DEVELOPMENT OF ANIMAL EDUCATIONAL GAME FOR MENTAL RETARDATION CHILDREN

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Abstrak

Anak tunagrahita memiliki IQ di bawah rata-rata anak pada umumnya. Karena IQ mereka lebih rendah daripada anak-anak yang sedang berkembang, anak-anak dengan keterbelakangan mental mengalami penurunan fungsi intelektual dan mengalami masalah perkembangan. Di SLB Negeri Sukoharjo, guru hanya menggunakan buku teks dan Kompetensi Inti Kompetensi Dasar (KIKD) sebagai pedoman dalam mengajar anak tunagrahita tentang binatang. Namun, buku-buku teks tersebut kekurangan beberapa informasi tentang suara dan gambaran spesifik dari hewan tersebut. Untuk membantu mengatasi permasalahan tersebut, akan dibangun sebuah game edukasi untuk membantu para guru dalam menyampaikan pelajaran dan mendeskripsikan objek khusus tentang hewan agar siswa tunagrahita menjadi lebih mudah. Game Development Life Cycle (GDLC) adalah metodologi penelitian yang diterapkan selama pembuatan game edukasi ini dan akan dikembangkan menggunakan perangkat lunak Construct 2. Pengujian akan dilakukan dengan menggunakan pendekatan black box testing untuk mengetahui seberapa baik game bekerja dan User Acceptance Testing (UAT) menggunakan kuesioner untuk mengetahui seberapa berharganya game edukasi ini. Berdasarkan pengujian dengan menggunakan metode black box testing dapat disimpulkan bahwa fungsi dan tombol game edukasi ini bekerja dengan baik pada smartphone dan perangkat PC (Personal Computer) ketika dimainkan menggunakan web browser yang mendukung game HTML5. Sistem permainan lulus tes UAT dengan skor 87%, menunjukkan bahwa itu sesuai dan bermanfaat untuk mengajarkan ciri-ciri fisik hewan untuk anak-anak tunagrahita.

Kata kunci: Black Box, Game Edukasi, GDLC, Retardasi Mental, UAT

Abstract

Children with mental retardation have an IQ below the average of children in general. Because their IQs are lower than those of typically developing kids, children with mental retardation have decreased intellectual functioning and experiencing in addition to developmental issues. In SLB Negeri Sukoharjo, the teachers only use textbooks and Kompetensi Inti Kompetensi Dasar (KIKD) as a guidance for teaching the mental retardation students about the animals. However, the textbooks lack of some information about sounds and specific picture of the animals. To aid resolving these issues, an educational game will be built to help the teachers to deliver the lessons and describe the specific object about the animals for mental retardation students to become easier. The Game Development Life Cycle (GDLC) is the research methodology applied throughout the creation of this educational game and will be develop using Construct 2 software. Tests will be conducted using the black box testing approach to determine how well the game work and User Acceptance Testing (UAT) using a questionnaire to determine how valuable this educational game is. Based on tests using the black box testing method, it can be concluded that this educational game's functionalities and buttons work properly on smartphones and PC (Personal Computer) devices when playing using web browser that support HTML5 games. The gaming system passed the UAT test with a score of 87%, indicating that it is appropriate and useful for teaching physical features of animals for mental retardation children.

Keywords: Black Box, Educational Game, GDLC, Mental Retardation, UAT

1. INTRODUCTION

Education is a method for preserving and enhancing a country's culture and character for the

benefit of the next generation as well as for the present and future welfare of the community (Rachmadtullah & Kusmaharti, 2018). In order to enhance the quality of life in a more honorable society, education approach actively seeks to develop their potential, inculcate values in their personalities, and contribute to the development of the nation's culture and character. The standard of living for both the people and the nation will rise as a result.

In order to improve oneself and create great human resources, education is crucial. Especially for children with special needs. Children with special needs are those who experience physical, psychological, and academic challenges (Yasin et al., 2022). Many children in special education have specific needs, including one who has mental retardation.

