

Boosting Literacy with an Educational RPG for Polytechnic Students

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Abstract: This study addresses the challenge of low literacy rates in Indonesia, particularly among students at the State Polytechnic of Malang. To tackle this issue, the research aims to develop an educational role-playing game (RPG) designed to enhance student literacy. The game will be both engaging and educational, incorporating interactive gameplay and quizzes related to robotics, a subject relevant to the students' field of study. The development process employs the Extreme Programming (XP) methodology, emphasizing iterative design, coding, and testing to ensure a user-friendly and educationally effective product. Playtesting will be conducted with 30 students, allowing for real-time feedback on usability, engagement, and educational value. The effectiveness of the game will be measured using a paired data Z-test, comparing pretest and posttest literacy scores. Results from the playtesting and statistical analysis will inform final optimizations, including enhancements to graphics, mobile compatibility, and educational content. The study anticipates that the RPG developed will hold significant promise for improving literacy skills among students at the State Polytechnic of Malang, with potential applications in broader educational contexts.

Keywords: Literacy, RPG, educational technology, student engagement

1. Introduction

Digital literacy are an important factor for socio-economic development of society and employability of the labour force. Without adequate digital literacy, it is not possible to participate in the economy and the digital society ((Bejaković & Mrnjavac, 2020). In the 2022 PISA (Programme for International Student Assessment) results, Indonesia's scores were significantly below the OECD average across all three subjects tested: mathematics, reading, and science. Indonesian students scored an average of 366 in mathematics, 359 in reading, and 383 in science. In comparison, the OECD averages were 472, 476, and 485, respectively(Kemendikbudristek, 2023).

To address the issue, educational games were created aiming at the students to become more literate and make learning more engaging. Due to several reasons, including the perception that playing is primarily an activity to find amusement, researchers have turned to games as a learning tool when appropriate (Agung Nugroho Pramudhita, 2022; Valladares et al., 2023). The qualities of games that are enjoyable but also encourage serious play are crucial because they connect to motivation (Chen & Wu, 2023). The game challenges players to overcome obstacles and achieve optimal results, aligning with its educational goals. By incorporating robotics, a subject relevant to the majors at the State Polytechnic of Malang, the game aims to enhance literacy among students familiar with gaming. Designed as an RPG (Role Playing Game), it uses engaging settings to support and improve players' learning experiences. An RPG type game includes various varieties and game dynamics that can be utilized as a method to boost the efficacy of learning, according to research (Videnovik et al., 2023) that investigated the application of educational games in the field of science.

2. Development Methodology

This study, conducted at the State Polytechnic of Malang from January to May 2024, focused on developing and evaluating an educational game to improve students' literacy using the Extreme Programming (XP) method, known for its iterative and flexible approach ((Khasanah et al., 2022)). XP was selected for its ability to incorporate constant feedback and real-time adjustments based on user engagement and learning outcomes. Unlike linear methodologies like Waterfall, XP's frequent testing and adaptability ensure the game's mechanics and educational content are continuously refined to meet students' literacy needs and deliver a high-quality, effective learning tool.

1. Extreme Programming (XP) Process

- **Planning:** Defined the research objectives and game requirements.
- **Designing:** Created an engaging and educational game interface.
- **Coding:** Developed the game, ensuring it was interactive and user-friendly.
- **Testing:** Assessed the game's functionality and educational impact.

2. Data Collection and Analysis A paired data Z-test was used to evaluate the game's effectiveness by comparing pretest and post-test literacy scores from 30 students

3. Statistical Testing

- **Data Normalization:** Verified data normality.
- **Z-Test:** Calculated the Z-value to assess statistical significance.
- **Hypothesis Testing:** Tested whether the game significantly improved literacy.

3. Gameplay Implementation

At the start, the main character receives an introduction about humanoid robots from the teacher. Players use keyboard controls to navigate, with settings on the top left and quests on the top right. When near an interactive NPC, a notification prompts the player to start a conversation, guiding them through the game's objectives.



Figure 1. Teacher's Dialogue, interaction notification, and collected components

Questions related to humanoid robots appear, with material displayed on the right. Correct answers turn green, and incorrect ones turn red.



Figure 2. Questions, Readings, robot assembly, and grade display

Once all questions are answered, the player's progress in collecting components updates, shown in the component menu. After gathering all components, the player returns to the teacher, sees the robot assembly, and then views a grade display. A button to return to the main menu will appear after the grade is shown.

4. System Testing and Results

To validate the game's effectiveness in meeting educational objectives, a combination of evaluation types will be employed with 30 students from the State Polytechnic of Malang. These evaluations will be divided into user experience, learning, and usability assessments to provide a comprehensive understanding of the game's impact. The user experience evaluation will involve observing students as they interact with the game, allowing for real-time feedback on usability and engagement (Liebenberg & Klerck, 2023). Learning evaluations will focus on measuring educational outcomes, particularly literacy improvement, through pretest and post-test comparisons, analyzed using Mann-Whitney U to assess statistical significance (Chaudy & Connolly, 2019). Usability evaluations will include testing game mechanics, content, and interface, with focus on NPC interaction, quiz functionality, and progress tracking. Post-playtesting surveys and qualitative feedback will identify strengths and areas for improvement. This approach, following design-based research principles, will drive iterative enhancements to boost the game's educational value and user engagement. (Kiili & Lainema, 2008).

5. Conclusion

The literacy educational game developed for the State Polytechnic of Malang holds significant promise for enhancing student literacy. The upcoming actions focused on gameplay refinement, user experience, learning, and usability assessments are vital for ensuring the game's success. By executing these actions, the game can be optimized to provide an engaging and effective learning experience. The goal is to produce a game that not only improves literacy skills but also makes learning an enjoyable and accessible experience for students. Through careful planning and execution of these future actions, the game is poised to make a meaningful impact on education at the State Polytechnic of Malang and beyond.

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