Journal of Artificial Intelligence and Engineering Applications

Website: https://ioinformatic.org/

15th October 2025. Vol. 5. No. 1; e-ISSN: 2808-4519

Development of Android-Based Interactive Learning Media to Improve Students' Reading Abilities at SDI Kondamara 2

Yunarti Raji Roy [1] *, Fajar Hariadi [2] , Novem Berlian Uly [3]

[1,2,3] *Program Studi Teknik Informatika, Fakultas Sains dan Teknologi, Universitas Kristen Wira Wacana Sumba,Indonesia*

narty scorpio05@gmail.com[1*]

Abstract

This research focused on creating an innovative Android-based interactive learning media designed to enhance reading comprehension among first-grade students. The development process employed Unity 3D, a powerful platform for creating engaging digital applications, combined with the Model Development Life Cycle (MDLC) method to ensure a systematic and structured approach. To add an element of variability and challenge, the Learning Content Generator (LCG) algorithm was integrated into the media, enabling the randomization of quiz questions. This feature aimed to prevent predictability and encourage critical thinking among young learners. The implementation of this interactive media was tested in a classroom setting, and the results were highly encouraging. The students demonstrated a significant improvement in their reading comprehension skills, with scores increasing by 62.8% from the initial pre-test to the subsequent post-test. This substantial gain indicates that the use of technology-enhanced learning tools, particularly those incorporating game-like elements and adaptive algorithms, can effectively support early literacy development. Overall, this study highlights the potential of combining Unity 3D, the MDLC method, and the LCG algorithm to create impactful educational media for young learners.

Keywords *: Learning Multimedia , Reading, Unity 3D, Linear Congruential Generator*

1. Introduction

Read Reading is a very important skill for every individual. Mastering reading skills can increase one's insight and knowledge. Not only that, but good reading skills can also improve other life skills, such as communication skills [1] .

The advancement of information and communication technology has significantly transformed various aspects of daily life, revolutionizing communication, education, commerce, and social interactions in unprecedented and profound ways. In today's digital era, the learning process is no longer limited to classrooms and conventional methods. Educational innovation is rapidly advancing through the integration of digital technology, opening up exciting new opportunities for more interactive, personalized, and engaging learning experiences tailored to each student's unique needs and interests. Technology enables the delivery of learning materials in a more interesting and interactive manner, and provides opportunities for students to learn independently according to their learning style and pace. One form of application of technology in the world of education is the development of interactive multimedia-based learning media [2] . This media effectively combines text, images, audio, video, and animation to create interactive learning. Not only does it present information, interactive media also allows for two-way interaction between users and the material being studied, so that the learning process becomes more lively and meaningful [3] .

Unity is a game engine first developed in 2004 by David Helgason, Nicholas Francis, and Joachim Ante in Denmark. Unity has evolved into a cutting-edge technology that makes it easier for game developers to develop games. Unity supports the development of a wide range of interactive applications, including not only console and PC games but also mobile applications and virtual reality technology. [4] .

Linear Congruential Generator is a *Pseudo Number Generator method* used to generate pseudo random numbers. Its main advantage lies in its operating speed. This method can be used to generate a number of random values or to randomize the order of a data set [5] . Linear Congruential Generator is flexible because it can be used to create a sequence of random values or randomize the position order of a set of values. The formation of random values in Linear Congruential Generator follows a recurrent relation [6] . In the context of developing learning media, the Linear Congruential Generator method is used to randomize the order of questions on the quiz menu .

Black box testing is the most commonly used test to ensure a built system functions according to predetermined specifications. This testing focuses on the system's functionality without considering the program code written or the system's internal structure. Because the main focus is on the conformity of the system's output to the given input [7] .

SD Impres Kondamara 2 is an elementary school located in Kondamara Village, Lewa District, East Sumba Regency. This school faces challenges in Indonesian language subjects, especially reading material. Among the 22 first-grade students, fourteen scored below the passing criteria with scores ranging from 50 to 55, indicating they need additional support. Meanwhile, three students met the established KKM, demonstrating satisfactory understanding. The remaining five students scored above the passing mark, showcasing strong grasp of the material. These results highlight areas for targeted instruction and improvement. The teaching method currently still predominantly used is the lecture method, this method tends to be one-way. This makes students less actively involved in the learning process, so that the learning atmosphere becomes monotonous and not varied.

