serious game to increase leisure reading engagement in H. C. Andersen's fairy tale, *The Little Mermaid*. The objectives were to increase leisure reading engagement among young Danish adults and to familiarize the group with original version as a supplement to the Disney version. The novelty within this study is the focus on leisure reading engagement and having participants read a story in its original 1837 language. 25 participants were included in a formative evaluation. The evaluation was based on three questionnaires at various stages of the game play, and six participants were selected for in-depth interviews. The findings reveal increased engagement and interest in the story throughout the game. There was a very high level of interest in the story and some good indicators that the users read the entire story. In conclusion, when designing a serious game to promote increased leisure reading engagement, intrinsic motivation is of high importance. Telling the original story of *The Little Mermaid* in a serious game is, to a large extent, about transforming the fairy tale into a digital storytelling with meaningful skills and knowledge for the users.

Keywords: Reading engagement, Digital storytelling, Intrinsic motivation, Formative evaluation.

1   Introduction

The Danish author Hans Christian Andersen (1805-1875), usually called H.C. Andersen, is recognized around the world for his fairy tales and stories. From the very first publication, it was H.C. Andersen's intension to target not only children, but also to activate the adult consciousness, and the childlike imagination. His fairy tales are with high complexity of language and contains complicated philosophical, psychological, existential and social issues with life experiences and lost. For the same reason, H.C. Andersen's collection of fairy tales are commonly used as presents for young adults in Denmark, but are rarely read.

The aim of this study was to implement a serious game to achieve leisure reading engagement for H.C. Andersen's fairy tale, *The Little Mermaid*. The story follows the journey of a young mermaid who is willing to give up her life in the sea to gain a human soul. The tale was first published in 1837 and was later adapted to various versions,

including musical theatre, ballet, opera, and Disney's well-known animated film [1]. The research question of this study was: How can young Danish adults be engaged in reading H. C. Andersen's fairy tale, *The Little Mermaid*, through a serious game? The background and objectives behind the research question were twofold:

1. To increase reading engagement among young adults aged 18 to 25. Over the past few decades, young adults have changed their habits, reading fewer novels and fairy tales but spending more time reading online than before [2-4]. In Demark, 20% of young adults do not read fiction [13], which is equivalent to other international reporting [4, 14]. On average, across OECD countries, 37% of young adults (students) report that they do not read for enjoyment at all [14]. Reading has always been encouraged through complex and diverse practices. However, there is a huge concern that young adults do not read well enough to cope with the increasing literacy demands of an information society [3-5]. Reading fiction among young adults appears to be positively associated with higher performance on reading assessments [14]. Reading is a skill with many graduations of proficiency, and reading a rather complex tale from 1837 requires a different level of reading ability (compared to, e.g., a newspaper or subtitles on Netflix), which is challenging for many young adults [3-5].

2. To let young adults understand H. C. Andersen's fairy tale, *The Little Mermaid*, as a supplement to the Disney version. The Disney version of *The Little Mermaid* is widely known and has been a bestseller [6], whereas few young adults have read the original fairy tale the Disney version is based on. In both versions, an evil sea witch takes the little mermaid's voice in a trade that allows the mermaid to walk on land. There is also a storm, and the little mermaid must save the prince from drowning. However, there are also major differences. In the original version, there is a narratively influential grandmother, and the little mermaid does not have a name; she is only referred to as the little mermaid. In Disney's version, her name is Ariel. In the Disney version, the sea witch (called Ursula) is killed, and Ariel and Prince Eric live happily after. In the original version, the prince never discovers that the little mermaid actually saved him. In Disney's version, Ariel will belong to the sea witch if she does not complete the task; in the original, she will die if she does not complete the task. The original tale is far more complex than the movie from Disney, as well as far more dystopian, melancholic, and gloomy.

