Master Degree Project

UNIVERSITY
OF SKÖVDE

Designing Educational Games with Role-playing Elements to Improve Student Engagement in the Classroom

Master Degree Project in Informatics
One year Level 22.5 ECTS
Spring term 2024

Nedim Ogul

Supervisor: Mikael Johannesson
Examiner: Per Backlund

Abstract

In recent years, educators have become increasingly interested in improving methods in order to engage students and enrich their learning experiences. With technology's continual advancement, educators are recognizing the effectiveness of Game-Based Learning in enhancing student learning. This paper aims to identify and highlight the key role-playing elements that foster student engagement in the classroom, proposing strategies to enhance educational games through these elements. A qualitative research study was made with a semi-systematic literature review and the use of the Minequest game prototype, which includes 9 of 10 RPG elements identified in this paper. Thirteen students have participated in this study and overall results show that they have found the game prototype engaging, but not educational enough only by itself. Therefore, it could be better if similar educational games with role-playing elements were used as a complement to conventional teaching methods.

Keywords: Role-playing Games, Game-Based Learning, Primary Education, Serious Games, Educational Games

Table of Contents

1 Introduction **1**
2 Background **2**
2.1 Role-playing games to educate numerical skills 3
2.2 Role-playing games to educate verbal skills 4
3 Problem **6**
3.1 Method Description 6
3.1.1 Literature Review 6
3.1.2 Game Test 8
3.2 Ethical Considerations 11
4 Results & Analysis **12**
4.1 Literature Review 12
4.1.1 Concept Matrix 12
4.1.2 Narrative Elements 13
4.1.3 Game Mechanics 14
4.1.4 Other Elements 16
4.2 Game Test 17
4.2.1 Results of the Questionnaire 17
4.2.2 Results of the Teacher Interview 20
5 Conclusions **21**
5.1 Summary 21
5.2 Discussion & Limitations 22
5.3 Future Work 23

1 Introduction

Role-playing games (RPGs) represent an interactive storytelling format where participants take on the roles of fictional characters, collaboratively weaving narratives within a designated game world. These games manifest in diverse formats, including tabletop, live-action, or digital platforms. While RPGs have primarily served entertainment and socialization functions, their educational potential remains significant (Prager, 2019). This article delves into the applications of RPGs across educational settings, examining both their advantages and challenges in fostering learning and engagement. Role-playing exercises offer students the chance to step into the shoes of a particular individual or implement specific scenarios. These roles may be undertaken individually, in pairs, or within groups, allowing for the exploration of more intricate scenarios. By immersing students in real-life situations that are potentially stressful, unfamiliar, complex, or contentious, role plays compel them to assess their personal sentiments towards others and the circumstances at hand (Bonwell & Eison, 1991).

RPGs hold versatility in their application across diverse educational settings and contexts, spanning formal, informal, and non-formal education, and across various disciplines and academic levels. For instance, within formal education, RPGs can serve as valuable supplements or complements to the curriculum, exemplified by utilizing a tabletop RPG as a tool for teaching English language arts (Cook, Gremo & Morgan, 2017), or using a digital RPG to teach mathematics (Chiu & Hsieh, 2017). RPGs extend their utility to informal education settings, fostering opportunities for self-directed and lifelong learning. For instance, employing a live-action RPG can facilitate exploration of history and culture (Cheville, 2016), while a digital RPG can offer avenues for delving into science and technology (Chen & Hwang, 2017). Furthermore, in non-formal education contexts, RPGs play a role in promoting personal and social development. For instance, a tabletop RPG can aid in the cultivation of teamwork skills (Heinz & Prager, 2019), while a live-action RPG can even be utilized in efforts to prevent sexual assault (Bowman & Standiford, 2015).

Employing RPGs in education yields manifold advantages. These games not only bolster learner motivation and engagement by offering immersive and enjoyable experiences tailored to diverse learning styles but also foster cognitive and meta cognitive skills through problem-solving and reflective practices (Harbour & Connick, 2005). Furthermore, RPGs facilitate the development of emotional and social competencies, as learners engage in meaningful interactions and moral reasoning within the game environment. Additionally, they serve as effective tools for promoting content knowledge and literacy by exposing learners to varied topics and genres, thereby enhancing their comprehension and language skills (Prager, 2019).

Even though there are many research articles analyzing the impact of role-playing games in education, clear game design suggestions to develop an educational serious game with the use of role-playing elements are very limited. This study aims to reduce this limitation by exploring how role-playing elements in games can better engage students in education. It seeks to identify and test these features to improve educational games, including the prototype used in this study.

2 Background

Game-based learning entails integrating specific gaming principles and modifying them to suit real-world situations, with the goal of engaging users (Trybus, 2015). Game-based learning integrates interactive games to support educational goals. Learners engage with educational content through elements like points, badges, quizzes, and leaderboards, motivating them to achieve objectives. Teachers design contexts where students explore game elements, fostering collaboration and enhancing the educational experience (EdTech Dictionary, 2013).

Role-playing games, commonly known as RPGs, transport players into the personas of characters within fictional realms. These immersive experiences span various platforms, from video games like The Witcher (CD Projekt Red, 2008) and Skyrim (Bethesda Game Studios, 2011) to Live Action Role-Playing games (LARPs), where participants physically inhabit their characters amid fictitious scenarios set within real-world environments (Haarman, 2022). Additionally, the oldest iteration of RPGs, Tabletop Role-Playing Games (TRPGs or TTRPGs), unfold through dialogue. Seated around a table, players guided by a game master delve into intricately woven narratives, collectively crafting stories within established rules and settings, each embodying a unique character within the fictional tapestry. The first and the most influential TTRPG is known as Dungeons and Dragons (Gygax & Arneson, 1974), currently owned by Wizards of the Coast.

RPGs commonly include mechanics such as character creation and customization. Players can select a character, role, or can completely generate their own characters and as they are completing challenges, they progress by gaining experience points (XP), which leads them to level up to gain new abilities and skills to improve their character. Quest completion is a common aspect of RPGs, encompassing both main storyline quests and side quests. These quest mechanics not only propel the narrative forward but also offer players clear direction within the game world. Moreover, resource management, a pivotal aspect of gameplay, involves overseeing essentials such as health potions, mana, or ammunition. Striking a balance in resource allocation is key to ensuring survival and achieving success in the game (rpgwizard.org, 2024). These kinds of aspects can be categorized under narrative or story elements, game mechanics or gameplay elements and other elements (Ahmad, 2019). Narrative elements have to do with the plot and setting of the game. They contribute to the creation of an immersive and captivating experience by giving the player's activities a meaningful context and rich background. Gameplay elements are the rules and systems that govern how a game is played. These mechanics define the structure of gameplay and the interactions within the game environment (Lo, Thue and Carstensdottir, 2021). Other elements include the remaining aspects which do not fall upon the previous categories.

Various studies explore the integration of role-playing games (RPGs) in education, particularly focusing on mathematics, science, language, and teamwork skills development. For mathematics and science education, RPGs like Liber Domus (Nunes et al., 2022), Speedy World (Wang et al., 2017), and Mission HydroSci (Adroit Studios, 2017) offer engaging and effective learning environments. In language learning, RPGs are utilized to enhance communicative English skills among university students and facilitate deeper engagement with literary texts in middle school English Language Arts classrooms. Additionally, themed role-playing games are employed in preschool settings to foster teamwork skills among

young children. These studies highlight the potential of RPGs to improve learning outcomes and engagement across various educational contexts. Two of the most common practices of educational role-playing games are to teach numerical and verbal skills to students. Below follows a more detailed background of these two practices.

2.1 Role-playing games to educate numerical skills

Role-playing games are effective tools for teaching mathematical concepts. By integrating mathematical principles into their design, these games encourage players to develop and refine their math skills in an enjoyable and engaging way. Whether through puzzles, combat mechanics, or resource management, these games offer diverse opportunities for players to enhance their math abilities while having fun.

There have been multiple uses of integrating role-playing features to education to instruct mathematics to students. Some researchers address the challenge of low motivation and engagement among pre-university students in distance learning settings. They propose a solution centered around a digital 3D role-playing game (RPG) prototype called Liber Domus, aimed at integrating mathematics and science learning for 6th-grade students. They detail the key features and components of the RPG, including the storyline, 3D environment, companions, quests, skills, elements, societies, rank, and equipment. They also explain the reason behind selecting and adapting specific RPG mechanics to align with the educational and ethical objectives of the game. The authors outline the team structure, tools, and timeline for developing the prototype. They specify the educational content and objectives covered by the initial four quests of the game, as well as the support systems provided to players. Furthermore, the authors present initial findings from an exploratory study involving thirty students who interacted with the prototype, demonstrating positive impacts on learning outcomes, student motivation, and classroom dynamics (Nunes et al., 2022).

Another research paper proposes a microworld-based approach to developing role-playing games aimed at involving students in effective, entertaining, and interactive mathematics instruction. The authors created a game titled "Speedy World," which simulates the concept of speed within a running field environment. They conducted a quasi-experimental study involving 107 sixth graders to compare the effects of the game-based learning approach with a conventional technology-enhanced learning method. The study revealed that the game-based learning approach significantly enhanced students' learning achievement and motivation in mathematics. Moreover, students demonstrated high acceptance of the game as a tool for learning mathematics. The paper suggests that microworld-based gaming approaches offer authentic and challenging contexts for students to apply their mathematical knowledge and skills. It underscores the importance of aligning gaming contexts with mathematical concepts when designing educational games for mathematics (Wang et al., 2017).

