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An Android-Based Learning Multimedia for Intoducing Central Sumba Traditional Culture at SD Masehi Matawai Pandang

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Abstract

Indigenous culture is a system of values and habits that is inherited from generation to generation and plays an important role in shaping cultural identity. However, there are still many students who do not know the traditional culture of their own region, as happened at SD Masehi Matawai Pandang, Central Sumba Regency. Students' low understanding of local culture is caused by the limitations of learning media that are able to increase students' interest in learning, because the learning process is still dominated by the use of package books without interactive media. This research aims to develop game-based interactive learning multimedia as a medium to introduce Central Sumba culture and customs for elementary school students. Game development uses *the Game Development Life Cycle (GDLC)* method, while the *Linear Congruential Generator (LCG) algorithm* is applied to generate pseudo-random numbers in the game. The results of the development are expected to increase students' interest in learning, students' understanding of indigenous culture, and foster a sense of belonging to local cultural heritage. In addition, this learning media is expected to be able to support digital cultural preservation and improve the quality of learning in remote areas.

Keywords: Multimedia Learning, Traditional Culture, *Educational Games*, *GDLC*, Central Sumba

1. Introduction

Indigenous culture is an ancestral heritage that contains values, norms, and community identities that are inherited from generation to generation, so it needs to be introduced from an early age through formal education. However, learning indigenous culture at SD Masehi Matawai Pandang, Central Sumba Regency, is still dominated by conventional methods using package books without the support of interactive learning media, which has an impact on students' low interest and understanding of local culture. This condition shows that there is a gap between the cultural richness of Central Sumba and the level of student understanding. The use of game-based interactive learning multimedia is considered to be a solution because it can integrate visual, audio, and interaction elements to create an interesting and enjoyable learning experience. Therefore, this study aims to develop Android-based multimedia learning to introduce Central Sumba indigenous culture using *the* Game Development Life Cycle (GDLC) *method,* with the application of *the Linear Congruential Generator (LCG) algorithm* to generate pseudo-random numbers in the game. It is hoped that this learning media can increase students' interest in learning, understanding of indigenous cultures, and support the preservation of local culture digitally, especially in remote areas such as Central Sumba.

2. Literature Study

2.1 Multimedia Learning

Multimedia learning is a learning medium that integrates various elements such as text, images, audio, video, animation, and interaction to deliver learning materials more effectively. The use of multimedia in learning is able to increase students' attention, motivation, and understanding because information is presented visually and interactively. At the elementary school level, multimedia learning is very effective because it is in accordance with the characteristics of students who tend to like visual and exploratory learning (Mayer, 2009).

2.2 Educational Games

Educational games are games designed with the aim of providing a learning experience through play activities. Educational games are able to create a fun learning atmosphere, increase active student involvement, and help students understand the material indirectly. In the context of cultural learning, educational games can be an effective medium to introduce local cultural values, traditions, and customs in an interesting and easy-to-understand way for elementary school students (Nugroho, 2019)

2.3 Linear Congruential Generator (LCG)

The Linear Congruential Generator (LCG) is one of the simplest pseudo-random number generation algorithms and is widely used in software development, including educational games. This algorithm works by generating a series of random numbers based on linear mathematical equations involving a starting value (*seed*), multiplier constant, add constant, and a specific modulus. In the development of educational games to introduce Central Sumba indigenous culture, the LCG algorithm is used to randomize, such as the order of questions and challenges in the game, so that the learning process is not monotonous. The application of the LCG algorithm is expected to increase interactivity, game variety, and students' interest in participating in multimedia-based learning in a more fun and effective way (Knuth, 1997).