2 Previous research and theoretical framework

Reading engagement is a multidimensional construct including behavioral, affective, and cognitive dimensions [15]. It can be defined as the interest and attitude towards reading and the time used to read a diversity of material for pleasure [7]. Reading engagement for enjoyment is multidimensional and used from various perspectives in various fields; it is also complex, with many variables, including motivation, frequency, emotional engagement, gender preferences, and storytelling.

a) Motivation. Engaging in leisure reading, both in serious games and in other media (analogue included), requires the reader to be motivated [9]. This involves, e.g., important elements within the text's content, comprehending the text, gaining new knowledge, and social interactions with used knowledge and/or lessons learned from the text [8, 9]. Furthermore, to design a motivating reading experience in a serious game, scholars have already emphasized aspects of intrinsic motivation, such as curiosity, a desire for challenge, and involvement [9, 19-23]. However, the success of a serious game for leisure reading purposes depends on players' motivation to start playing the game and spend their time, effort, and energy. Hence, players' intention to interact with the game is crucial [17]. It is assumed that the experiences of flow [18] and enjoyment [19] are crucial in this process. When players have mastered specific challenges, they develop a greater level of skills that can be used and improved with more complex challenges in other levels or games [17, 18]; this can have a positive influence on intrinsic motivation in serious games [20]. Serious games outside a traditional learning context may need to focus more on intrinsic motivation [17, 20-22] in the possible absence of extrinsic motivation from a teacher or learning progression. This means that the learning materials need to invoke curiosity, flow (interplay between challenges and skills), be fun and enjoyable, and eventually allow the player to gain new knowledge.

b) Frequency. The frequency of leisure and educational reading can contribute to one's engagement in reading [7, 10]. Reading engagement and practice allow for more and/or better reading achievements [14] and more motivation towards reading [3, 7, 14]. Better readers tend to be more motivated to read and therefore read more, which leads to improvements in vocabulary and comprehension skills, whereas poor readers experience a decline in skill level [7, 10]. Frequent reading activities also enable readers to discuss an array of topics and comprehend various viewpoints in social groups [11]. In applied approaches, previous research has demonstrated how reading in serious games with self-directed work increases the frequency of reading practice [9, 23].

c) Emotional engagement. Reading engagement in serious games incorporates other forms of engagement in terms of emotional engagement to positively (interest) and negatively (boredom) affect the engagement of the reader. Emotional engagement can be part of cognitive engagement in terms of a reader exerting their mental effort to comprehend the text-based element of a game [7-11]. However, other cognitive activities that distract the reader (media or contextual disturbances) can negatively affect the amount of information the reader can gain or recall [12]. The definition of emotional engagement varies across literature, as it is used within many contexts. However, there is a common understanding that it involves interest, motivation, happiness, fun, anger, empathy, tension, anxiety, and other affective states, any of which could affect gamers' involvement or effort to continue playing [16].

d) Gender preferences. There are no reported gender differences related to reading engagement and reading achievements [10, 13]. However, there are some specific gender differences in terms of motivation for reading. Girls favor narrative and/or continuous texts, whereas boys' reading ability is more affected by their attitude, enjoyment, and interest in the text's content [10].

e) Storytelling. One way to motivate reading engagement is to include a text-based story in a serious game via digital storytelling (DS). This opens an interactive

story/world, including both text and game, with the potential to engage a user in the digital storytelling experience and make them focus on the story itself instead of the text or gameplay alone. Digital storytelling is well covered and discussed within serious gaming [24-26]. However, digital storytelling is much more than telling a story in a digital format; in a serious game, it is mainly about making stories engaging and interactive, with meaningful skills and knowledge for the users.

3 Methods

3.1 Participants and ethical issues

25 participants were included in a formative evaluation. The participants were young Danish adults aged 18-24 (mean: 21.5) with 20 males and five females. All participants were enrolled in different study programs; 13 were enrolled in IT and design programs, four in humanities, four in engineering, three in medicine, and one from a nursing school. Within the last three months, 18 of the participants had not read any fiction, whereas six participants had read fiction for leisure purposes (reading 1-2 novels each). One participant had read four novels over the last three months. Twenty-two participants had played computer games within the last three months; three participants estimated having played more than 30 hours per week. Twelve participants estimated playing 11-20 hours per week, five participants played 1-10 hours per week, and 3 participants did not play any computer games during the last three months.