Similarly to mathematics education, role-playing elements have also been used to teach other science related topics. Mission HydroSci is a game-based, 3D virtual environment designed to educate middle school science students about water systems and scientific argumentation (Adroit Studios, 2018). In this game, players engage in a narrative focused on exploring, shaping, and managing water systems on a distant planet. The game incorporates learning progressions for water systems science and scientific argumentation, along with features such as a teacher support system and learning analytics (Laffey et al., 2017).

One research examines the impact of a role-play-based micro-game strategy on students' computational thinking, learning engagement, and motivation in a Python programming course. The researchers introduced a novel approach combining elements of role-playing games and micro-games, designing a 2D educational game system to support the learning process. A quasi-experiment involving 133 eighth-grade students from schools in eastern China compared the experimental group, which utilized the role-play-based micro-game strategy, with a control group employing traditional instructional methods. Results revealed that the experimental group outperformed the control group on the computational thinking test, particularly in computational concepts and practices. Additionally, the experimental group's learning levels had noticeably higher engagement and motivation compared to the control group, both before and after the experiment. Qualitative analysis of interview data suggested that the role-play-based micro-game strategy facilitated classroom learning and addressed the requirements of the course knowledge system (Yang et al., 2023).

2.2 Role-playing games to educate verbal skills

Role-playing games are excellent tools for teaching language skills. Through immersive storylines, character interactions, and creative expression, players can significantly enhance their language abilities while enjoying the game. RPGs offer unique and effective methods for improving verbal skills, including reading, writing, speaking, and listening.

Multiple previous research is present about the integration of role-playing games to develop language, communication and team working skills. One research paper investigates the determinants influencing university students' intention to use role-playing games (RPGs) for learning communicative English in Da Nang city, Vietnam. A research model is proposed, incorporating six independent variables (innovation, popularity, price, content quality, enjoyment, and attitude) and one dependent variable (intention to use). Data from 275 respondents is collected through a questionnaire and analyzed using SPSS and AMOS software to assess hypotheses and model fit. The study reveals that all independent variables positively impact the attitude towards using RPGs, with popularity emerging as the most influential factor. Furthermore, a positive association is observed between attitude and intention to use RPGs. Suggestions to enhance RPG innovation, popularity, price, content quality, and enjoyment include integrating artificial intelligence, voice recognition, multiplayer modes, celebrity endorsements, and immersive activities. Acknowledging limitations such as a small and homogeneous sample size, lack of qualitative data, and limited factors considered, the paper recommends future research directions, such as expanding the sample size, utilizing mixed methods, and exploring additional factors influencing RPG usage intention (Vo & Trong, 2022).

Another research article investigates the utilization of a modified tabletop role-playing game in middle school English Language Arts (ELA) classrooms to assess students' abilities to interact with and derive meaning from a traditional text, specifically Richard Connell's "The Most Dangerous Game." Employing a qualitative approach, the authors gathered data from various sources, including field notes, student writing samples, student interviews, and teacher interviews. They conducted analyses using constructivist grounded theory, identifying three prominent themes: (1) students' decision-making processes influenced by the story, (2) students' immersion in the narrative through the perspective of their characters, and (3) students' collaboration, both within their groups and across different groups. The study concluded that the game facilitated an extension of students' learning and

engagement with the story, enabling them to participate in the creation of interactive narratives. Furthermore, the authors discussed challenges and implications associated with implementing such games in ELA classrooms, including teacher comfort levels, student collaboration dynamics, and classroom arrangement considerations (Cook, Gremo & Morgan, 2017).

A different study focuses on teamwork skills education through themed role-playing games in preschool settings. The study aims to examine the current status of cooperative skill development among children using themed role-playing games in Dak Lak, Vietnam, and proposes measures to enhance this aspect. Employing a mixed-methods approach, the paper utilizes questionnaire surveys, pedagogical observations, conversations, and activity product analysis to gather and analyze data from 110 preschool teachers and 60 children aged 5-6 years old. Results indicate that while preschools dedicate considerable effort and resources to fostering collaboration skills among primary students, the outcomes remain relatively modest and do not proportionally reflect participant numbers. Furthermore, findings reveal that children aged 5-6 years old benefit from the implemented measures, with the experimental group exhibiting superior collaboration skills compared to the control group. The paper concludes that themed role-playing games serve as effective tools for educating and cultivating children's social ethics and intellectual development. It emphasizes that teamwork skills education is a continuous process requiring active participation from children and support and encouragement from teachers (Yen, Nho & Huyen, 2022).

3 Problem

As mentioned previously in the background section, there are many instances of educational role-playing games, however, there has not been much research done on specifically identifying what aspects of role-playing games to include in educational games and evaluating them.

This research paper seeks to contribute to educators, serious game designers and researchers in the game development field by developing a theoretical understanding of how role-playing game elements can be used to effectively engage students in their education. It aims to identify, test and verify these role-playing features with the intention of improving educational games to fulfill their purpose including the game prototype that is being used in this research. It could be a good early step to read this paper before starting to develop an educational RPG game or to implement RPG elements to the conventional teaching methods. Also, it could include some useful information for the educational games that are already in development.

This study includes 2 research questions.

Research Question:

- Which elements of role-playing games contribute to the engagement of students?
- In what ways role-playing elements can be implemented in game-based learning to enhance student engagement?

3.1 Method Description

A semi-systematic literature review is included to summarize the previous related research and to identify the possible engaging roleplaying elements that could be used in game-based learning (Zunder, 2021). These features are tested with students with the use of the serious game prototype, Minequest. A qualitative case study was carried out with students recruited by Balthazar Science Center to gather data by an interview with an educator who has observed the playtest and a questionnaire was carried out with the students to collect the data, in order to perceive the learning effect RPG elements have in game based learning and to evaluate which of the identified elements are more effective.

3.1.1 Literature Review

In this research, the literature review serves the dual purpose of enhancing familiarity with existing knowledge and establishing a theoretical framework. It aims to identify commonly used RPG elements in educational games and position this study in relation to previous research by pinpointing gaps.

A semi-systematic literature review method was used, involving scanning four academic databases to locate relevant scientific research articles. Semi-systematic reviews are chosen when conducting a comprehensive systematic review is impractical due to diverse conceptualizations and interdisciplinary studies (Zunder, 2021). Systematic literature reviews carefully analyze evidence to answer research questions, following strict criteria and methodologies to reduce bias. Semi-systematic literature reviews blend systematic and

traditional methods, allowing more flexibility in study selection and providing insights through narrative synthesis (Elsevier, 2022). They are particularly useful in fields where covering every relevant article is challenging. Rather than relying on quantitative measures, this review synthesizes various research traditions using meta-narratives. Qualitative techniques, such as thematic or content analysis, are frequently employed to identify patterns within the text (Braun & Clarke, 2006). While qualitative analysis is prevalent, exceptions exist, such as combining semi-structured literature collection with statistical meta-analysis (Borman & Dowling, 2008). The significance of a semi-systematic review lies in identifying themes, theoretical frameworks, or shared issues, mapping the research field, synthesizing knowledge, presenting a research agenda, providing a historical overview, and contributing valuable insights to complex areas (Snyder, 2019).

Literature Search Procedure

The databases, Web of Science, ScienceDirect, Scopus and Google Scholar were searched using keywords such as game-based learning, role playing elements, RPGs, primary education, secondary education, serious games, and educational games. The search results were then refined to include scientifically peer-reviewed papers published between 2010 and 2023, with a focus on publications in computer science, psychology, education, gaming, technology, and social science. Furthermore, the search targeted studies involving participants in primary or secondary education. Following the initial filtering of 459 papers, a total of 70 pertinent papers were identified.

Selection Criteria

After identifying papers with relevant topics, those with the most similar titles and highest citations were analyzed. If they contained concepts related to the effectiveness of role-playing games in educational games, they were included in the selection pool, while papers lacking relevant concepts were excluded. Following this method, thirty-one papers are further analyzed and from the references included in those papers, seven new and relevant research papers are found and included in the research pool increasing the total size to thirty-eight.

To identify the relevant elements mentioned in these papers, thematic analysis is used where the components were divided into three main categories, including “narrative”, “gameplay” and “other”. Then they were listed down under relevant themes and the ones with the most recurrences were included in the results. In the case of synonyms, the most repeated words were used.