2.4 Learning Indigenous Cultures

Learning indigenous culture aims to instill knowledge, values, and positive attitudes towards local cultural heritage. Early introduction to indigenous culture is important to build students' sense of love, identity, and responsibility in preserving their regional culture. The use of technology-based learning media, such as interactive multimedia and educational games, can be an effective strategy in supporting the preservation of local culture digitally, especially in remote areas (Suryadi, 2014)

3. Research Methodology

The research flow in the creation of the Multimedia Game for Indigenous Culture learning can be seen in the image below

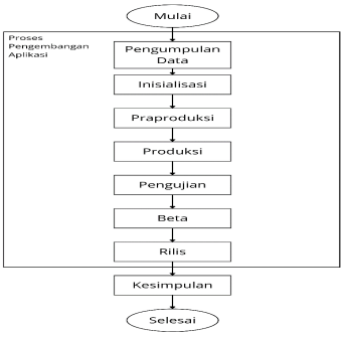

Fig. 1: Research flow

3.1. Data Collection

Aim to gather information to support and address problems. Data collection was carried out by interviews, observations, and documentation.

3.2. Educational Game Development

The research method used in the development of the application in this study is *the Game Development Life Cycle (GDLC). GDLC* is a game development method that applies an interactive and systematic approach through several stages. This method consists of six main stages, namely *initiation* , *pre-production* , *production* , *testing*, *beta*, and *release* . Each stage in GDLC is interconnected and plays an important role in producing a game application that suits the user's needs and learning goals. The stages of research conducted using the GDLC method are explained as follows

1. **Initiation Stage**
   At this stage, concept design and game description are prepared. The design is based on data that has been obtained at the previous data collection stage. The educational game developed carries the theme of introducing Central Sumba indigenous culture, which includes the introduction of vocabulary in the form of verbs and nouns in Indonesian. The game is titled "Central Sumba Culture**".**
2. **Pre-production stage**
   At this stage, a thorough game design and game production plan are prepared. This stage includes game *design*, which is the preparation of UML diagrams such as *Use Cases*, *Activity Diagrams*, *User Interfaces*, and the collection of supporting materials such as questions according to Central Sumba cultural materials, images, icons, background music, and game sound effects.
3. **Production Stage**
   This stage is the process of building the game using developer software (*Unity*). All visual, audio, animation, and logic elements of the game begin to be compiled into a complete and functional educational game application. At this stage, the *Linear Congruential Generator* (LCG) algorithm was also coded to produce random and varied cultural questions.
4. **Testing Stage**
   At this stage, the test is carried out using *the blackbox,* SUS, *pre-test and post-test methods.*
5. **Beta Stage**
   This stage will be an initial trial on the Central Sumba Culture application, which involves users directly. The purpose of this trial was to obtain initial feedback regarding the usefulness, appearance, and effectiveness of the application in the learning process of Central Sumba indigenous culture.
6. **Release Stage**
   This stage is the final stage in the development process where the Central Sumba Cultural Application that has been completed and through a series of tests is declared ready to be released and used by users.

3.3. Pre-test *and* post-test *testing*

The *pre-test* and *post-test* tests will be carried out on 5th grade students of SD Matawai Pandang which totals 21 people. At this stage, students are given *pre-test* questions before using learning media, and *post-test questions* after using educational game applications.

4. Results and Discussion

4.1. Implementation

The results of the research are the achievements obtained by the researcher from the research process which is carried out in accordance with the stages of the procedure that has been designed, so as to produce an educational game and the test results of the educational game. The development of the Central Sumba Traditional Culture game for 5th grade students at SD Masehi Matawai Pandang is designed to provide solutions to the problems faced to increase students' understanding of the importance of Central Sumba indigenous culture to be learned from now on so that it does not become extinct. After the educational game is completed, tests are carried out using *the black box* method to ensure that each function runs as expected and to find out, as for SUS and *pre-test* and *post-test*.

1. *Linear Congruential Generator* (LCG)

This display shows the application of *the Linear Congruential Generator* (LCG) algorithm as a method of randomizing the sequence of questions in multimedia learning applications. The LCG algorithm is implemented through the LCG function (int x) which generates a pseudo-random number based on the mathematical equation (A×x+B) mode C (A \times x + B) \bmod C(A×x+B)modC, with AAA, BBB, and CCC as a generating constant. The output value of the function is used as the basis for determining the index of questions to be displayed. Furthermore, the *Generate* Question Sequence () function plays a role in forming *an array of* Question Sequences that contain an index of questions that have been randomized. The randomization process begins with determining the *initial seed* value, then repeating it to produce a new random number using the LCG algorithm. Each value generated in the modulo with the total number of questions to remain within the valid index range. To prevent the recurrence of the question, the system uses *the boolean array used* as a marker for the index of the selected question. If the results of the randomization result in an index that has already been used, the system automatically searches for other indexes that have not been used. With this mechanism, all questions can be displayed randomly without duplication, so as to increase the variety of questions and student interactivity in the learning process.

