

Educational Game Development Based on Role Play Games for Students with Special Needs

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INTISARI

Penelitian bertujuan mengembangkan sebuah game edukasi yang dapat mendukung siswa berkebutuhan khusus belajar menguasai pengetahuan dan keterampilan dasar hidup. Genre *Role Play Game* (RPG) yang dilengkapi animasi, interaksi, dan tantangan dipilih sebagai desain alternatif dari multimedia interaktif ini. Metode Luther-Sutopo diterapkan ketika mengembangkan antarmuka game dan gameplay. Pada tahap percobaan (*testing* atau *early access*), game diujicobakan pada sepuluh siswa berkebutuhan khusus. Teknik wawancara digunakan pada tahap pengumpulan data. Hasil penelitian memperlihatkan antarmuka dan gameplay *'The Adventure of Ali'* menawarkan interaksi dan tantangan pada saat murid belajar tentang malaikat Allah, dan menstimulasi siswa untuk bereksplorasi di dunia virtual melalui karakter animasi Ali. Sistem "hadiah" (*reward*) yang ditawarkan pada game adalah progres cerita. Pengembangan game edukasi ini merupakan jawaban terhadap tuntutan penyediaan teknologi pembelajaran yang dapat dimanfaatkan siswa berkebutuhan khusus sebagai bentuk tanggap terhadap tantangan pendidikan khusus saat ini, sekaligus memberi peluang yang sama bagi siswa berkebutuhan khusus untuk memperoleh pendidikan.

Kata kunci: game edukasi, game RPG, siswa berkebutuhan khusus.

ABSTRACT

The study aimed to develop an educational game that would support students with special needs gain knowledge and essential life skills. The Role Play Game (RPG) genre with animation, interaction mode, and the challenge was proposed to be an alternative design for this interactive multimedia. The Luther-Sutopo method was applied to design game interface and gameplay in this study. Ten students played this game during beta testing or early access. While collecting data, an interview was used to learn participant's perceptions. The findings demonstrate how the game interface and gameplay of 'The Adventure of Ali' offer students interactions and challenges while learning about angels and encourage them to explore the virtual world as Ali, the main character. Meanwhile, the game suggests narrative progression as a reward system. This Role Play Game-based educational game development responds to current unique education challenges for providing educational technology, and it allows students with special needs to have an equal opportunity in education.

Keywords: educational game, RPG, Student with Special Needs.



INTRODUCTION

The rapid technological advancements have notably affected the educational field, including special education services for special needs students. In providing the independent living skills necessary, most special educations focus on

educational arrangements: the use of appropriate and effective methods in the learning-teaching process [1]. These methods generally aim to acquire and accelerate appropriate behavior and prevent, reduce, and eliminate inappropriate behavior of the students with special needs to help them with daily life skills [2]. At this point, it is

essential to consider closely the type of skills that will be learned, students' characteristics and learning styles, educational requirements, learning environments, teaching materials, and accessibility of support services [3]. For example, in computer-assisted education, technology as a tool for delivering instruction offers long-lasting effects and responsible changes in special education, providing students with learning problems [4,5]. In educational games, interactive multimedia use has indicated considerable success in increasing learning motivation [6-8].

More than entertainment media, educational games increase students' comprehension by exploring and learning new things [9]. As a persuasive technology, the educational games provide story elements that allow students with special needs to immerse themselves in the game world. The immersion gives the students opportunities to explore and learn social values; understand their world through the game world. Engaging to game rule structure, they explore their imagination to educate themselves, making trials and errors [10]. One of their basic needs, the feeling of security, remains since educational games allow them to repeat and fix mistakes.