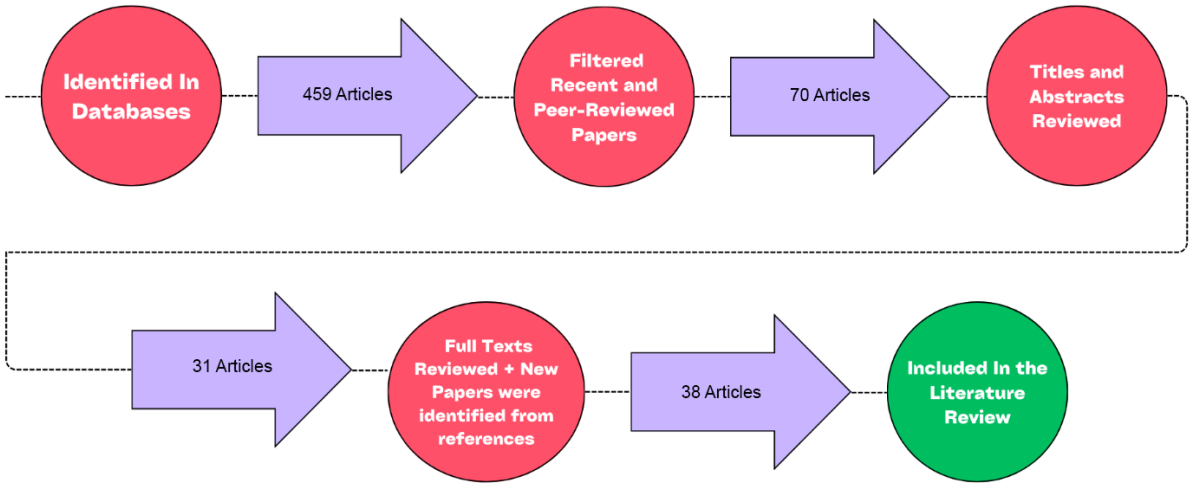

Figure 1 Number of articles identified, evaluated, and included in the literature review

3.1.2 Game Test

After the RPG elements were identified, their real-life effectiveness were tested with playtests across students from ages 14 and 18. For the game test, an educational game prototype called Minequest was used. This game includes most of the elements in the literature review. This choice is also because of the familiarity of the researcher to this specific game as he was one of the four developers of this game.

Minequest is a narrative focused and discussion based serious game, designed for the purpose of teaching children about the mining related controversies within Sweden. In the beginning of the game, players are divided into three groups representing mining companies, locals, and environmentalists. Then, guided by the characters in the game, they encounter various events. These events are presented to players in videos, as this reduces reading pressure and makes the game more engaging. Each event has 2-3 different options, all with different tendencies. For example, deciding whether to cut down trees to build a new mine; choosing "yes" yields more resources but decreases the satisfaction values of environmentalists. If "no" is chosen, the opposite will occur. Players have 2 minutes for intra-group discussion, followed by around 3 minutes of discussion between the three groups to make the final decision. The chosen options have different impacts on satisfaction values, and based on these effects, corresponding consequences occur, triggering subsequent events for players to continue making choices. The game continues until all events are completed or the satisfaction value of one group becomes zero. Subsequently, the corresponding ending is shown to the players, and the game ends.

This game includes almost all of the identified role-playing elements within this research. Therefore, it is suitable to be used in this study. It includes 9 of the 10 elements identified in

the research, only exception being the element “customisation”. Game contains various challenges for the players, where they need to make difficult decisions in collaboration with each other. It contains stylised visuals and funny videos to engage students. The narrative story of the game aims to emotionally immerse them to the different roles within the game with the consequences of their choices and tries to teach the students both about the pros and cons of mining in Sweden as well as how to engage in divisive discussions with respect to each other.

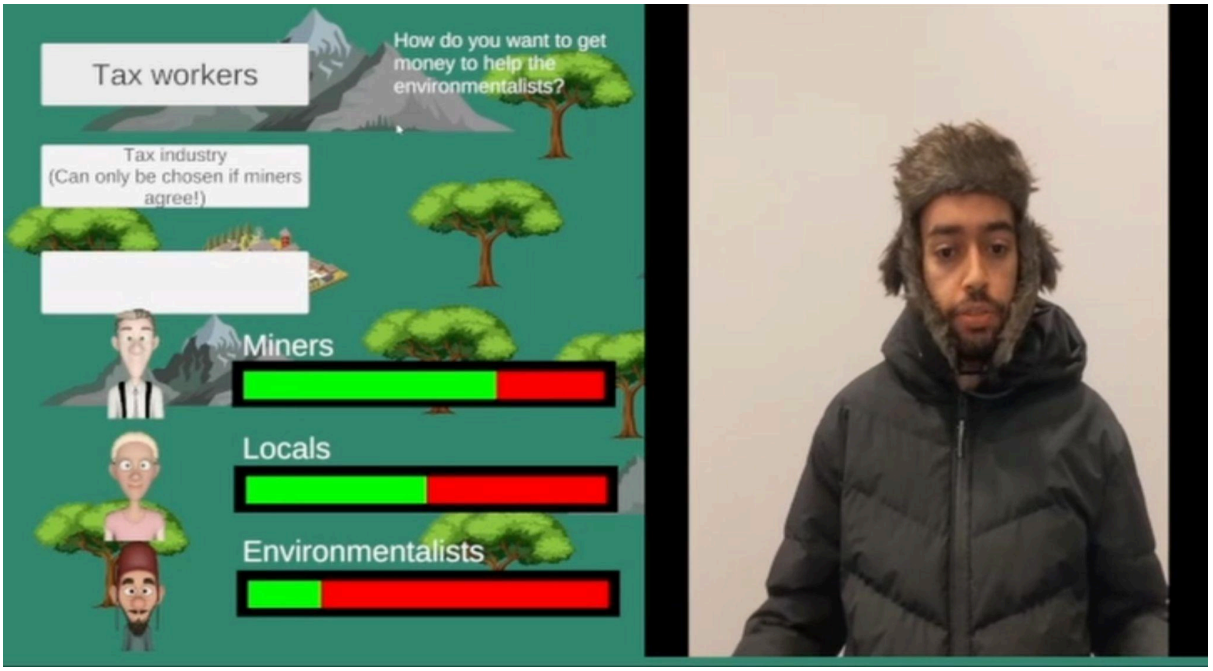

Figure 2 Screenshot of Minequest

Participants

With the collaboration of the Balthazar Science Center in Skövde, purposive sampling is used to gather six students within the ideal age group between the ages 14 and 16. Students under the age of 14 were not invited to participate due to the game being entirely in English, thus mitigating potential language barrier issues. Purposive sampling was the desired recruitment method for all the workshop groups, however, due to many of the students being in an examination period during the time of the playtests, additional students who were slightly above the ideal target group were also recruited and they were informed that they were about to test a game designed for a younger audience before the test started.

In total three workshop groups of students between ages 14 to 18 were chosen for this study. six male and seven female students have participated. Three different playtests were conducted with three different groups.

The first playtest took place in Kulturlabbet Skövde, which is a youth activity center in the local town. It included four students of age seventeen and in order to balance the numbers in the playtest groups, two staff members also joined the playtest, but no data was collected from the staff, as they were older than the target group.

The second playtest was organized in Vasaskolan Skövde with six students, from the ages 14 to 16, who were in grades 8 and 9. A Balthazar Science Center educator was present during

this test who made observations and was later interviewed based on her observations of the test.

The third playtest took place in The University of Skövde with three playtesters from Gymnasium Skövde Västerhöjd. They were between the ages 17 and 18. In this test, intra-group discussions were replaced with slightly longer inter-group discussions, due to lack of enough participants.

Questionnaire

As the participants of the experiment are young students, designing a questionnaire suitable for them required careful consideration to ensure that the questions are engaging, age-appropriate, and easy for them to comprehend. The phrasing of questions significantly impacts their understanding and comfort with a survey. Best practices include keeping questions short and asking one at a time, piloting questions beforehand, using affirmative statements, and balancing positive and negative response options. Introducing statements with an acknowledgment of differing opinions and separating scale midpoints from "don't know" responses also helps (Saris & Gallhofer, 2007). Consideration of sensitive topics and age-appropriate language is essential, along with reversing question directions to reduce bias. Using terms relevant to children's daily lives and including "other" options in item lists enhances response accuracy (Fowler, 1993).

The main reason for using a questionnaire to collect data for this research is because it would be quick and easy for the young participants to share their input. After a 35-40 minute playtest, they might be starting to get tired, so private interviews were not considered the best option to avoid spending too much time after the playtest. The questionnaire was initially written in English and was translated into Swedish. Both versions were present for the playtesters to choose from, in order to reduce the possibility of language related confusion while reading and answering the questions.

The questionnaire focuses on the identified elements in the literature review and is adapted from the research conducted by Hwang and Chen (2017). It comprised fourteen items, thirteen of them rated on a 5-point Likert rating scale and one open ended question at the end. Students were provided with the opportunity to express their motivation towards the learning activity, with perceptions ranging from 1 (strongly disagree) to 5 (strongly agree). This survey scale is further improved by following suggestions from an AMEE guide (Artino et al., 2014). Some of the questions are inspired from game engagement questionnaires (Moketar et al., 2021), (Norman, 2013). To make the questions easier to understand and more consistent, all of the questions were written with positive statements in the questionnaire.

The terminology used in each of the elements is simplified for the participants to clearly understand. For example, to examine the collaboration of the game, the initial question “I found collaboration and discussion interesting” was changed to “I liked working together and talking with others.” This was to avoid confusion especially for the younger playtesters, if they did not know the meaning of each element.

Teacher interview

After the playtest and survey were completed, the teacher was interviewed with a semi-structured interview to gather her views on student engagement, interaction, and

learning. These questions were adapted from another similar study (Cook, Gremo & Morgan, 2017). This gave a detailed understanding of how students interacted with the game. Below is a list of the interview questions used.