Lack of mental capacity or daily living abilities is referred to as mental retardation (Menon, 2021). Intellectual disability is what it is known. It results in below-average level of intelligence in that person. As an outcome, it demonstrates a lack of mental flexibility to quickly adjust to a scenario or set of circumstances. Even people who have intellectual disabilities can acquire new knowledge and abilities. In comparison to other people, learning occurs more slowly for children with mental retardation (Menon, 2021). The classification of children with mental retardation often uses classification by intellectual level. Based on the level, there are four groups that are in accordance with the conditions in Indonesia. Such mental retardation is categorized as follows: mild mental retardation, moderate mental retardation, severe mental retardation, very severe mental retardation (Tawar, 2018). In this research, mild mental retardation has been chosen as the subject. The intellectual ability and social adaptability of children with mild mental retardation have decreased, but they nevertheless have the capacity to learn and acquire social employable skills.

It is impossible to overstate the value of technology in education, it is because technology has potential to significantly transforming education (Trust, 2018). It can support and strengthen relationship between teachers and students (Trust, 2018). In fact, the incorporation of computers into the classroom has simplified it for both teachers to convey knowledge and students to acquire it. The usage of technology has increased the fun factor of teaching and learning (Raja & Nagasubramani, 2018). In SLB Negeri Sukoharjo, especially for grade IV there are several learning materials, one of them is about animal around. The material is about introduction of physical features of animals such as the number of legs, body parts, as well as their lifelines. Due to the limits of the available teaching resources, students with different levels of knowledge find the subject challenging to understand because the learning process still relies on books and whiteboard media for existing lessons. To help overcome these issues, an educational game will be built for helping the teachers.

Games that are specifically intended to be educational are called educational games (Stenholm et al., 2019). These games can be played in a variety of ways, including board, card, and digital games. At every stage of life, they aid in the acquisition of knowledge or skills (childhood, student life and professional life) (Daniel et al., 2019). The conventional lecture approach is still used in teaching and learning activities in Indonesia, hence it is vital to modernize these processes by including learning media (Sudarmilah et al., 2022). These days, games serve more objectives than just amusement (Sudarmilah et al., 2018), but also as a means of education.

2. METHOD

The Game Development Life Cycle (GDLC), whose stages are depicted in Figure 1, is the research methodology used to develop this educational game.

Due to its straightforward stages that suit the research's conditions and objectives, the GDLC method proposed by Heather Chandler is considered as the most efficient method in this study (Husniah et al., 2018). Initiation, pre-production, production, testing, and post-production are some of the procedures that are conducted.

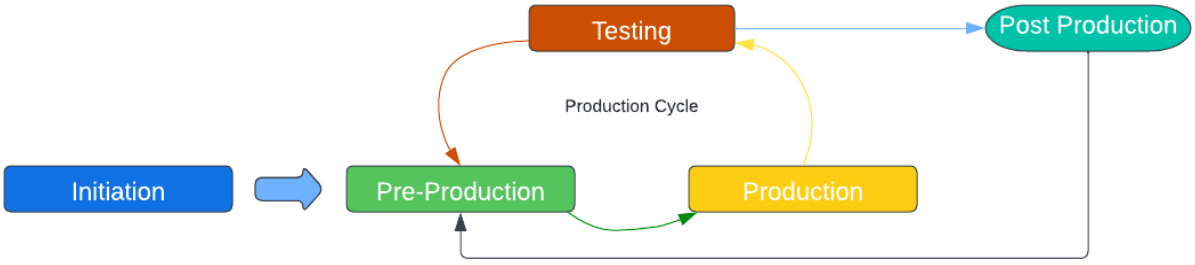

Figure 1. Game Development Life Cycle Methodology

2.1. Initiation

Initiation is the first step that must be done in developing a game. The type of game, the purpose of the game, the target audience, tools, and materials, as well as the required data, are some of the steps that need to be considered at this stage. After conducting research, "Mengenal Binatang" has been chosen as the title of the game. Which is an educational game with the purpose of educating students about various animal. This game is targeted toward grade IV of elementary school students with mental retardation in SLB Negeri Sukoharjo.