Many studies have been investigating the use, benefits, and impacts of educational games, an additional teaching method. Al-Shammari researched to describe the advantage that students with special needs might gain when technology is used in teaching these students [4]. A significant improvement in learning and teaching resulted from this technology use. In line with Al-Shammari's, Hakim executed research related to applying interactive multimedia - Educational Computer Game for Young Children (*Serial Belajar Si Kecil*, SECIL) - to educate students with special needs of Nurul Ikhsan Ngadiluwih, a particular school for students with special needs (*Sekolah Luar Biasa*, SLB) located in Kediri, East Java - Indonesia [6]. The findings describe that interactive multimedia increases students' motivation to learn, gives them joyful feelings, and entertains learning. Using educational games, Ulrich Münz et al. experimented with investing complex theoretical materials in engineering students' minds, who were more interested in practical problems. This approach improves students' motivation to learn rigid materials [11]; the students' interest in theoretical has improved persuasively. Another study by Y. Liu et al. focused

on designing and developing educational games [12]. The project objectives were to reinforce students to learn biology theory and concepts, including understanding software engineering principles. The results indicate that educational games are entertainment media that can enhance understanding. Intended to provide students with game-based cooperative learning, Jong et al. developed an online game [13]. They claimed that this online game achieves better learning outcomes due to students' eagerness to learn before playing the game. From that research, educational games (a computer-assisted teaching method) enable students with special needs to achieve living skills without being dependent on others. These games propose practical, amusing, and desirable learning experiences, including assistance. The enthusiasm of students with special needs to learn promotes their attainment of living skills [4].

It is essential for students with special needs to feel like a part of society, be free from stigmatization, and increase self-confidence. Come to the point, students with special needs should have an appropriate approach to learning independently. When we inquired into Hakim's findings, students with special needs of SLB Nurul Ikhsan still required technical assistance from their teachers to operate the interactive multimedia. Meeting demand for assistive technology is essential, but SECIL needs improvement in adaptive. Taking this challenge, this study aimed to improve SECIL performance, to develop an assistive and adaptive educational game. Applying the Luther-Sutopo method for game development, this study focused on designing an interactive educational mobile game, minimizing students' difficulties working on tasks. It is expected that this study would provide special education services for students with special needs to have equal opportunity in education.

METHOD

This study aims to design an interactive educational game to minimize students with special needs' difficulties in working on tasks in the game. Supporting Blackhurst [14] and Al-Shammari [4], technology media for students with special needs should meet assistive and adaptive requirements to deliver instruction. At this point, the interactive educational game was intended to enhance and enforce the learning process with immersion.

The interactive multimedia SECIL is originally an educational game on a PC or desktop.

In this study, the game was designed for mobile, building a mobile educational game. Four factors initiated this idea. The first issue is the platform's small, superficial, easily carried characteristics. Students with special needs can take their mobiles anywhere to access them anytime without necessary difficulties. The easy access to the game makes the students save their time. After that, they can get learning materials quickly by accessing their mobiles. Finally, mobile phones are more practical than PCs. By minimizing difficulties, the students' concentration increases [15].

Furthermore, in the learning process, educational games facilitate themselves by conveying messages and stimulating students' attention, thoughts, interest, and feeling to achieve learning objectives [16]. Exploiting story elements, the educational game offers excitement [17]. The visual in the form of 2D games was implemented to make children desire to play and enjoy the game while learning process.

Among various game development methods, this study adopted the Luther-Sutopo method, a method modified by Hadi Sutopo [18]. This method consists of six basic steps: Concept, Design, Obtaining Content Material, Assembly, Testing, and Distribution, as shown in Figure 1.

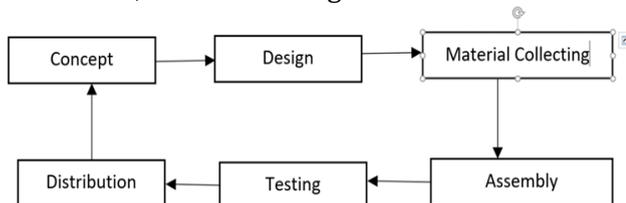


Figure 1. Process of Luther's Method

In line with Satwika et al., the Luther-Sutopo method makes various kinds of multimedia products, including games, possible to be developed [19].