1. Do you think the students have learned anything useful from the workshop?
2. Do you think the workshop was engaging and fun for the students?
3. Was the game difficult to understand?
4. Based on your observations, do you think educational games incorporating roleplaying systems can be effective for teaching?
5. Did you see the students working together as a team towards a common goal?"

3.2 Ethical Considerations

The fundamental principle outlined in the ethical review act states that research is permissible only with the explicit consent of the subject involved. This consent is considered valid only if the subject has been informed about the research in advance. Furthermore, the consent must be voluntary, explicit, and specific to the particular research project, with documentation required (Eriksson, n.d).

Conducting research in Sweden requires compliance with various regulations, including securing all necessary permits and approvals before starting. Grant applications to the Swedish Research Council must address legal and ethical requirements, reflect on ethical issues, and justify the research's necessity. Research involving humans or animals needs approval from the Swedish Ethical Review Authority or a regional animal ethics board. Additional permits may be required for activities such as using ionizing radiation or conducting clinical trials. For research abroad, Swedish ethical standards must be maintained, and additional host country requirements must be met. Researchers and their organizations are responsible for adhering to good research practices, as confirmed by accepting the grant terms and conditions (www.vr.se, n.d.).

In research involving children, three main ethical concerns emerge: power relations, informed consent, and confidentiality. Due to this, researchers must also ensure that children are not harmed during the research process. Informed consent involves providing comprehensible information, ensuring voluntary participation, and assessing the child's competency to consent (Kirk, 2007).

With these considerations in mind participants were verbally informed about the research and permission was taken from their legal guardians prior to the playtest and they were informed that the test was voluntary, and they could leave at any moment if they did not want to continue. Additionally, any private information that might be gathered from the participants would not be shared to the public. The permission letter can be found in Appendix - A.

4 Results & Analysis

4.1 Literature Review

After thorough analyses of the relevant papers repeating patterns have been found and the ten recurring elements have been identified under three categories, “narrative elements”, “game mechanics” and “other” elements. The 10 identified RPG elements are, “emotional engagement”, “immersion”, “Challenge”, “Customisation”, “Decision Making”, “Feedback and Progression”, ”Interactivity”, “Graphics and Visual Design”, “Collaboration” and “Integration of learning objectives”.

4.1.1 Concept Matrix

	Narrative Elements		Game Mechanics					Other Elements		
	Emotional Engagement	Immersion	Challenge	Customisation	Decision Making	Feedback and Progression	Interactivity	Graphics and Visual Design	Collaboration	Integration Of Learning Objectives
Abdul Jabbar and Felicia, 2015	X	X	X			X	X	X	X	X
Cook, Gremo & Morgan, 2017	X		X		X	X	X		X	X
Ismail et al., 2022	X				X	X	X	X		X
Laffey et al., 2017	X	X	X		X		X	X		X
Moketar et al., 2021		X	X		X	X				X
Nunes et al., 2022	X	X		X	X	X	X	X		X
Ntokos, 2019	X	X		X	X	X	X	X		
Pratama, Yanfi & Nusantara, 2023		X	X				X			X
Wang, Hwang & Chen, 2017	X	X	X		X		X	X		X
Yen, Nho & Huyen, 2022			X		X		X		X	X

Figure 3 Concept Matrix

Out of the thirty-eight analyzed papers, 10 were chosen to include in the concept matrix. This choice included the papers which were clearly talking about elements which are used or should be used in educational RPGs. Most of these papers incorporated some specific educational games in the research as a part of their data collection method and some were theoretical frameworks.

Most common elements are “Interactivity” and “Integration of learning objectives” with 9 out of 10 mentions. Whereas the least common one was “Customisation” with only two mentions. It is important to note that even though some of these elements could fit into most educational RPG games, some games with a specific purpose do not benefit from the inclusion of all of the elements.

4.1.2 Narrative Elements

Narrative elements in educational role-playing games (RPGs) enhance learning and engagement. These elements help create immersive experiences that effectively impart a wide range of knowledge and skills (PENON, 2024).

Emotional Engagement: Role-playing games frequently incorporate intricate narratives, captivating storylines, and intricately developed characters. These aspects heighten emotional involvement by enabling players to empathize with and relate to the characters within the game (EMB, 2024).

Researchers emphasize the significance of emotional engagement in educational games, advocating for a holistic model encompassing cognitive, affective, and behavioral elements of engagement states. They underline the influence of factors such as attention, memory, motor control, persistence, and effect on engagement, stressing the importance of designing games that accommodate diverse student engagement states. Moreover, the distinction between engagement and motivation is highlighted, urging educational games research to delve into the processes of cognition, emotion, motivation, and will during learning (Deckard, Chang & Evans 2013). Additionally, the integration of emotional agents in game design is explored as a means to assess subjective playing experiences and enhance engagement by responding to learners' cognitive and emotional states. In essence, a nuanced understanding of emotional engagement and tailored game design strategies are posited as pivotal for optimizing learning experiences in educational games (Gutica & Conati, 2013).

Immersion: The narrative of an RPG serves as its foundation, drawing players into richly detailed worlds filled with intriguing characters, environments, and plot twists. It not only captivates players' attention but also provides a contextual framework for the embedded learning objectives.

The findings indicate that Role-Playing Games (RPGs) have garnered significant acclaim. A well-executed Randomised Controlled Trial (RCT) conducted by (Jennet et al. 2008) focusing on immersive experiences within entertainment-based gameplay (Connolly et al., 2012) suggests that immersion is heightened when role-playing is integral to the gameplay. RPGs are recognized for their ability to enhance engagement and learning, with role-play emerging as a primary driver of immersion in Game-Based Learning (GBL) (Adul Jabbar and Felicia 2015).

In a different study, a role-playing game was integrated into virtual reality (VR) learning environments using an RPG-VR learning approach. An investigation was carried out at an elementary school to find out how this method affected the science education of the students. Comparing this method to the traditional VR learning approach, the experiment's findings showed that students' perceptions of immersion, self-efficacy, and extrinsic learning motivation were significantly improved. However, in terms of improving their learning outcomes, there was no discernible difference between the two groups (Chen & Syu, 2024).

4.1.3 Game Mechanics

Educational role-playing games (RPGs) incorporate a variety of gameplay elements to produce engaging learning opportunities. These gameplay elements aim to instruct players in particular knowledge and skills while entertaining and motivating them.

Challenge: RPGs provide varied challenges and difficulty levels that keep players engaged and motivated. Overcoming obstacles and developing strategies instills a sense of accomplishment and mastery, driving players to progress through the game.

According to previous research findings, the concept of challenge is prominently featured and assessed in Game-Based Learning (GBL) studies (Abdul Jabbar and Felicia, 2015). Students engaged with games featuring challenges demonstrated increased curiosity towards the content area and developed a deeper understanding of the topic (Tan et al., 2013). Despite the difficulty posed by challenges, students found the games enjoyable, leading to heightened engagement (Ke, 2008a; Simkins, Egert, & Decker, 2012). Confronted with challenges, students actively explored the game environment and exhibited reduced frustration when tackling difficult tasks (Sadler et al., 2013). Moreover, their subject knowledge and ability to devise appropriate strategies for problem-solving appeared to improve in response to challenges (Rubin-Vaughan, Pepler, Brown, & Craig, 2011). In a rigorous quasi-experimental study, (Rosas et al., 2003) observed that challenges fostered both competition and collaboration among students, promoting teamwork within the learning context.

Customization: Players can frequently alter their characters' abilities, gear, and skills in role-playing games. Players feel more invested and have a sense of ownership thanks to this personalization, which increases engagement (rpgwizard.com, 2024).

Customization in educational games is essential for optimizing the learning journey of students. Unlike traditional games with fixed content sequences, personalized adaptations offer a dynamic framework based on context and learner-centred design principles. This approach tailors game elements to individual learning objectives, levels, and progress, creating a non-linear learning sequence. By engaging students with content that matches their characteristics, personalized adaptations increase motivation and improve learning outcomes (Shum et al., 2023). An example of this framework is demonstrated in GhostCoder, an educational game that adjusts content difficulty in real-time based on player performance. Although testing has been conducted in lab environments, further evaluation with student target groups is planned. In essence, customization in educational games provides tailored learning experiences, enriching effectiveness and enjoyment for students.

Decision Making: RPGs challenge players to make meaningful choices with consequences, promoting critical thinking, problem-solving, and ethical reasoning. Players must weigh their options carefully and consider potential outcomes as they shape the course of the game world (learnexus.com, 2024).

Educational role-playing games (RPGs) offer an engaging blend of learning and interactive storytelling, particularly in the realm of decision-making. One notable example is Quandary, a video game designed to cultivate ethical reasoning and decision-making skills. Players assume the role of a space colony captain on the planet Braxos, facing dilemmas that shape the colony's future. RPGs like Quandary foster critical thinking by prompting players to analyze situations, consider consequences, and evaluate options. They also encourage perspective-taking as players inhabit different roles and viewpoints. A study on Quandary's impact on middle school students revealed qualitative insights consistent with the game's objectives, despite limited immediate quantitative effects (Lacey et al., 2018). Although not immediately quantifiable, RPGs contribute to social, emotional, and cognitive development by engaging players emotionally, promoting critical thinking, and nurturing empathy. In

essence, educational RPGs offer a dynamic platform for ethical exploration, decision-making practice, and holistic growth (Prager, 2019).