Fig. 2: LCG Algorithm

2. Main Menu View

On this display is the main menu page. At the top right, there's a *speaker icon* that lets you turn background music on and off in the app. In the middle area, there are four main menu buttons, namely the learn, play, about and exit buttons. The Learn Button functions to enter the sub-material page of the introduction of Central Sumba customary culture, the Play Button functions to enter the play page, the About Button functions to enter the about page that contains information about the application, the Exit Button to close the application.

Fig. 3: Main Menu View

3. Study Menu View

After the user selects the learn button on the main page, it will display a learning page containing material about the indigenous culture in Central Sumba. In the upper right there is a *speaker icon* that functions to turn background music on and off in the application, in the upper

left corner there is a Home home icon that functions to return to the main page of the application, in the middle of the page there are three buttons, namely the accessories button functions to display material about accessories, the dance button functions to display material about dances and the traditional ceremony button functions to display material about Traditional Ceremonies in Central Sumba**.**

Fig. 4: Study Menu Display

4. Accessories Learning Menu Display

After the user selects the accessories menu, the application will display about the accessories, In the top center of the page there is an image of the accessories**,** below the image is the title of the material, then the text of the explanatory paragraph explaining the accessories is displayed, at the top there is a Home icon *that* functions to return to the main page of the application, the *speaker* icon which functions to turn the background music on and off in the app. At the bottom of the page there are two Left arrow keys to see previous material, Right arrow keys to move to the next material.

Fig. 5: Accessories Learning Menu Display

5. Dance Learning Menu Display

After the user selects the dance menu, the application will display about the dance, In the upper center of the page there is a dance image**,** below the image is the title of the material, then the text of the explanatory paragraph explaining the dance is displayed, at the top there is a Home home icon that functions to return to the main page of the application, the *speaker* icon that functions to turn on and off Background music on the app. At the bottom of the page there are two Left arrow keys to see previous material, Right arrow keys to move to the next material.

Fig. 6: Dance Learning Menu Display

6. Traditional Ceremonial Learning Menu Display

After the user selects the customary ceremony menu, the application will display about the customary ceremony, In the upper middle of the page there is an image of the customary ceremony**,** below the image is the title of the material, then the text of the explanatory paragraph explaining the customary ceremony is displayed, at the top there is a Home home icon that functions to return to the main page of the application, the speaker icon that functions to turn on and off Background music on the app. At the bottom of the page there are two Left arrow keys to see previous material, Right arrow keys to move to the next material.

Fig. 7: Display of the Traditional Ceremonial Learning Menu

7. Play Menu Display

After the user selects the Play menu, it will display two levels of difficulty, namely level 1, and level 2. At the beginning, only level 1 was open, while level 2 was locked. After level 1 is completed and gets a score of 80, then level 2 will open in the upper left corner equipped with a *Home icon* that allows users to return to the main page at any time, the upper left corner of the *speaker* icon that functions to turn the background music on and off in the application.

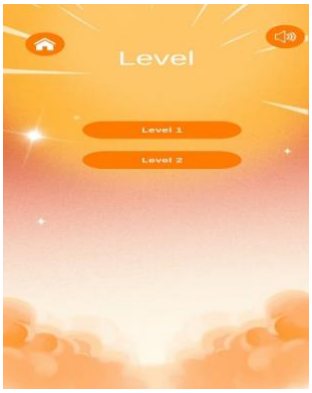

Fig. 8: Play Menu Display

8. Level 1 play Menu Display

This page displays level 1 playing information, at the top there are two Home icons in the top left that function to return to the previous menu, speaker icons that function to turn the background music on and off in the application. In the middle of the top of the page there is a picture of indigenous culture**,** below the image there are questions about culture, and below the question there are answer options to be chosen.