All participants gave informed consent and were informed that they could withdraw from the study at any time. We provided all participants with anonymized ID numbers, and all the data were labeled with these IDs. Furthermore, we applied special considerations when recruiting to inform the participants that we respected each individual's reading speed—there was no hurry or judgement based on speed.

3.2 Data collection, procedure, and data analysis

The 25 participants were recruited by a combination of convenience and snowball sampling via Discord or Facebook. The only criteria for being included in the study was being a young Danish (holding a Danish passport) adult between the ages of 18-30. Due to this study being performed during the outbreak of COVID-19, the data collection and procedure were carried out online.

After giving informed consent and background information, the participants were provided with a link to play the game based on *The Little Mermaid*. The evaluation was divided into three questionnaires provided at various stages of game play. The first (provided after the first level was finalized) and second (provided after finalizing the second level of the game) consisted of three options: a) I would like to continue playing this game; b) I would like to know what is going to happen next in the story; and c) Please write any comments you have regarding what you have experienced until now. We provided only these three options so as not to lose potential user engagement or game flow [18, 19]. After the game was completed, there was a final questionnaire with

9 Likert scale items based on the participants' understanding (knowledge check of the reading) and engagement. The final questionnaire was inspired by the User Engagement Scale, short form (UES-SF)[27], and items from the Narrative Engagement Scale [28]. The rating scale was a 5-point Likert scale (raging from completely disagree to completely agree). Furthermore, six participants were selected for in-depth interviews following a semi-structured interview guide.

The questionnaires were analyzed by cumulative frequency—the total number of answers to specific questions. The interviews were analyzed by traditional coding [29] following four steps: organizing, recognizing, coding, and interpretation. The interviews were transcribed verbatim to be organized and prepared for data analysis. The transcriptions were read several times by two researchers to recognize the concepts and themes, which also included a general sense of the information and an opportunity to reflect on its overall meaning. Researchers then coded and labelled the data in categories/subcategories, followed by interpretation.

4 Design and Implementation

The game was designed in Unity 3D using C# and playable on Mac and PC. The level design is based on four main scenes. The assets used for all the scenes were gathered mainly from the Unity Asset store and Turbosquid. We designed the models and animations of the player and non-player characters (NPCs) using Blender. We used assets to follow a low-polygon aesthetic and implemented a progression system to ensure that the player did not miss any of the story and experienced it chronologically.

The first scene (Figure 1, left) is under the sea in a water castle and designed mainly to introduce the atmosphere and the premise of the story. Interaction with the little mermaid's sisters.

The second scene (Figure 1, right) is under the sea at the witch's house, and it covers the part of the story in which the little mermaid interacts with the witch to get her legs. In the scene, the player needs to speak to the witch, who sets the goal of collecting skulls and passing through rings in order to make the potion.


Fig. 1. Water castle (left) and grandmother's house (right). Top left corner guiding the player of what to do.

The third scene (Figure 2, left) is on the surface near the prince's castle. In this scene, the player needs to interact with the prince and the sisters. In each scene, the player's main goal is to interact with NPCs to get to know (read) the story. Besides those objectives, minor challenges (like gathering oysters or swimming through hoops) were designed to get the players used to the movement of the character, keep them focused, and avoid boredom. The fourth scene (Figure 2, right) provides some contextual information about the fairy tale.
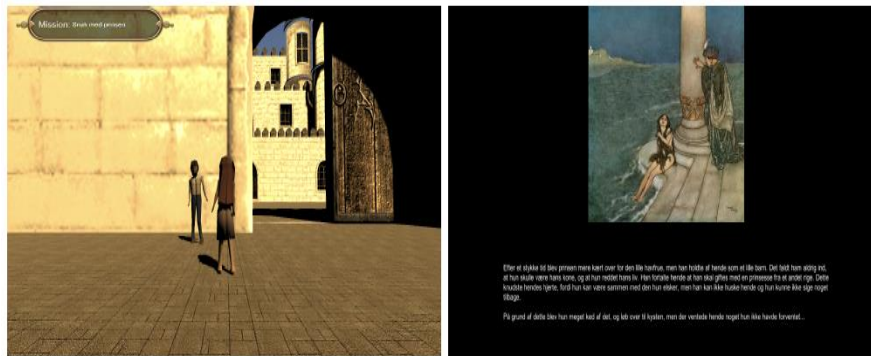
Fig. 2. The prince's castle (left) and contextual information (right).