Luther-Sutopo Method

As mentioned, there are six basic steps in Luther-Sutopo Method, namely Concept, Design, Obtaining Content Material, Assembly, Testing, and Distribution. The concept is a primary line to develop a multimedia product where the purpose of the application, target users, and all basic rules are set. The second step is the Design step, where designers define product specifications: architecture style, appearance, material, and storyboard. Next is Obtaining Content Material. The designers collect and decide materials used in the product, and they cover pictures, sounds,

animation, or other support materials. Assembly, the fourth step of the method, is when the designers combine all materials based on the storyboard. Then, Testing allows the designers to assure the feasibilities of the product. Finally, Distribution is done by creating a master file. Based on the research, the multimedia products' positive result has resulted from this method [19].

Design, Participants, and Hypothesis

This study's basic idea is to develop a mobile educational game where students with special needs become learning actors, a student-centered approach. In this way, the students may build their self-confidence and reach maturity. The type of Role-Playing Game (RPG) is adopted to accomplish it. Players playing certain characters encounter adversaries in the form of a choice sequence, a challenge to decide a problem-solving. All activities are formed in a story.

Ten students with special needs from Bandung, West Java, participated in this study. The students with intellectual disabilities were encouraged to learn daily living skills by associating specific tasks with angels, or "*Malaikat Allah*."

This game, called "The Adventure of Ali," is designed to be played on a mobile phone to improve the performance of the desktop-based SECIL game, which relies heavily on technical assistance from teachers. The need for the teacher's aid and the difficulties in working on tasks are reduced in this manner. As a result, students are given more independence in their learning, which helps them mature.

We hypothesize that mobile educational games with RPG type can give valuable experiences for students with special needs to increase their independence while managing themselves to achieve the skills. The mobile educational game is developed to introduce Malaikat Allah based on this argumentation. This study puts game interfaces and gameplay into the primary consideration.

Steps of Making Game

The game process involves three core steps: idea, development, and publishing [19]. Game designers conduct brainstorming and prototyping to create a game design. To achieve the goal, close research must be done, covering the type of skills learned, students' characteristics and learning

styles, educational requirements, learning environments, teaching materials, and accessibility of support services. All gathering information determines the success of the game development.

In the development step, a game is ready to be published in the outcome of the process [19]. A solid team is required. Finally, disseminating games to users is the last step of making games. The publishing step still needs testing before releasing the game. Pre-release potentially provide feedback for evaluation and updating and/or upgrading

RESULTS AND DISCUSSION

As previously stated, the Luther-Sutopo model framework was used to develop “The Adventure of Ali,” a mobile educational game. Each stage of development – concept, game design, material collection, assembly, testing, and distribution – led to adaptive and assistive determination. This mobile game is an RPG game.

RPG was intended to create a stable virtual world – a story – and opportunities for students with special needs to repeat and fix errors while exploring and experiencing new life events in this mobile game. This is a method of putting students at ease. In addition, this gameplay can help to fill the void left by the absence of a teacher’s assistance. With a single tap on their mobile screen, students can start learning.



Figure 2. Start

Figure 2 displays the main menu from which students can begin learning. This application does not require a personal account to use; anyone can use it. To start playing, select Start. A presented material animation video, on the other hand, is

intended to pique students’ interest in the material provided during the learning process.

However, teachers' simple instruction is required to start the game first. Although this is an optional step, the information in Figure 3 may assist students in understanding how to play the game effectively.

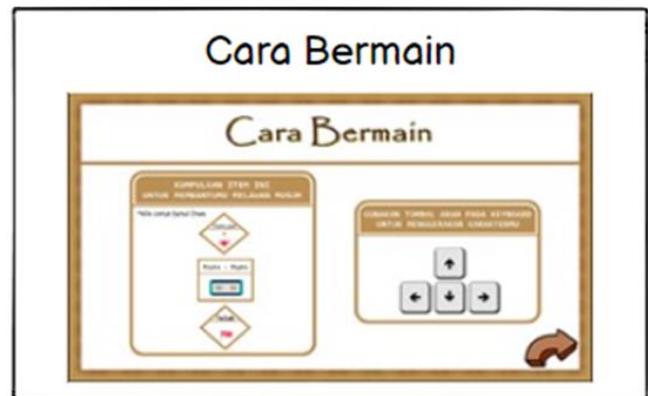


Figure 3. Tutorial

With learning material, this mobile game focuses on recognizing and learning the names of the angels with their specific tasks, as shown in Table 1