Fig. 9: Level 1 Play Menu View

9. Level 2 menu display

On this page, there is a Level 2 educational puzzle menu display which is part of the implementation of interactive learning which aims to improve students' accuracy, focus, and memory of Central Sumba cultural objects. The puzzle display consists of several components: A timer at the top as a measure of the duration of the puzzle completion*, the* puzzle *board area* in the form of a black 3x3 grid as a place to

arrange the pieces of the image, Random pieces of images from cultural objects (e.g. Mamuli), which must be arranged to form a complete image, *Home* and *Audio* buttonsas on the other page. Students are asked to drag the pieces of the picture onto *the puzzle board* according to their position. If *the puzzle* is arranged correctly, the system provides a notification of completion or sound effects as a form of appreciation.

Figure 10: Level 2 menu view

10. Final score page view

This view is the Final Score page view of the game that displays the results of the game after the user completes the level. This page is also equipped with a clap icon in appreciation to the user who gets the highest score, a *speaker* icon that functions to turn the background music on and off in the application, a *play* again icon to restart the game, a *Home* icon to return to the home page, and an arrow icon to return to the Play menu page.

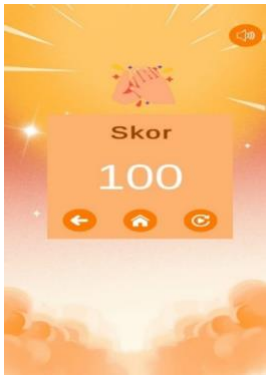

Fig. 11: Final score page view

11. About Menu Display

Once the user presses the About button on the main page, the About menu page will be displayed with game information. In this view, information about the identity of the app developer is displayed in a light orange box. This information includes name, NIM, application development purpose, and origin of study program and university. In addition, it also displays a photo of the developer on the right side of the information box. At the bottom, there is a Back button that functions to take the user to the main page, as well as *a speaker button* in the upper left corner that has a function to adjust the sound.

Fig. 12: About Menu View

4.2. Testing

4.2.1. Black Box

The testing of the Central Sumba Traditional Culture game for grade V students at SD Masehi Matawai Pandang was carried out using *the black box testing* method. The results of the *black box* test are presented in Table 1.

Table 1: *Black Box*

Functions tested	How to Test	Expected results	Test Results
Main Menu	The user selects the menu button	Each button goes to the page accordingly	[✓] Successful [ ] Didn't work
Study Menu	The user selects the material	Complete Material	[✓] Successful [ ] Didn't work
Play Menu	The user answered the question correctly	Correct waste is scored.	[✓] Successful [ ] Didn't work
Final Score View	Game features scores	Score recap and *home* and *reload* options (to replay to the original game)	[✓] Successful [ ] Didn't work
About Menu	Display personal data information from game creators	Information displayed	[✓] Successful [ ] Didn't work
Exit Menu	Displays exit menu	User exits the game	[✓] Successful [ ] Didn't work

Based on Table 1, the test results of the Central Sumba Traditional Culture Introduction Education game using *the black box* method show that all the features tested obtained successful results and ran according to the expected function. Thus, it can be concluded that the educational game developed has functioned well and in accordance with the design that has been set.

4.2.2. SUS (System Usability Scale) Testing

In the testing of the Central Sumba Traditional Culture Introduction game using *the System Usability Scale* (SUS) method, the test was carried out on 10 respondents consisting of 5 teachers and 5 students, the score obtained from the respondents in the application test using *the System Usability Scale* (SUS) can be seen in Table 4.2.