2.1.1. Data Collection

The information is gathered by interview with the concerned of teacher at SLB Negeri Sukoharjo, as part of the data collection process. The following results were obtained from the interview:

1) SLB Negeri Sukoharjo using Curriculum 2013
2) Animal-related subjects are included in thematic learning
3) The process of learning usually only uses of a few textbooks and tools
4) Students find it boring and challenging to comprehended the material using current teaching methods
5) Examples of nearby animal make it easier for students to comprehended lessons about animals
6) The animals that will be learn in the game are chicken, duck, fish, goat, and cow

2.2. Pre-Production

Pre-production is the first step of GDLC(Ramadan & Widyani, 2013). Before the development process starts, the game production plan and game design will be completed. This stage includes game design, which includes the development of the game concept, its documentation (the Game Design Document), and prototyping.

2.2.1. Storyboard

Making a storyboard for the game's scenario serves as the first step in the design of an educational game and to simplify the process of designing the overall educational game flow.

Starting with the scene 1 page that appears when the application is first opened. Scene 2 shows a choice of available materials. Furthermore, scene 3 through 7 display a menu for learning about animal characteristics. This menu includes an audio button for listening to explanations of the animals. A menu of questions about previously examined animals is displayed in scenes 8 through 12.

2.3. Production

Pre-production is followed by production, which entails the development and localization of game builds(Van de Weerd et al., 2007). The production of the necessary materials and the preparation of the audio at this stage will be utilized to lunch a game with a concept, design, and storyboard that were developed during the pre-production phase.

2.3.1. Creating Game Visual Assets

Based on the generated storyboard, assets in the form of visuals to aid in game visualization. This educational game let use of both free and publicly available online resources. Another usage for the Snipping Tool program is for taking picture.

2.3.2. Audio Assets

To make it simpler to explain the material introduction of pet around, audio is being prepared to fill the game's sound. The music and sound effects (SFX) utilized in this educational game that liven up the environment while playing this educational game, are all available online.

Additionally, the audios are transformed using the Audacity program to convert several audio formats to Construct 2 compatible audio extensions (.ogg).

2.3.3. Developing the Game

The development of a game using Construct 2 software is the following step. At this point, the author began creating games using previously generated storyboards, assets, sounds, and by creating game layouts and code blocks.

2.4. Testing

Finding mistakes and defects in the game to be tested is a task that is highly significant. The test that was employed was black box testing that concentrated on the features and operation of the gaming instruction. After the gaming system has been verified to be functioning properly, a User Acceptance Testing (UAT) test will be performed to determined how valuable those educational game is.

2.5. Post-Production

This phase is designed to assess the game's or application's usability and to find any bugs or concern that the third-party tester may have raised. Although this stage is not a part of the production cycle, the outcomes of this test could lead to developers restarting it in order to create or improve some of the game's contents or general components.

3. RESULTS AND DISCUSSIONS

An animal educational game for children with special needs and mental retardation in class IV SLB Negeri Sukoharjo is the outcome of this project. This game serves as a learning tool for students and as a resource for teachers in the introduction of animal physical characteristics. The game's content is compatible with both the teacher's book and student's book. The results of the research on animal educational games for mental retardation children class IV SLB Negeri Sukoharjo are as follows:

3.1. The Results of the Game Display

3.1.1. Main Menu

This is the first layout or display that appears when the game begins. This page has a play button to launch the game, a credit button to access developer information and asset sources, a music button to enable or disable audio, and a help button to view the game's instructions. The main menu layout is shown in figure 2 down below.

Figure 2. Main menu

3.1.2. Material Selection Menu

This menu will appear with options for players to select once they click “play button”. There are learning menu and quiz menu. Material selection menu layout is show in figure 3.

Figure 3. Material Selection Menu

3.1.3. Quiz Level Selection

A variety of quiz levels will be shown on this page. Quiz level selection layout is shown in figure 4.