Table 1. Material Structure: Angels, ‘*Malaikat Allah*’ and Their Tasks

| Name | Tasks |
|---------|----------------------------------|
| Jibril | convey revelation |
| Mikail | give fortune |
| Isrofil | blow the trumpet |
| Izroil | life-threatening |
| Munkar | questions for deeds in the grave |
| Roqib | record good deeds |
| Atid | record bad deeds |
| Malik | the gatekeeper of hell |
| Ridwan | heaven’s gatekeeper |

Students are encouraged to identify which task belongs to which angel. Because The Adventure of Ali’s gameplay allows students to repeat and correct their mistakes, they may have opportunities to change the answer and accept failures. Failure acceptance is a necessary skill for dealing with life’s challenges despite evaluating and making decisions.

Using plot points in story tokens, this mobile game introduces the topic. Features “New Game”

(Permainan Baru) and “Continue” (Lanjutkan), for example, direct students to take a step in the game. As shown in Figure 4, the game’s interface is simplified by using dialog boxes with simple instructions.

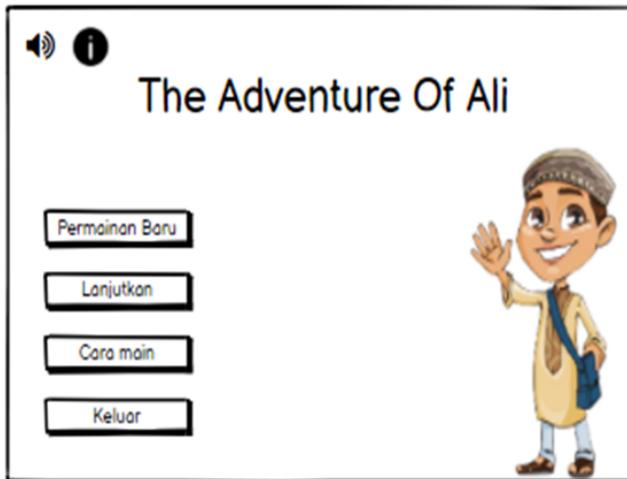


Figure 4. Main Menu

The character of Ali is another token in Figure 4. Ali was created to provide companionship and security for students with special needs to explore their imagination.

Besides the game’s interface, gameplay gives students options for what they ‘can’ and ‘cannot’ do, determined by experience points. Students convincingly immerse themselves in the game world and take on the role of characters in the story. A narrative story can be an effective persuasion tool [20]. As a result, this mobile game is designed to reduce students’ difficulties completing tasks. Simultaneously, they can train themselves to deal with essential life skills like evaluating and making decisions. On the other hand, the story flow is designed to increase student’s engagement as a player.

Begin with a city background (Figure 5). Students’ engagement grows throughout their journey as they travel to every corner of the city in search of knowledge with Ali.



Figure 5. A City

Along with a story, students portraying the character Ali explore every nook and cranny of the city in search of knowledge. As previously stated, the ability here is information about angels, *Malaikat Allah*, and their tasks.

In line with the idea that players create a role for a character in a virtual or fictional world, students act out this role within the narrative by making character-development decisions. A narrative progression reward system provides students with the excitement of learning something new. Figure 6 depicts the narrative progression after all tasks have been completed in the previous scene (shown in Figure 5).