Feedback and Progression: Clear feedback mechanisms and visible progression indicators inform players of their achievements and areas for improvement. RPGs provide players with a sense of advancement as they level up, gain new skills, and unlock content. Rewards like experience points, items, or achievements serve as motivation for players to continue playing the game (Zitha, Mokganya & Sinthumule, 2023).

In serious games and simulations, feedback is essential for affecting performance and learning objectives (Johnson, Bailey and Van Buskirk, 2016). Researchers have examined various factors affecting feedback efficacy, including its content, modality, timing, and adaptation to individual differences. Theoretical perspectives such as the cognitive theory of multimedia learning support the integration of feedback into games, with practical implications for game design emphasizing timely and meaningful feedback tailored to learner characteristics and objectives (Johnson et al., 2016). Educational games offer real-time feedback to players, informing them about their performance, progress, and areas for improvement. This dynamic feedback mechanism guides players and enhances the learning experience by adjusting content dynamically (Usher, 2023). In essence, thoughtful feedback and well-designed progression mechanisms significantly contribute to effective learning experiences within educational games.

Interactivity: Interactive elements, such as puzzles, quests, and dialogue trees, enhance engagement by allowing players to actively participate in the game world. Interactivity promotes active learning, creativity, and agency as players shape the narrative through their choices and actions (Pixel, n.d.).

Three essential levels of interaction are present in educational games, especially role-playing games: Three types of interaction: social, narrative, and interface (Eseryel, Guo & Al, 2012). Interface Interactivity refers to the interaction between players and the game interface, encompassing aspects such as navigation, controls, and usability (Hwang et al., 2017). Narrative Interactivity involves the player's engagement with the game's storyline, characters, and plot development. Social Interactivity focuses on interactions among players within the game environment, facilitating collaboration and communication (Adipat et al., 2021). RPGs offer unique advantages such as persistent worlds and collaborative play, which enhance students' motivation and problem-solving abilities. These games serve as dynamic learning environments that encourage contextualization, intrinsic motivation, and social communication (Brooks and Sjöberg 2022). Effective design of educational RPGs involves considering all three levels of interactivity, ensuring user-friendly interfaces, captivating storylines, and opportunities for collaborative gameplay. Evaluating RPGs using this framework validates their effectiveness in fostering motivation and problem-solving skills (Eseryel, Guo & Al, 2012). In the end, interaction in educational games—especially role-playing games—enhances social interaction, learning, and engagement.

4.1.4 Other Elements

The remaining recurring components are categorized under other elements for being more unique and different.

Graphics and Visual Design: In educational games, the visual components are meticulously selected to create an aesthetically pleasing and cognitively impactful learning environment (Neto et al., 2020).

High-quality graphics and animations not only enhance visual appeal but also play a crucial role in conveying information effectively. User interfaces are thoughtfully designed for clarity and simplicity, ensuring that learners can navigate complex concepts seamlessly (Zhang, Shang, Pelton and Pelton 2020). High-quality graphics enhance immersion and facilitate learning. However, game design poses challenges, especially with Commercial Off-The-Shelf (COTS) games primarily designed for entertainment (Sanchez et al., 2022). Custom game development demands expertise in game design, graphics, and programming, often requiring a balance between educational objectives and limited resources (Neto et al,. 2020). To design effective educational game graphics, considerations include creating user-friendly interfaces, developing engaging storylines and characters, and promoting collaboration among players. Accessibility for diverse learners, including those with visual impairments, should also be addressed. Collaborating with graphic designers ensures professional execution, achieving a balance between functionality and visual appeal (Whitton & Whitton, 2011). In summary, thoughtful visual design enhances educational games, making them more engaging and effective for learners.

Collaboration: Many RPGs feature multiplayer modes or cooperative gameplay elements that encourage teamwork and social interaction. As participants cooperate to overcome obstacles and accomplish shared objectives, collaborative experiences help players develop their communication, teamwork, and leadership abilities (Loarbaind, 2023).

Collaboration in educational games is a potent strategy that enhances learning and social interaction among students. These games, designed for cooperative learning, encourage teamwork, problem-solving, and communication skills development within teams. Through collaborative efforts, students not only apply their knowledge but also develops a supportive learning environment (Yen et al., 2022). Various types of cooperative games, such as grouping games, problem-solving scenarios, and team-building exercises, cater to diverse learning objectives. Effective implementation involves ensuring active participation, providing clear instructions, offering constructive feedback, and evaluating the games' impact on collaboration and comprehension (Riivari et al., 2021). In the end, cooperative learning games improve student engagement, teamwork, and sense of community while also enhancing the educational process.

Integration of Learning Objectives: Effective RPGs seamlessly integrate educational goals into the gameplay experience, reinforcing key concepts and promoting meaningful learning outcomes. Content is carefully crafted to align with curriculum standards, ensuring that learning remains central to the gaming experience. By incorporating these elements, educators can create dynamic and immersive RPGs for game-based learning that engage students, promote critical thinking and collaboration, and inspire a love for learning.

The integration of learning objectives into educational games presents a multifaceted challenge, as outlined in the discussion below. First, the role of teachers and their working processes are crucial factors to consider when implementing games in formal educational settings. This endeavor demands significant effort from teachers, who must orchestrate

various organizational resources to seamlessly integrate games into the curriculum. It's crucial to comprehend the settings in which games are used as well as the roles that educators play in game-based learning scenarios. (Marklund & Taylor, 2016). Additionally, the resource intensiveness and lack of established standards further complicate the integration of games into educational environments. Despite recognizing the educational potential of games, their integration remains limited due to the laborious and resource-intensive nature of their usage, exacerbated by the absence of standardized guidelines (Ke, 2016).

4.2 Game Test

The three playtests have gathered important data from the playtesters answers of the post-game questionnaire and the semi-structured interview with the educator. Even though the game was found engaging and it has educated the students to some degree about teamwork, it was not effective enough on teaching about the specific topic, the mining in Sweden.

4.2.1 Results of the Questionnaire

To analyze the results of the questionnaire eGameFlow model is adapted (Johari et al., 2023). This model assists game designers in understanding the strengths and weaknesses of e-learning games from the learner's perspective. By emphasizing the achievement of learning objectives through a flow effect, it enhances the overall educational experience (Fu, Su & Yu, 2009).

First three questions aimed to measure the game's overall effectiveness in terms of its enjoyability, engagement value and its clarity. The next ten questions aimed to measure the 9 of the 10 elements that are present in the game's design and the element "integration of learning objectives" has been included in 2 different questions as the game intended to teach both about the mining topic as well as team working skills.

The mean of the answers in each question is calculated, where "1" is the lowest possible outcome and "5" is the highest possible outcome. Table 1 shows all the results for Likert-scalequestions from the 13 playtesters.

Table 1 - Overall Results of the Likert-scale questions

Element	Item	Questions	Mean
-	1	I have found this game to be fun to play.	4.15
-	2	The game keeps me interested.	4.46
-	3	The game is easy to understand.	3.62
Emotional Engagement	4	The game's story made me feel lots of emotions.	3.92
Immersion	5	While playing the game I felt like I was inside the story or game world.	3.69
Challenge	6	The game's difficulty is just right-not too hard, not too easy.	3.69
Decision Making	7	I think my choices in the game matters.	4.15
Feedback & Progression	8	I know how well I am doing in the game.	3.31
Interactivity	9	I enjoy learning by playing because it is fun to be involved.	4.08
Graphics & Visual Design	10	The visuals in the game were interesting and fun.	4.38
Collaboration	11	I liked working together and talking with others while playing.	4.54
Integration Of the Learning Objectives	12	In today's workshop I have learned a lot about mining in Sweden	3.00
Integration Of the Learning Objectives	13	In today's workshop I have learned a lot about working with others.	4.15

The game has been found fun to play and very engaging by the majority of the students. According to some, however, it was not easy enough to understand.

The highest rated element for this specific game has been "collaboration" with "4.54" value and the lowest has been "integration of the learning objective" related to the mining topic.

Later, the questionnaire answers were separated into two categories representing the two age groups who participated in the playtests. Six students were in "grundskola" level between ages 14-16 and seven were in "Gymnasieskola" level between ages 17 and 18. In table 2, mean young represents the group of younger students and mean old represents the older students.

Table 2 - Separated Results of the Likert-scale questions

Element	Item	Questions	Mean Young	Mean Old
-	1	I have found this game to be fun to play.	4.33	4.00
-	2	The game keeps me interested.	4.33	4.57
-	3	The game is easy to understand.	3.50	3.71
Emotional Engagement	4	The game's story made me feel lots of emotions.	3.67	4.14
Immersion	5	While playing the game I felt like I was inside the story or game world.	3.50	3.86
Challenge	6	The game's difficulty is just right-not too hard, not too easy.	3.83	3.57
Decision Making	7	I think my choices in the game matters.	4.33	4.00
Feedback & Progression	8	I know how well I am doing in the game.	3.33	3.29
Interactivity	9	I enjoy learning by playing because it is fun to be involved.	3.67	4.43
Graphics & Visual Design	10	The visuals in the game were interesting and fun.	4.00	4.72
Collaboration	11	I liked working together and talking with others while playing.	4.83	4.29
Integration Of The Learning Objectives	12	In today's workshop I have learned a lot about mining in Sweden	3.17	2.86
Integration Of The Learning Objectives	13	In today's workshop I have learned a lot about working with others.	4.16	4.14

There are some differences to be observed between the two age groups. The biggest gap was on the element “interactivity” with 0.76 mean value of difference, followed by “Graphics and visual design” with 0.72 difference. It is also notable that the mean value for the “integration of the learning objectives” related to mining in Sweden is very low for the older group with only 2.86 value. It could be interesting to gather data from an even younger audience.