2. Research Methodology

This research utilized the multimedia development life cycle (MDLC) method, which provides a systematic approach for designing, developing, and evaluating multimedia projects to ensure effective and engaging educational or informational content creation. All stages are carried out sequentially [8] .

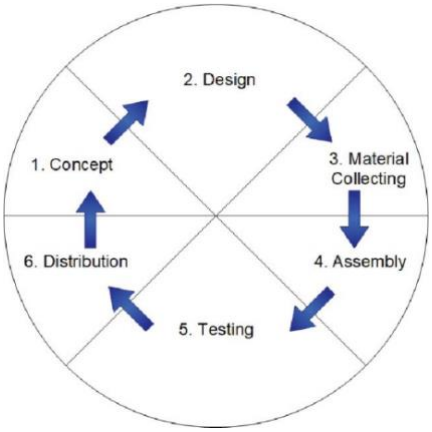

Fig. 1: Multimedia Development Life Cycle (MDLC) Stages

1. Concept
   In the conceptualization stage, the development of the learning media concept takes place by identifying its key features, including animation, images, sound, and interactivity. This foundational step ensures the media effectively engages learners and enhances understanding, setting the stage for successful content creation and implementation.
2. Design
   The design stage begins with gathering ideas, followed by creating a wireframe for the basic structure and compiling a sketch (storyboard) for the storyline.
3. *Material* Collection
   The material collection stage is the stage where the resources needed to develop learning media are gathered. These resources include images, text, and audio.
4. Production (*Assembly*)
   At this stage, the application will be developed based on the design that has been done, using *Unity 3D* as the main software, while Visual Studio Code is used as a code editor for writing programs using the C# programming language.
5. Testing
   The testing stage is carried out to ensure that the application functions optimally, including testing the button functions, navigation and display. This testing stage uses Black Box.
6. Distribution
   The concluding phase entails carefully distributing the fully prepared, ready-to-use application to teachers and students, ensuring everyone receives access smoothly and can begin utilizing the new tools effectively for optimal learning experiences.

3. Results and Discussion

3.1. Learning Media Results

1. Opening Page
   The opening page displays features in the form of a play button which when clicked will enter the main menu page, then a profile button which displays the developer's biodata and an exit button which functions to exit the application.

Fig. 1: Opening Page

2. Home Page

The main menu consists of a material button which when clicked will display a material page consisting of 3 sub-menus, namely letters, syllables, and words, quizzes, and exit, then a quiz button which when clicked will display quiz questions, and an exit menu which functions to exit the application.

Fig. 2: Main Page

3. Material Page

This page features three sub-topics. The first covers alphabet introduction, followed by syllables in the second, and word pronunciation in the third. Each sub-topic includes audio pronunciation.

Fig. 3: Material Page

4. Quiz Page

The quiz page display has two buttons: A home button to return to the main menu and a convenient search feature to quickly find what you're looking for enhance the user experience significantly. Once the user completes the questions, the app automatically displays their final score.

Fig. 5: Quiz Page

5. Score Page

The final score display will show the user's score after completing the questions on the quiz page, each worth 5 points. The final score display also has two buttons: The interface features a convenient home button that allows users to easily return to the main screen anytime.

Fig. 6: Score Page

6. Profile Page

The profile page displays the app developer's biodata. There's a *home button* that, when clicked, returns to the main page.

Fig. 7: Profile Page

a. Black box testing

Application testing was performed using comprehensive manual and automated techniques, this testing focused on validating the main functions of the application [9] . In a thorough black box testing process, it was confirmed that all application features functioned properly, ensuring reliability and user satisfaction. Additional testing was conducted to validate performance under various conditions, reinforcing confidence in the software.