Table 2: SUS *Testing*

Respondents	SUS Statement										Total	SUS Score
	P1	P2	P3	R4	R5	R6	R7	R8	R9	R10		
1	3	2	5	2	4	3	3	4	2	4	33	82.5
2	2	1	5	4	2	4	3	3	4	4	33	82.5
3	3	4	5	3	4	3	4	4	4	2	34	85
4	5	2	2	4	3	4	4	4	3	4	35	87.5
5	2	4	2	3	4	4	3	2	4	3	32	80
6	5	3	4	4	4	4	4	4	4	4	36	90
7	3	2	4	4	3	3	4	3	3	3	33	82.5
8	5	2	1	3	2	4	3	4	4	4	30	75
9	3	4	3	2	4	3	4	3	3	2	31	77.5
10	4	1	3	4	4	4	3	4	4	3	37	92.5
Average Score												**830**

The total *System Usability Scale* (SUS) score obtained in this study was 830, as shown in Table 2, which came from 10 respondents. Furthermore, for the next stage of calculation, the average SUS score of all respondents was calculated. The formula for calculating the average SUS score is presented in the Mathematical Formula 2.2

$$\bar{x} = \frac{830}{10} = 83$$

4.2.3. Pre-test and Post-test

The test in this study used *pre-test* and *post-test*, the test was carried out on Grade 5 students at SD Masehi Matawai Pandang consisting of 21 students. Pre-test and *post-test* are given to students with the scores obtained in Table 3.

Table 3: *Pre-test* and *Post-test*

Yes	Student Name	Value	
		Pre-test	***Post-test***
1	Queensha	90	100
2	Photos	100	90
3	Eca	100	100
4	Mira	100	100
5	Geysa	80	90
6	Iren	100	100
7	Squirrel	80	100
8	Renal	100	90
9	Morata	100	100
10	Sharon	100	100
11	Filneya	90	100
12	Perol	80	100
13	Jefri	90	100
14	John	80	90
15	Jeni	80	100
16	Kings	100	100
17	Adit	100	100
18	Yogi	100	90
19	Sanjaya	80	100
20	Serwin	90	90
21	Rivan	100	100
	Total	**1940**	**2040**

Table 4.4 shows the results of *the pre-test* and *post-test* carried out, the number of *pre-test* scores in this study is 1940 and the number of *post-test* scores in this study is 2040 as shown in Table 4.3. For the next calculation, the number of scores from each *test* is searched for the average score. The formula for calculating *the average score of the pre-test* and the formula for calculating the *average score of the post-test* can be seen below:

Calculation of *the average score of the pre-test*:

$$\bar{x}_{Pre} = \frac{1940}{25}$$

$$\bar{x}_{Pre} = 77{,}6$$

Calculation of the post-test average score:

$$\bar{x}_{Post} = \frac{2040}{25}$$

$$\bar{x}_{Post} = 81{,}6$$

Based on the results of the calculation of the average score of the students, *a pre-test* score of 77.6 and *a post-test* score of 81.6 were obtained. Furthermore, based on the average value, a percentage calculation is carried out, as shown in the following equation;

$$Angka\ Persentase = \frac{81{,}6-77{,}6}{77{,}6} \text{ x } 100\%$$

$$Angka\ Persentase = 5{,}15\%$$

Based on the results of *the pre-test* and *post-test* tests carried out on students, there was an increase in the value of learning outcomes by 5.15% after students participated in learning activities while playing using educational games, the results of the tests showed that the educational game application developed could be used as an effective learning medium in helping students learn and remember the indigenous culture found in Central Sumba.

5. Conclusion

Based on the results of analysis, design, and testing, it can be concluded that the Multimedia Learning Introduction to Central Sumba Traditional Culture for grade V students of SD Matawai Pandang has run well and met the learning objectives. This application is able to improve students' understanding of local cultural materials, which is shown by the increase in the average *pre-test* score from 77.6 to 81.6 in the *post-test* with a percentage increase of 5.15%. Interactive presentation of material has been proven to increase students' interest and motivation to learn. The results *of the Black Box Testing* showed that all application features worked as designed, while the *System Usability Scale* (SUS) test obtained an average score of 83.0 which was in the good to excellent category. Thus, this application is suitable for use as an additional and effective learning medium in supporting the introduction of Central Sumba indigenous culture in elementary schools.

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