The open-ended question is analyzed using “thematic analysis” to select repeated and similar topics (Caulfield, 2019). The process was a part of reporting patterns, identifying key themes, topics and concepts present in the data. These themes included 9 RPG elements present in the game and also a “general” theme. The relevant points from the answers were identified and listed under these relevant themes and irrelevant information was filtered out.

Multiple students stated that the game was a fun concept and a good way to gain insight into the mining industry. Graphics and visual design were positively mentioned several times, and one student found the characters in the game “charming”. Many of the answers included that they have enjoyed taking part in the discussions while playing the game. One tester wrote down “I have enjoyed immersing myself in the discussion while role-playing as my assigned role.” Another stated that it was interesting to learn about important topics in combination with role playing. The elements of collaboration and challenge seemed to combine well as some of the answers were including both such as, “It was fun to talk to people and come to an agreement together, it was hard to know what was good for everyone”.

Even though the majority of the open-ended answers were positive, there was some criticism towards the game's clarity related to its feedback as they were slightly getting confused about how well they were doing. Students seemed to learn more about collaboration and teamwork, than the mining topic. One student felt that it wasn't really about mining in Sweden, but more about mining in general.

Overall, the themes that were mentioned the most were the top 3 elements with the highest mean values in table 1, which were collaboration, graphics and visual design and decision making.

4.2.2 Results of the Teacher Interview

An interview was conducted with an educator from Balthazar Science Center, who observed the game. She reported that the students were highly engaged and enjoyed the experience. She noted that the students learned that some decisions are significantly more challenging than they had initially anticipated. Additionally, she found the gameplay loop to be very intuitive. She expressed the belief that game-based learning, particularly those incorporating roleplaying systems, holds substantial potential and can be highly effective in education when integrated with traditional teaching methods. At the conclusion of the interview, the educator expressed a desire to repeat this test once the game is further developed.

5 Conclusions

5.1 Summary

Research Questions:

- Which elements of role-playing games contribute to the engagement of students?
- In what ways role-playing elements can be implemented in game-based learning to enhance student engagement?

This paper aimed to develop a theoretical understanding of how role-playing elements in games can effectively engage students in their education. It identifies and tests these role-playing features in an attempt to enhance educational games.

In this research ten elements from educational RPG games have been identified with the use of a semi-systematic literature review and their effectiveness were tested with a case study involving young students playing an educational game called Minequest, including 9 of the 10 identified elements. From a questionnaire filled by the playtesters and from a semi structured interview with an educator observing the playtest, necessary data is collected.

In the tested game, four RPG elements, “Collaboration”, “Graphics and visual design”, “Decision making”, and “interactivity” have been found significantly engaging for the playtesters. The two different questions evaluating the effectiveness of the learning objectives had different outcomes, the one teaching teamwork had positive effects whereas the one teaching about the mining topic had neutral effects. Three elements, “emotional engagement”, “immersion” and “challenge” have been found slightly positive in the results whereas the element “Feedback and progression” had a neutral outcome. Finally, the popular RPG element “customisation” has not been tested as it was difficult to implement in the developed game.

Using RPG systems is found to be a good way to introduce new topics to students, but it is not effective enough for teaching topics on its own. It should be used as a supplement to traditional teaching techniques. Integrating RPG elements into the teaching syllabus can significantly increase classroom engagement. They could be very useful at either introducing students to a new educational topic, to increase their interest or after the educator teaches about a topic traditionally, GBL with RPG elements can be utilized to review and practice the recently learned material. However, the clarity of the game and selecting the appropriate difficulty level for the targeted age group are crucial factors that affect the game's effectiveness as a teaching tool. Key elements such as collaboration, graphics and visual design, and decision-making should be incorporated when designing educational games. Elements should be chosen depending on the topic and type of the game while keeping the targeted age group clearly in mind. Furthermore, game developers should work closely with experienced educators to carefully analyze the topics they aim to teach. This collaboration ensures that the educational content is both accurate and effectively delivered through the game.

In summary, this study demonstrates that role-playing components can enhance player engagement and educational effectiveness in learning games. The findings suggest that incorporating carefully designed RPG elements can lead to more engaging and productive learning experiences for students.

5.2 Discussion & Limitations

There has been much research on developing educational games, especially using role-playing systems but it is not common for these papers to include clear suggestions on what design or mechanical elements to include. For this reason this research paper can be a beneficial introductory step for both game developers and educators to have a look at before starting to use RPG systems in the context of game-based learning.

One of the closest studies examined a range of game-based learning (GBL) elements and how they affect students' learning and engagement (Abdul Jabbar and Felicia, 2015). The key finding was that students' emotional and cognitive involvement in GBL is strongly correlated with their engagement. Encouraging students to surpass fundamental learning objectives requires striking a balance between aptitude, drive, and enjoyment. Some similar GBL elements such as “incorporation of learning tools”, “Challenges and Conflicts” and “Control and choices” were identified in this research. However, this research was not directly focused on developing educational role-playing games, but general inclusion of GBL elements to determine the ways in which learning and engagement are impacted by the design of game-based activities and create a set of broad guidelines for GBL instructional design. Other relevant papers explained the design decisions in the educational RPG games used in their research, but they have lacked an overall framework to suggest how to develop similar games for teaching (Laffey et al., 2017, Nunes et al., 2022, Wang et al., 2017). This research compiles valuable information in the field as an initial step towards developing an educational RPG game or integrating RPG elements into conventional teaching methods. Additionally, it provides insights which could be useful for educational games already in development.

There are some limitations in this research which may have affected the reliability and validity of the results. The scope of the literature review was limited by the search location within the electronic databases accessible through the library system. To ensure the inclusion of the most recent findings, the search was further restricted to articles published in peer-reviewed journals between 2010 and 2024.

The game was mainly developed for students in the younger age group, so the older students were expected to find the game less challenging and learn less from it and the third playtest group did not play the game completely as intended, as their numbers were insufficient. Having three groups of six students below the age 16 would have been more beneficial for the research, but still this limitation helped to analyze the differences between the engagement levels and interests of two age groups related to GBL. Another important limitation is the way the elements were evaluated in the questionnaire. Complex terminology was excluded from the questions to prevent confusion for the playtesters, which might have prevented the identified elements from being perfectly presented in the questionnaire. Another possible limitation to note is the outcome of the question determining how easy the game was to understand. The result was slightly positive and the clarity of the game was higher for the

older play-testers compared to the younger ones. It is possible that uncertainty regarding the game might have influenced the overall engagement to the game. Moreover, only a singer interview has been conducted, which makes the results of the interview less reliable.

5.3 Future Work

Even though some relevant results have been obtained in this research, more research is required to further understand how to develop RPG games and to integrate them into education. More similar games with different topics and gameplay should be tested with more students to gather more reliable data, especially with students who are younger than the ones who have participated in this research. Furthermore, additional feedback needs to be collected from teachers and educators to further comprehend in what ways RPGs can be utilized as either a complement or a supplement to the conventional learning methods. Future studies should look into how other RPG components, like "Customization," can be integrated and how that affects different learning objectives. Additionally, more research needs to be done to validate or to discover potentially new role-playing elements.

In light of the review's limitations, it is crucial to recognize that these suggestions do not ensure that game-based learning (GBL) will be successful. They might, nevertheless, provide insightful information about the factors influencing learning and engagement. Through comprehension of the ways in which these components affect these results, we can design more efficient and captivating GBL settings.

References

Abdul Jabbar, A.I. and Felicia, P. (2015). Gameplay Engagement and Learning in Game-Based Learning. Review of Educational Research, 85(4), pp.740–779. doi:https://doi.org/10.3102/0034654315577210.

Adipat, S., Laksana, K., Busayanon, K., Ausawasowan, A. and Adipat, B. (2021). Engaging Students in the Learning Process with Game-Based Learning: The Fundamental Concepts. International Journal of Technology in Education, [online] 4(3), pp.542–552. doi:https://doi.org/10.46328/ijte.169.

Ahmad, M. (2019). Categorizing Game Design Elements into Educational Game Design Fundamentals. [online] www.intechopen.com. IntechOpen. Available at: https://www.intechopen.com/chapters/70106.

Artino, A.R., La Rochelle, J.S., Dezee, K.J. and Gehlbach, H. (2014). Developing questionnaires for educational research: AMEE Guide No. 87. Medical Teacher, [online] 36(6), pp.463–474. doi:https://doi.org/10.3109/0142159x.2014.889814.

Bethesda Game Studios, 2011. The Elder Scrolls V: Skyrim [PC game] Rockville, Maryland: Bethesda Game Studios.

Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), pp.77–101. doi:https://doi.org/10.1191/1478088706qp063oa.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom.* Washington, DC: The George Washington University.

Borman, G. D., & Dowling, N. M. (2008). Teacher Attrition and Retention: A Meta-Analytic and Narrative Review of the Research. Review of Educational Research, 78, 367-409.https://doi.org/10.3102/0034654308321455

Brooks, E. and Sjöberg, J. (2022). Playfulness and Creativity as Vital Features when School Children Develop Game-based Designs. Designs for Learning, 14(1), pp.137–150. doi:https://doi.org/10.16993/dfl.170.

Caulfield, J. (2019). How to Do Thematic Analysis | Step-by-Step Guide & Examples. [online] Scribbr. Available at: https://www.scribbr.com/methodology/thematic-analysis/

CD Projekt Red, 2007. The Witcher [PC game] Lodz: CD Projekt RED.

Chen, C. and Jia‐Yu Syu (2024). Effects of integrating a role‐playing game into a virtual reality‐based learning approach on students' perceptions of immersion, self‐efficacy, learning motivation and achievements. British journal of educational technology (Print). doi:https://doi.org/10.1111/bjet.13436.

Connolly, M. T., Boyle, A. Z., MacAuthor, E., Hainey, T., & Boyle, M. J. (2012). A systematic literature review of empirical evidence on computer games and serious games. Computers & Education, 59, 661–686. doi:10.1016/j.compedu.2012.03.004

Cook, M.P., Gremo, M. and Morgan, R. (2016). We're Just Playing. Simulation & Gaming, 48(2), pp.199–218. doi:https://doi.org/10.1177/1046878116684570

Deater-Deckard, K., Chang, M. and Evans, M.E. (2013) 'Engagement States and Learning from Educational Games', New Directions for Child and Adolescent Development, (139), pp. 21–30. doi:10.1002/cad.20028.

Defining the Criteria for an RPG: What Makes a Game an RPG? – 2D Computer Game RPG Hub. [online] Available at: https://www.rpgwizard.org/defining-the-criteria-for-an-rpg-what-makes-a-game-an-rpg/

EMB, T. (2024). Captivating Narratives: Engaging Storylines in Games. [online] Available at: https://blog.emb.global/engaging-storylines-in-games/

Eriksson, S. (n.d.). Human subjects research - CODEX rules and guidelines for research - Uppsala University, Sweden. [online] www.codex.uu.se. Available at: https://www.codex.uu.se/Human+subjects+research/.

Eseryel, D., Guo, Y. and Law, V. (2012). Interactivity3 Design and Assessment Framework for Educational Games to Promote Motivation and Complex Problem-Solving Skills. Assessment in Game-Based Learning, pp.257–285. doi:https://doi.org/10.1007/978-1-4614-3546-4_14.

Fowler, F. J. (1993) Survey research methods (2nd ed.). Newbury Park, CA, London, and New Delhi: Sage Publications.

Fu, F.L., Su, R.C. and Yu, S.C., 2009. EGameFlow: A scale to measure learners' enjoyment of e-learning games. Computers & Education, 52(1), pp.101-112. Available at: https://doi.org/10.1016/j.compedu.2008.07.004.

Gutica, M. and Conati, C. (2013) 'Student Emotions with an Edu-game: A Detailed Analysis', 2013 Humaine Association Conference on Affective Computing and Intelligent Interaction, Affective Computing and Intelligent Interaction (ACII), 2013 Humaine Association Conference on, pp. 534–539. doi:10.1109/ACII.2013.94.

Haarman, S. (2022). Dungeons & Dragons & Dewey: The Potential for Dramatic Rehearsal and Civic Outcomes in Tabletop Role-Playing Games. Philosophical Studies in Education, [online] 53, pp.56–70. Available at: https://eric.ed.gov/?id=EJ1366548

Hwang, G.-J. and Chen, C.-H. (2016). Influences of an inquiry-based ubiquitous gaming design on students' learning achievements, motivation, behavioral patterns, and tendency towards critical thinking and problem solving. British Journal of Educational Technology, 48(4), pp.950–971. doi:https://doi.org/10.1111/bjet.12464.

Hwang, G.-J., Hsu, T.-C., Lai, C.-L., & Hsueh, C.-J. (2017). Interaction of problem-based gaming and learning anxiety in language students English listening performance and progressive behavioural patterns. Computers & Education, 106, 26–42. https://doi.org/10.1016/j.com#pedu.2016.11.010

Interaction Design and Architecture(s), [online] (53), pp.51–69. doi:https://doi.org/10.55612/s-5002-053-003.

Ismail, M.I. et al. (2022) 'The Design and Evaluation of "MoM (Microbiome of Maternity)" Role-Playing Game (RPG) in Educating on the Importance of Diet and Lifestyle and Its Interactions with the Gut Microbiota during Pregnancy', Asian Journal of University

Education, 18(3), pp. 830–846. Available at: https://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ1348946&site=eds-live

Jennet, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience in games. International Journal of Human Computer Studies, 66, 641–661. doi:10.1016/j.ijhcs.2008.04.004

Johari, N.F.M., L, M.A.N.M.R., Ishak, N.H. and Zaini, H. (2023). Adopting the eGameFlow Model in an Educational Game to Increase Knowledge about Vaccination. JOIV : International Journal on Informatics Visualization, [online] 7(2), pp.338–344. doi:https://doi.org/10.30630/joiv.7.2.1809.

Johnson, C.I., Bailey, S.K.T. and Van Buskirk, W.L. (2016). Designing Effective Feedback Messages in Serious Games and Simulations: A Research Review. Instructional Techniques to Facilitate Learning and Motivation of Serious Games, pp.119–140. doi:https://doi.org/10.1007/978-3-319-39298-1_7.

Ke, F. (2008). A case study of computer gaming for maths: Engaged learning from gameplay? Computers & Education, 51, 1609–1620. doi:10.1016/j.compedu.2008.03.003

Ke, F. (2016) Designing and integrating purposeful learning in game play: a systematic review. Education Tech Research Dev 64, 219–244 . https://doi.org/10.1007/s11423-015-9418-1

Kirk, S. (2007). Methodological and ethical issues in conducting qualitative research with children and young people: A literature review. International Journal of Nursing Studies, 44(7), pp.1250–1260. doi:https://doi.org/10.1016/j.ijnurstu.2006.08.015.

Lacey J. Hilliard, Mary H. Buckingham, G. John Geldhof, Patricia Gansert, Caroline Stack, Erin S. Gelgoot, Marina U. Bers & Richard M. Lerner (2018) Perspective taking and decision-making in educational game play: A mixed-methods study, Applied Developmental Science, 22:1, 1-13, DOI: 10.1080/10888691.2016.1204918

Laffey, J.M., Griffin, J., Sigoloff, J., Lander, S., Sadler, T., Goggins, S., Kim, S.M., Wulff, E. and Womack, A.J. (2017). Mission HydroSci: A Progress Report on a Transformational Role Playing Game for Science Learning. [online] ERIC. Available at: https://eric.ed.gov/?id=ED600218

learnexus.com. (2024). Empower Learning: Unlocking The Secrets Of Realistic Role-Playing Scenarios | Learnexus. [online] Available at: https://learnexus.com/blog/creating-realistic-role-playing-scenarios/

Lo, P., Thue, D. and Carstensdottir, E. (2021). What Is a Game Mechanic? Entertainment Computing – ICEC 2021, [online] pp.336–347. doi:https://doi.org/10.1007/978-3-030-89394-1_25.Loarbaind - Ignite Your Imagination, Forge Your Adventure! (2023). Tabletop RPG Explained: Dive into Collaborative Storytelling. [online] Available at: https://www.loarbaind.com/what-is-tabletop-rpg-a-comprehensive-guide-to-the-world-of-collaborative-storytelling/

Marklund, B.B. and Taylor, A.-S.A. (2016). Educational Games in Practice: The Challenges Involved in Conducting a Game-Based Curriculum. Electronic Journal of e-Learning, [online] 14(2), pp.122–135. Available at: https://eric.ed.gov/?id=EJ1101225.

mhs.missouri.edu. (n.d.). Mission HydroSci | MHS. [online] Available at: https://mhs.missouri.edu/

Moketar, N.A., Zain, N.H.M., Johari, S.N., Samah, K.A.F.A., Riza, L.S. and Kamalrudin, M. (2021). Learning Cultural Heritage History in Muzium Negara through Role-Playing Game. International Journal of Advanced Computer Science and Applications, 12(12). doi:https://doi.org/10.14569/ijacsa.2021.0121253.

Mulia Pratama, Yanfi Yanfi and Pualam Dipa Nusantara (2023). WizardOfMath: A top-down puzzle game with RPG elements to hone the player's arithmetic skills. Procedia Computer Science, 216, pp.338–345. doi:https://doi.org/10.1016/j.procs.2022.12.144.

Neto, L.V., Fontoura Junior, P.H.F., Bordini, R.A., Otsuka, J.L. and Beder, D.M. (2020). Design and implementation of an educational game considering issues for visually impaired people inclusion. Smart Learning Environments, 7(1). doi:https://doi.org/10.1186/s40561-019-0103-4.