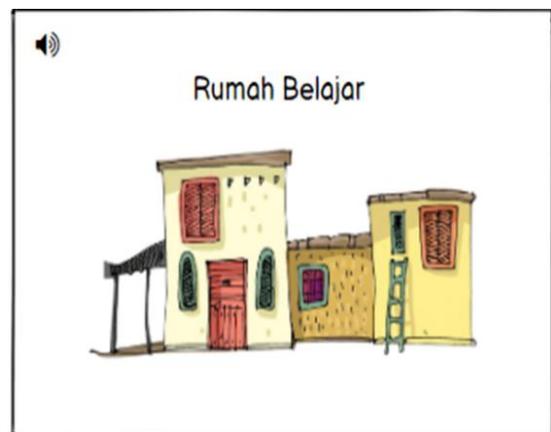


Figure 6. Learning House

As the narrative progresses, the process of assessing is executed using a question-and-answer system. This system was selected based on the skills that the students are expected to acquire.

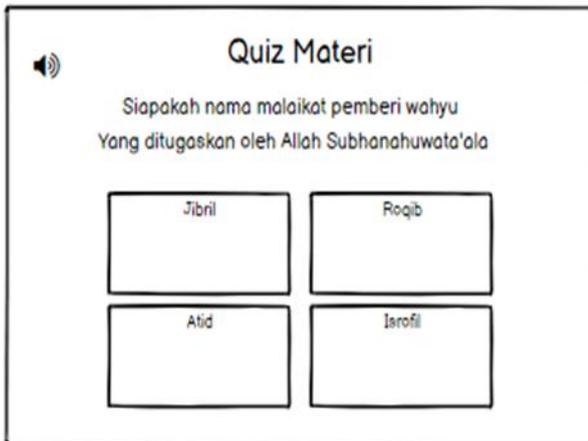


Figure 7. Material Quiz

The abilities to evaluate, determine, and make decisions and knowledge about angels and their tasks will be taught in this game. The students are encouraged to explain who the angels are and what they do.

This educational game development included an early access testing phase to deliver a high-quality game. Fullerton's game prototype usability quality criteria [21] evaluated the interface and gameplay of "The Adventure of Ali" for fun and accessibility. Ten students with special needs participated in the evaluation by playing a prototype of "The Adventure of Ali."

The findings show that "The Adventure of Ali" generates engagement in plot points built on story tokens. 100% of participants said they were immersed in the fictional world and experienced events just as they would in real life. Their imagination provided them with excitement and challenges, encouraging them to play more. The interview results are shown in Table 2.

Table 2. Early Access in Testing Stage: Fullerton's Usability Quality Criteria

| | Game Prototype Usability Quality Criteria | | | | | | | | | |
|-----------|---|--------------|-------------|--------------------------------------|--------------------|---------------|------------------|------------------------|-------------------------------|----------------------|
| | Fun | | | | Accessible | | | | | |
| | Engaging | Entertaining | Challenging | Makes player keeps coming and coming | Easy to understand | Easy to learn | Intuitive enough | Capability to navigate | Grasp the control of the game | Time needed to learn |
| Student1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | X |
| Student3 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student4 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student5 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student6 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student7 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student8 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student9 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Student10 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 90 |

Based on accessibility, the participants discovered that this educational game could navigate them to learn intuitively, as stated by 100% of the participants. Although 10% of participants said they needed time to learn the user interface, they were able to control the game

intuitively and learn and retain information. The game correctly navigated them.

To sum up, "The Adventure of Ali", a mobile educational game, provides a convenient game environment for special needs students based on participant responses of fun and accessibility of the game interface and gameplay. The instructions are delivered directly through simple instructions and dialog boxes. The importance of adaptable interactive multimedia for students with special needs is widely recognized [22]. As a result, this educational game demonstrates consideration for students' needs and desires. In this case, it could be used as a learning tool to improve these students' quality of life.

CONCLUSION

The Adventure of Ali's interface and gameplay are designed to meet the assistive and adaptive needs of students with special needs. This mobile game's features include dialog boxes with direct language, plot points, and narrative progression rewards. Story and background tokens are used to create assistive and adaptive behavior in a virtual or fictional world. Ali's character was created to provide companionship and security for students with special needs as they explore their imaginations. This mobile game allows students with special needs to immerse themselves in the virtual world by experiencing events through Ali's character.

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