To ensure that players are able to experience as much of the story as possible, they can engage with NPCs throughout the game via dialogue-based interactions (implemented as "Press E to start dialogue"). The dialogue bolsters players' perceptions of being part of the game world. This mechanic is introduced early in the game, so the player knows that they can engage in dialogue with various NPCs (Figure 3). Figure 3 also shows an example of the provided text, which is an old (1837) wording.
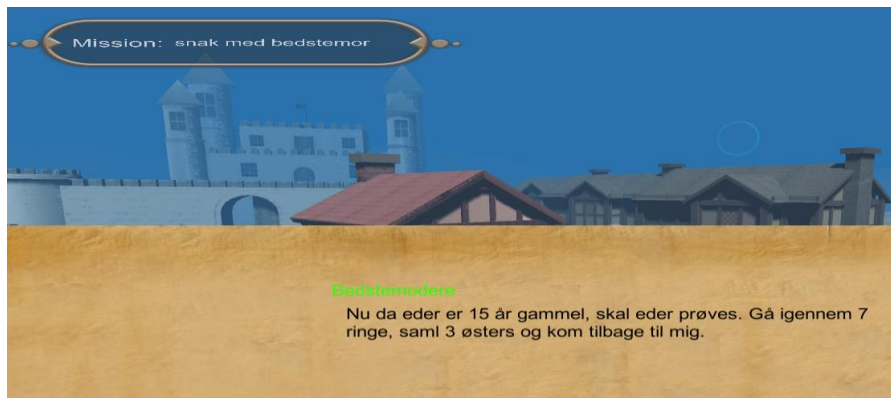

Fig. 3. Example of the text (in Danish) from the fairy tale. Grandmother: Now that you are 15 years old, you need to be tested. Go through 7 rings, collect 3 oysters, and then return here.

5   Findings

5.1   Game engagement

As seen in Figure 4, there was a slight increase (mean 3.36 to 3.52) in engagement from "Mid-Game 01" (after the first level) to "Mid-Game 02" (after the second level) based on responses to the statement "I would like to continue playing this game." The engagement was high in general (based on 5-point Likert items, from completely disagree to completely agree). There was also a slight increase (mean 3.96 to 4.08) in interest in the story based on the statement, "I would like to know what is going to happen next in the story." A rather high number of participants reported wanting to read the rest of the story (mean: 3.96). The findings indicate some narrative engagement in this serious game, indicating perceived suspense and relationships between exposure and acceptance of story-related beliefs [28].
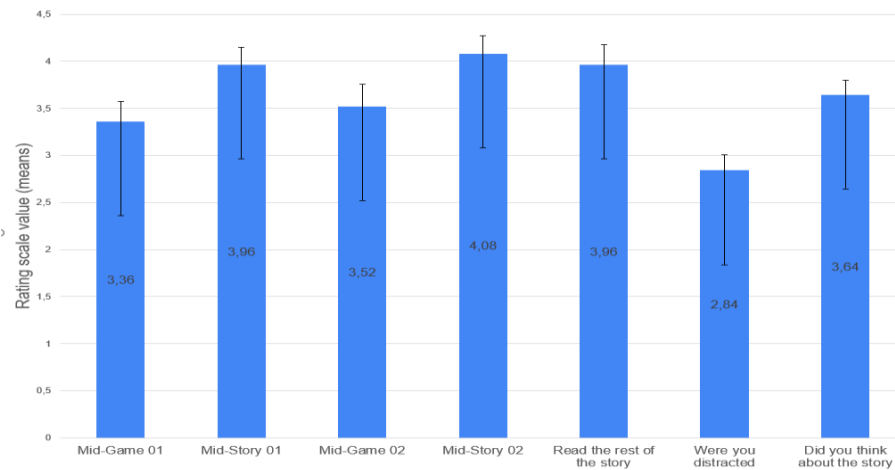
Fig. 4. Engagement levels in various stages of the game; means and standard error. Rating scale 0-5, n = 25.