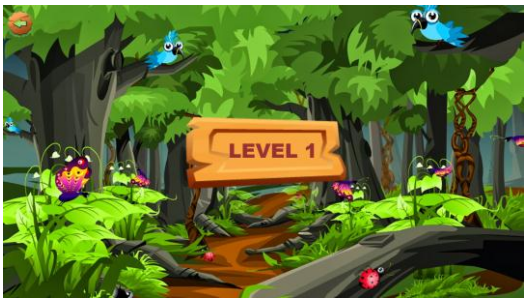

Figure 4. Quiz Level Selection Menu

3.1.4. Learning Menu

Learning resources for study the physical characteristics of animals are available on the learning menu. The five slides in this menu describe characteristics of fish, cows, chickens, ducks, and goats. Learning layouts are shown in figure 5, figure 6, figure 7, figure 8, and figure 9.

Figure 5. Chicken Learning Menu

Figure 6. Duck Learning Menu

Figure 7. Fish Learning Menu

Figure 8. Goat Learning Menu

Figure 9. Cow Learning Menu

3.1.5. Quiz Menu

The quiz menu is a slide with questions on it. On this section there are questions about physical characteristics of the animal. There are 14 questions total on this quiz, separated into 3 levels. There are two possible responses for each question. Quiz menu layouts are shown in figure 10, figure 11, and figure 12. Level 1 quiz menu asking the name of the animals. Level 2 quiz menu asking the sound of the animals. And the level 3 quiz menu asking about the characteristics of the animals.

Figure 10. Level 1 Quiz Menu

Figure 11. Level 2 Quiz Menu

Figure 12. Level 3 Quiz Menu

3.1.6. Score Menu

When you have finished all the questions, a display called the score menu will show up. This display includes the game's score valued from when it was played. Score menu layout is shown in figure 13.

Figure 13. Score Menu

3.2. Game Testing Results

At SLB Negeri Sukoharjo, educational game testing was done. Teachers and students both conducted the test. Black box and UAT are used to test animal educational games.

3.2.1. Black Box Testing

This black box testing seeks to assess the gaming app's functional specification's focus. The outcome of the software testing demonstrates that both smartphones and personal computer devices may use the Animal Educational Game without any issues.

Table 2. Black Box Testing Results

No.	Layout	Button	Expected Result	Status
1.	Main Menu	Play	Go to "Material selection" layout	Valid
		Music	Turn on/off the backsound music	Valid

		Credit	Show pop-up information about developer and assets resources	Valid
		Help	Show pop-up about game instruction	Valid
2.	Material Selection	Mengenal	Go to the beginning of the learning materials	Valid
		Quiz	Go to the "Quiz Level Selection" layout	Valid
		Home	Go back to "Main menu" layout	Valid
3.	Learning Menu	Animal Picture	Makes the animal being study sound	Valid
		Speaker	Providing explanations of the characteristics of the animal being study	Valid
		Arrow	Go to next/previous layout	Valid
		Music	Turn on/off the backsound music	Valid
		Home	Go back to "Main menu" layout	Valid
		Back	Go back to "Material Selection" layout	Valid
4.	Quiz Level Selection	Level 1	Go to "Level 1 Quiz" layout	Valid
		Level 2	Go to "Level 2 Quiz" layout	Valid
		Level 3	Go to "Level 3 Quiz" layout	Valid
		Back	Go back to previous layout	Valid
5.	Quiz	Question	Makes sound about the question	Valid
		Speaker	- Makes sound of the the animal - Makes sound about the answer	Valid
		Answer	- Go to next layout - If the answer "right" the system gives 20/25 points - If the answer "wrong" the system does not give any point	Valid
		Music	Turn on/off the backsound music	Valid
6.	Score Menu	Berhasil	Go to the "Quiz Level Selection" layout	Valid
		Home	Go back to "Main menu" layout	Valid

3.2.2. User Acceptance Testing (UAT)

The User Acceptance Testing (UAT) was employed in this evaluation. Twenty teachers who participated in the test were asked to complete a questionnaire. The UAT has 8 questions and 5 possible responses with 35 respondents consisting of 20 teachers and 15 parents, with scores as follows:

Table 3. Score of the Answer

Code	**Detail**	**Score**
VA	Very Agree	5
A	Agree	4
N	Neutral	3
D	Disagree	2
VD	Very Disagree	1

The results of the questionnaire analysis are in chart 1 as follows:

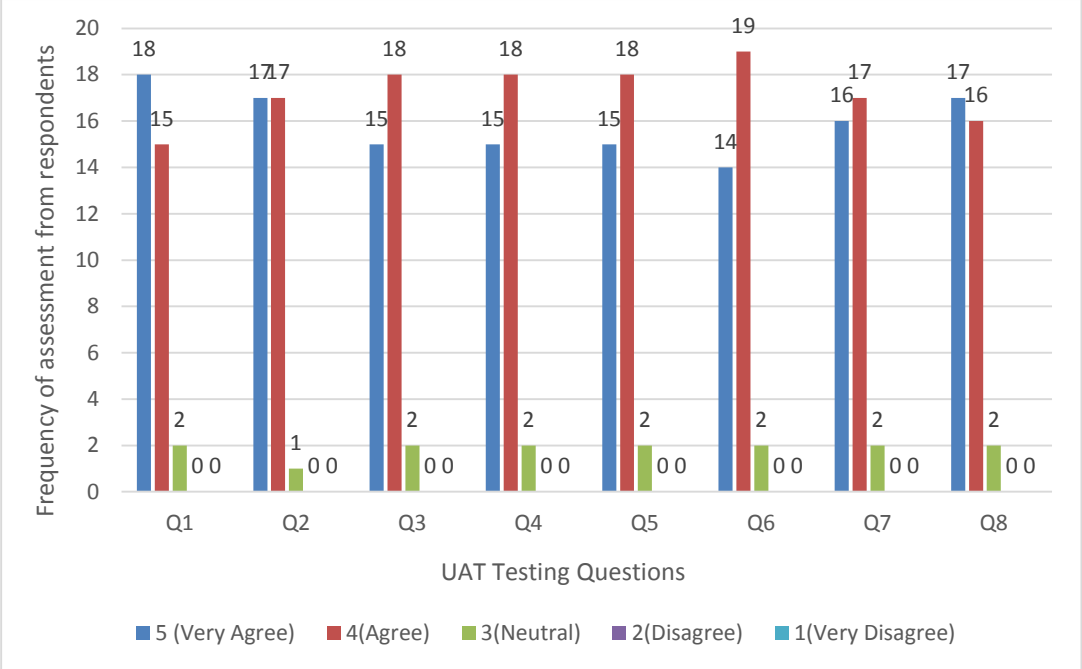

Figure 14. Results of Questionnaire

The outcomes of the above-mentioned analysis of the UAT test were as follows:

1) Question 1 (Q1): The appearance of educational games obtaining 89%
2) Question 2 (Q2): Educational games are easy to operate obtaining 89%
3) Question 3 (Q3): Quiz questions in educational games are easy to understand obtaining 87%
4) Question 4 (Q4): The material in the educational game is easy to understand obtaining 87%
5) Question 5 (Q5): Game audio can be heard clearly obtaining 87%
6) Question 6 (Q6): The delivery of material with sound media in educational games can be help to understand the material more easily obtaining 86%
7) Question 7 (Q7): Educational games can be used as a media of learning and playing obtaining 89%
8) Question 8 (Q8): Educational games are already quite satisfying obtaining 89%The average percentage of the questions instruments obtaining 87%

4. CLOSING

It can be determined from tests using the black box testing and UAT techniques that animal educational game suit the grade IV SLB Negeri Sukoharjo. And also all buttons and functions in this educational game work as intended on smartphones and PC (Personal Computer) devices using web browsers that support HTML5 games. The game's layouts, buttons, and features are all genuine and functioning as intended, according to the black box testing. The gaming system passed the UAT test with the average percentage of the questions instruments

score is 87%, indicating that it is appropriate and useful for teaching physical features of animals for mental retardation children.

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