Johnson, C.I., Bailey, S.K.T. and Van Buskirk, W.L. (2016). Designing Effective Feedback Messages in Serious Games and Simulations: A Research Review. Instructional Techniques to Facilitate Learning and Motivation of Serious Games, pp.119–140. doi:https://doi.org/10.1007/978-3-319-39298-1_7.

Konstantinos Ntokos (2019) 'Swords and sorcery: a structural gamification framework for higher education using role-playing game elements', Research in Learning Technology, 27(0), pp. 1–16. doi:10.25304/rlt.v27.2272.

Norman, K.L. (2013). GEQ (Game Engagement/Experience Questionnaire): A Review of Two Papers. Interacting with Computers, 25(4), pp.278–283. doi:https://doi.org/10.1093/iwc/iwt009.

Nunes, E., Gavaia, B., Rodrigues, R., Sampaio, L. and Silva, R. (2022). Liber Domus: Development of a Prototype RPG for 6th Grade Mathematics and Science Learning. Prager, R.H.P. (2019). Exploring The Use of Role-playing Games In Education. The MT Review. [online] Available at: https://mtrj.library.utoronto.ca/index.php/mtrj/article/view/29606.

PENON (2024). Gamification of Learning: Engaging Students Through Play. [online] Medium. Available at: https://medium.com/@penon/gamification-of-learning-engaging-students-through-play-7b8d256d6e75.

Pixel, W. (n.d.). Visual Storytelling in Games: Crafting Immersive Narratives Through Visual Artistry | Watermelon Pixel. [online] www.watermelonpixel.com. Available at: https://www.watermelonpixel.com/a/visual-storytelling-in-games-crafting-immersive-narratives-through-vis.

Riivari, E., Kivijärvi, M. and Lämsä, A.-M. (2021). Learning teamwork through a computer game: for the sake of performance or collaborative learning? Educational Technology Research and Development, 69. doi:https://doi.org/10.1007/s11423-021-10009-4.

Rosas, R., Nussbaum, M., Cumsille, P., Marianov, V., Correa, M., Flores, P., . . . Salinas, M. (2003). Beyond Nintendo: Design and assessment of educational video games for first and second grade students. Computers & Education, 40, 71–94.

Rpg Wizard Org. (2024). Understanding In-Game Mechanics: A Comprehensive Guide – 2D Computer Game RPG Hub. [online] Available at: https://www.rpgwizard.org/understanding-in-game-mechanics-a-comprehensive-guide

Rubin-Vaughan, A., Pepler, D., Brown, S., & Craig, W. (2011). Quest for the golden rule: An effective social skills promotion and bullying prevention program. Computers & Education, 56, 166–175. doi:10.1016/j.compedu.2010.08.009

Sadler, D. T., Romine, L. W., Stuart, E. P., & Merle-Johnson, D. (2013). Game based curricula in biology classes: Differential effects among varying academic levels. Journal of Research in Science Teaching, 50, 479–499. doi:10.1002/ tea.21085

Sanchez, D.R., Rueda, A., Jimènez, L.J. and Nargesi, M.N. (2022). Commercial-off-the-Shelf (COTS) Games: Exploring the Applications of Games for Instruction and Assessment. [online] www.intechopen.com. Available at: https://www.intechopen.com/chapters/81217

Saris, W., E., & Gallhofer, I., N. (2007). Design, evaluation and analysis of questionnaires for survey research. Available at: https://search.ebscohost.com/login.aspx?direct=true&db=edsool&AN=edsool.9781118634554&site=eds-live

Shum, L.C., Rosunally, Y., Scarle, S. and Munir, K. (2023). Personalized Learning through Context-Based Adaptation in the Serious Games with Gating Mechanism. Education and Information Technologies. doi:https://doi.org/10.1007/s10639-023-11695-8.

Simkins, D., Egert, C., & Decker, A. (2012). Evaluating Martha Madison: Developing analytical tools for gauging the breadth of learning facilitated by STEM games. Paper presented at the proceedings of the 2012 IEEE International Games Innovation Conference on IGIC. doi:10.1109/IGIC.2012.6329859

Snyder, H. (2019). Literature Review as a Research methodology: an Overview and Guidelines. Journal of Business Research, [online] 104(1), pp.333–339. Available at: https://www.sciencedirect.com/science/article/pii/S0148296319304564.

Tan, L. J., Goh, H.-L. D., Ang, P. R., & Huan, S. V. (2013). Participatory evaluation of an educational game for social skills acquisition. Computers & Education, 64, 70-80. doi:10.1016/j.compedu.2013.01.006

Trybus, Jessica. (2015) “Game-Based Learning: What it is, Why it Works, and Where it’s Going.” New Media Institute. http://www.newmedia.org /game-based-learning--what-it-is-why-it -works-and-where-its-going.html.

Idea Usher. (2023). Educational Game Development Guide and Best Practices. [online] Available at: https://ideausher.com/blog/how-to-develop-an-educational-game/

Vo Truong An, P., Ta Xuan, P. and Trong, V.H. (2022) 'Factors Impacting the Intention to use Role-playing Games in Learning Communicative English of University Students in Da Nang City', 2022 IEEE/ACIS 7th International Conference on Big Data, Cloud Computing, and Data Science (BCD), Big Data, Cloud Computing, and Data Science (BCD), 2022 IEEE/ACIS 7th International Conference on, pp. 7–12. doi:10.1109/BCD54882.2022.9900649.

Wang, S.-Y., Chang, S.-C., Hwang, G.-J. and Chen, P.-Y. (2017). A microworld-based role-playing game development approach to engaging students in interactive, enjoyable, and effective mathematics learning. Interactive Learning Environments, 26(3), pp.411–423. doi:https://doi.org/10.1080/10494820.2017.1337038.

Wang, Y.-H. (2019). Exploring the effects of designing a role-playing game with single and peer mode for campus learning. Educational Technology Research and Development, 68(3), pp.1275–1299. doi:https://doi.org/10.1007/s11423-019-09726-8.

Whitton, N. and Whitton, P.S. (2011). The Impact of Visual Design Quality on Game-Based Learning. pp.1–19. doi:https://doi.org/10.1007/978-94-6091-460-7_1.

Wizard of the Coast, 2014 Dungeons & Dragons (5th edition). Washington: Wizards of the Coast.

www.vr.se. (n.d.). Conducting ethical research. [online] Available at: https://www.vr.se/english/applying-for-funding/requirements-terms-and-conditions/conducting-ethical-research.html.

Yang, G., Zheng, D., Chen, J.-H., Zeng, Q., Tu, Y.-F. and Zheng Xiao-li (2023). The effects of a role-play-based micro-game strategy on students' computational thinking, learning engagement and learning motivation. Interactive Learning Environments, pp.1–21. doi:https://doi.org/10.1080/10494820.2023.2223239.

Yen, T.T.K., Nho, H.T. and Huyen, N.T.T. (2022). Teamwork Skills Education in Themed Role-Playing Games in Preschool. International Journal of Education and Practice, [online] 10(3), pp.300–312. Available at: https://eric.ed.gov/?id=EJ1390629

Zhang, L., Shang, J., Pelton, T. and Pelton, L.F. (2020). Supporting primary students' learning of fraction conceptual knowledge through digital games. Journal of Computer Assisted Learning, 36(4), pp.540–548. doi:https://doi.org/10.1111/jcal.12422.

Zitha I., Mokganya, G. and Orifha Sinthumule (2023). Innovative Strategies for Fostering Student Engagement and Collaborative Learning among Extended Curriculum Programme Students. Education Sciences, 13(12), pp.1196–1196. doi:https://doi.org/10.3390/educsci13121196.

Zunder, T.H. (2021). A semi-systematic literature review, identifying research opportunities for more sustainable, receiver-led inbound urban logistics flows to large higher education institutions. European Transport Research Review, 13(1). doi:https://doi.org/10.1186/s12544-021-00487-1.

Appendix A - Permission Letter

Dear Parents/Guardians,

I hope this letter finds you well. I am writing to seek your permission for your child's participation in an upcoming experiment conducted by researchers of University of Skövde in collaboration with Balthazar Science Center. The experiment is a play-test, where the students will play an educational game called Minequest, which aims to teach the players about the pros and cons of the mining industry in Sweden. Students will divide into three groups, they will make discussions and work together to find the best solutions for everyone.

Your child has been selected to participate based on their age. Their involvement in this study is entirely voluntary, and they may withdraw at any time without penalty or consequence.

Please be assured that we prioritize the safety and well-being of all participants. The experiment will be conducted in a controlled environment under the supervision of qualified educators and researchers who adhere to strict ethical guidelines.

Participation in the experiment may involve observations of the choices and behaviors of the players and a short questionnaire about the game. Rest assured that any data collected will be kept confidential and used solely for research purposes.

We understand that you may have questions or concerns regarding your child's participation, and we are more than happy to address them. If you would like more information about the experiment or if you have any specific concerns, please do not hesitate to contact me at a23nedog@student.his.se.

To grant permission for your child's participation, please sign and return the enclosed consent form by [Deadline Date]. If you choose not to grant permission or if you wish to withdraw your consent at any time, please inform us as soon as possible.

Thank you for considering this request. Your support and cooperation are invaluable in advancing scientific knowledge and understanding.

Sincerely,

Nedim Ogul

Researcher/ University Of Skövde