Even though the number of distracted participants is not very high (mean: 2.84), these data need further investigation. Ten participants answered "neutral" to the statement "I was easily distracted while following the story." Nine participants were not distracted, answering either "completely disagree" or "disagree," while seven participants were distracted. The interviews, based on the question of distractions and boredom, revealed that the game had many positive elements but also some minor issues to be improved upon. Especially, several participants suggested minimizing overly monotonous game elements to maintain flow; they also suggested customizing the text speed, which could be implemented via dynamic difficulty adjustment.

5.2   Story engagement

The participants read the story throughout the game, as revealed both in time spent on the game (an average of 18 minutes and 23 seconds) and the very high percentage of correct answers to the multiple-choice knowledge test (Table 1).

Table 1. Questions, correct and incorrect answers. Based on 5 multiple choice answers, n=25

Question. The correct answer in the parentheses. Based on 5 multiple-choice answers	Correct answers	Incorrect answers
How old was the little mermaid when she was allowed to swim to the surface? (15)	100%	0
What was the first thing the little mermaid saw after coming to the surface? (a ship)	96 %	4%
What did the little mermaid have to sacrifice to get her legs? (her tongue)	96%	4%
How did the witch describe the feeling of wailing with the little mermaid? (as if she were stepping on a knife)	80 %	20%
How did the prince see the little mermaid? (as a foundling/ little child)	80%	20%
Why did the little mermaid not get the prince? (he was promised to someone else)	92%	8%

The multiple-choice questions were designed to be increasingly difficult to test whether the participants actually read the story or skimmed parts of it. Only one question had 100% correct answers, but all questions had a vast majority of correct answers, meaning that the participants most likely read the story thoroughly enough to answer. It is also very interesting that in the interviews, seven participants mentioned that the story was interesting due the differences from the Disney version.

> *I've always thought it was a cool story, or a nice story, but I know most about Disney's version of it. But I still want to learn the original story because it tells more. It is just as interesting, if not more interesting. (ID4, female, aged 20 years, nursing school studies).*

6   Conclusion

This study was carried out during COVID-19 and the subsequent lockdown, meaning it was difficult to establish a gender-balanced high number of participants and a controlled environment for evaluation—the participants might have experienced various disturbances. In spite of this, our study reveals that it is possible to engage young Danish adults in leisure reading by introducing the text within a serious game. We conclude that the participants read and enjoyed the story via the serious game. There was high intrinsic motivation to read H. C. Andersen's version compared to what most participants were familiar with; namely, the Disney version. It can also be concluded that game progression is very important, and elements to guide the readers to their next

action are a prerequisite for success. When developing a serious game focusing on reading engagement, it is very important to focus on narrative engagement [16]. Narrative engagement is related to the story experienced while playing a game and may result in imaginative immersion, narrative involvement, or narrative immersion. The desire to know how the story about the little mermaid unfolds created curiosity, suspense, and excitement, making the players want to continue playing.

As many other scholars have realized when designing serious games, it is a special challenge to find the right balance between skills and challenges, keeping the players in the flow channel [18]. Some of the participants in this study would have liked the game to be a bit more challenging, less monotonous/tedious, and with better links/clues/semiotics to story-specific elements (e.g., making game a bit darker), as well as customizable reading speed to provide dynamic difficulty adjustment.

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