Table 1: Black Box Testing

Functions being tested	Expected realization	Expected results	Results

Opening screen	*Loading* 3-5 seconds	The Main Menu Display Interface Appears	Succeed
Main course	Testing the material button, quiz button, and exit	The reading learning material and quiz display appears	Success
Sub-material menu	Testing sub material buttons	A display of 3 sub-material menus appears	Succeed
Next button	Testing the *next button*	The next chapter begins now.	Success
Back button	Testing the *back button*	The previous material display appears	Succeed
Home button	Testing the *home button*	The display appears suddenly with bright, vivid colors.	Succeed
Implementation of the *Linear Congruential Generator algorithm*	Answering Practice Questions	The questions will be randomized and will not follow any particular order, ensuring a fair testing experience.	Succeed
Correct answer	Choose the correct answer	The score will increase according to the points of the question, a pop-up will appear showing the correct answer, and the question will continue to the next question.	Succeed
Wrong answer	Choosing the wrong answer	Despite the unchanged score, a pop-up appears, indicating the answer is incorrect, prompting the user to try again and encouraging continued engagement with the activity.	Succeed
Score page	Have finished completing the quiz	Displaying the final score	Succeed
Start again button	Choose to start retaking the quiz	Quiz menu display	Succeed
Quiz Page	Correctly adjust the scrambled image	Question display	Succeed

b. ***Pre-test* and *Post-test***

The pre-test and post-test are assessments used to measure the understanding of students' knowledge and progress before and after instruction, providing valuable insights into their learning development and areas needing improvement [10] . Table 1 displays the results clearly, illustrating the key findings of the study.

Table 2 : *Pre-test* and *Post-test*

No	Student Name	Mark	
		Pre-test	*post-test*
1	Aditya M Henggu	55	75
2	Aldrich Ozarius Dj Limu	50	80
3	Aryansa H Hilu Puti	30	70
4	Arlan Huki Konda Toma	40	80
5	Belvania Rada Ndima	45	75
6	Daniel Robinson Tarapanjang	50	80
7	Irene Charoline Retang	40	75
8	Juvandi Tri Putra Pila Ndelu	50	70
9	Jeansy Ruddji Mbani	40	70
10	Kristina Lawa Djati	50	70
11	Keisah Bangun Kahi	70	100
12	Kintan Jinara R Ara Dyana	50	80
13	Maximus Alfa Djanggalimu	45	70
14	Mizael Djanggalimu	40	70
15	Rilansia Hamu Meha	60	80
16	Randika Nggalu Landu Kara	40	70
17	Ercha Tamu Ina Sign	30	75

18	Shiren Wadang Atta Nara	40	70
19	Trisno Yunus Waiting for Mbera	60	90
20	Natalia Rambu Dai Duka	40	75
	Total Score	940	1,530

The pre-test and post-test results for twenty grade one students at SD Inpres Kondamara were carefully analyzed. The assessment aimed to measure their academic progress, highlighting improvements in literacy and numeracy skills following targeted instruction and intervention throughout the educational perio. The calculation will proceed systematically to accurately determine the overall average value for the dataset:

$$\bar{x}p_{re} = \frac{940}{20}$$

$$\bar{x}p_{re} = 47$$

$$\bar{x}p_{ost} = \frac{1.530}{20}$$

$$\bar{x}p_{ost} = 76{,}5$$

The average pre-test score is 47, indicating that students initially possess a moderate level of understanding before instruction begins, which provides a baseline for measuring progress. The next stage will be calculating the percentage value to determine how much the grades of grade 1 students at SD Inpres Kondamara 2 have increased.

$$\text{Percantage Figure} = \frac{76{,}5 - 47}{47} \text{x } 100\%$$

$$\text{Percentage Figure} = \frac{29{,}5}{47} \text{x } 100\%$$

$$\text{Percentage Figure} = 62{,}8$$

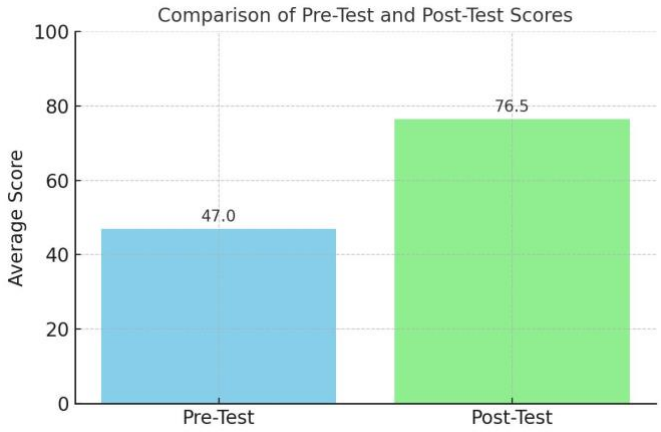

Fig. 8: Comparison graph of pre-test and post-test scores

Figure 8 demonstrates that, starting with a pre-test score of 47, students showed measurable improvement after the intervention, highlighting the effectiveness of the teaching method in enhancing their understanding and performance. The application of learning media can enhance students' understanding, engagement, motivation, retention, and overall academic performance significantly.

4. Conclusion

The developed Android-based interactive learning media successfully improved the reading skills of first-grade students at SD Inpres Kondamara 2. Pre-test and post-test results showed an increase in the average score from 47.0 for the pretest to 76.5 for the posttest. The 62.8% increase after using the learning media application indicates a significant improvement in understanding and engagement, demonstrating the effectiveness of integrating multimedia tools into the educational process.

References

[1] TKW Putri and YP Wicaksono, "The effectiveness of applying reading strategies in learning reading comprehension," *Caraka J. Linguistics, Literature, and Learning* , vol. 9, no. 2, pp. 147–159, 2023, doi: 10.30738/caraka.v9i2.14804.

[2] Syarifuddin. and ED Utari, *Learning Media (From the Conventional Era to the Digital Era)* . Palembang: Bening Media Publishing, 2022.

[3] E. Melati, AD Fayola, IPAD Hita, AMA Saputra, Z. Zamzami, and A. Ninasari, "Utilization of Animation as a Technology-Based Learning Media to Increase Learning Motivation," *J. Educ.* , vol. 6, no. 1, pp. 732–741, 2023, doi: 10.31004/joe.v6i1.2988.

[4] NF Ramadhanti, M. Lamada, and Muhammad Riska, "Development of a Unity-Based 3D Educational Game Application 'Finding Geometry' as a Learning Media for Mathematical Space Structures," *J. Mediat.* , vol. 4, no. 2, pp. 21–26, 2024, doi: 10.59562/mediatik.v4i2.3076.

[5] BO Sinaga, S. Sinurat, and T. Zebua, "Modification of the XTEA Algorithm with Key Generation Using the Linear Congruential Method for

Document File Security," *J. Informatics* , vol. 1, no. 4, pp. 144–152, 2021.
[6] S. Sofyan, "Application of Linear Congruential Generator (LCG) in Designing Ken Ken Game Software," *J. TIMES* , vol. 5, no. 1, pp. 20–22, 2016, doi: 10.51351/jtm.5.1.2016395.
[7] DP Andika, K. Immanuella, and SR Candra N, "Black Box Testing on Shopee.Co.Id Using Boundary Value Analysis Technique," *JIK J. Comput Science.* , vol. 9, no. 02, pp. 44–49, 2024, doi: 10.47007/komp.v9i02.8890.
[8] H. Sugiarto, "Application of Multimedia Development Life Cycle in Alphabet and Number Recognition Applications," vol. 3, no. 1, pp. 26–31, 2018.
[9] AMH Pardede, M. Zarlis, and H. Mawengkang, "Optimization of Health Care Services with Limited Resources," *Int. J. Adv. Sci. Eng. Inf. Technol.* , vol. 9, no. 4, pp. 1444–1449, 2019, doi: 10.18517/ijaseit.9.4.8348.
[10] I. Magdalena, M. Nurul Annisa, G. Ragin, and AR Ishaq, "Analysis of the Use of Pre-Test and Post-Test Techniques in Mathematics Subjects in the Success of Learning Evaluation at Sdn Bojong 04," *J. Educator. and Social Sciences.* , vol. 3, no. 2, pp. 150–165, 2021, [Online]. Available: https://ejournal.stitpn.ac.id/index.php/nusantara.