

E-learning as a Learning Media in the Form of Educational Games for Elementary School Students

Widya Hartayu¹, Ilham Albana²

^{1,2}Informatic Departement, Universitas Amikom Purwokerto,
Central Java, Indonesia

Email: ¹widyahartayu15@gmail.com, ²ilhamalbana@amikompurwokerto.ac.id

ARTICLE INFO



History :

Submit on 16 January 2023
Review on 19 January 2023
Accepted on 22 February 2023

Keyword :

E-Learning,
Game,
Education,
Animation

ABSTRACT

The use of games as a means of education is not wrong. Because games are entertaining. Human psychology is more like playing than serious study. In games, education is given through practice or learning by doing (learning by doing). The aim of this research is to design and build an Educational Game for learning mathematics, sub-materials for addition, subtraction, multiplication and division on integers, Indonesian, Natural Sciences, Desktop-based IPS, class VI. The purpose of designing this platform is to conceptualize and build E-learning in learning math operations, Indonesian language, Natural Sciences, Desktop-based IPS, sub-material addition, subtraction, multiplication and division of integers. Memorizing in history and understanding nature and others as well as understanding correct punctuation and language. Data collection methods used are interviews, literature and documentation. The system development method used is MDLC (Multimedia Development Life Cycle). In its manufacture using Adobe Flash Professional CS6, Adobe Photoshop CS6 and Adobe Audition CS6 software. The results of this study are in the form of E-learning as Learning Media in the Form of Educational Games for Class VI Students of SD Negeri 03 Karanggude Kulon

Copyright © 2022 by Author

The copyright of this article belongs entirely to the author

Corresponding Author:

Widya Hartayu
Faculty of Computer Science, Informatic Departement, Universitas Amikom Purwokerto
Email : widyahartayu15@gmail.com

INTRODUCTION

In the Law on the National Education System of the Republic of Indonesia No. 20 of 2003 states that national education functions to develop capabilities and shape dignified character and national civilization in order to educate the nation's life, aims to develop the potential of students to become human beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable, competent, creative, independent and become a democratic and responsible citizen[1][2]. According to the Ministry of National Education, one of the goals of learning mathematics, Indonesian, science, social studies is for students to have the ability to understand the concepts of mathematics, Indonesian, science, social studies to explain the interrelationships between concepts and apply concepts or algorithms in a flexible, accurate, efficient, correct manner. in language, and precise in solving problems[3].

Based on the results of interviews conducted by researchers at SD Negeri 03 Karanggude Kulon, information was obtained that the process of learning mathematics, Indonesian language, science, social studies in class VI had not been carried out optimally and referred to the goals set in the curriculum. In the learning process, the teacher still dominates as the main source and the method of delivering teaching material is still fixated on what is written in the textbook[4].

According to the results of a survey by a computer research and publishing institute, namely Computer Technology Research (CRT), it is stated that people are only able to remember 20% of what they see and 30% of what they hear[5]. But people remember 50% of what is seen and heard and 80% of what is seen, heard and done at once[6]. E-learning is an educational system or concept that utilizes information technology in the teaching and learning process. Learning is structured with the aim of using an electronic or computer system so that it is able to support the learning process. The advantages of E-learning are that it provides flexibility, interactivity, speed, visualization through the various advantages of each medium[7].

The use of games as a means of education is not wrong. Because games are entertaining. Human psychology is more like playing than serious study. In games, education is given through practice or learning by doing[8]. E-learning is an educational system or concept that utilizes information technology in the teaching and learning process. Here are some definitions of E-learning from various sources. Learning is structured with the aim of using an electronic or computer system so that it is able to support the learning process[9].

Android-based mobile is one of the leading platforms that runs various types of games. The Android operating system is an operating system for mobile phones that is freely available for commercial or non-commercial use[10]. The Android operating system was introduced in 2010 and in 2020 Android has controlled 59% of the world smartphone market so that Android is the most popular operating system today[11].

Based on the background that has been described, the authors are interested in designing and building an E-learning as a learning medium such as educational games in mathematics, Indonesian, science, social studies. Educational games are games that are accompanied by learning and are the newest learning media that are expected to increase understanding quickly because they are supported by interesting games and make students active[12][13].

The purpose of designing this platform is to conceptualize and build E-learning in learning math operations, Indonesian language, Natural Sciences, Desktop-based IPS, sub-material addition, subtraction, multiplication and division of integers[14]. Memorizing in history and understanding nature and others as well as understanding correct punctuation and language[15].

METHOD

The method used for system development in this study is Luther concept of Multimedia Development Life Cycle (MDLC) which consists of six stages, namely the concept, design, material collecting, assembly, testing, and distribution. What type of research should be used, is always based on the problem being studied, not the type of research first defined and then the problem defined. This is due to the fact that the research was carried out because of a problem. The reasons for choosing a method are, of course, based on its suitability with the research problem, research objectives, and appropriate research procedures, expected results, and conditions of the target group or research object.

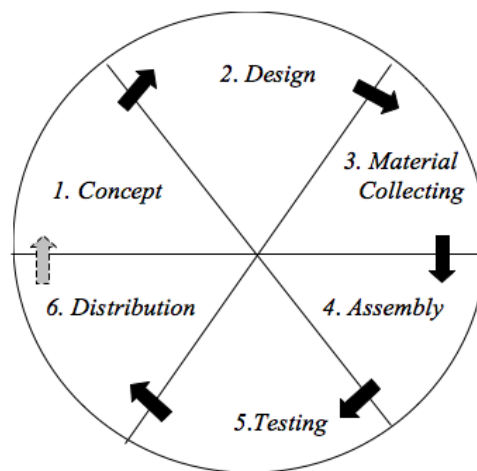


Figure 1, MDLC Multimedia Development Stages

The concept stage is to determine the purpose and who are the users of the program (audience identification), types of applications (presentations, interactive, etc.), application objectives (entertainment, training, learning and others). Basic rules for design are also defined at this stage, such as application size and application targets. The goals and end users of the program affect the feel of multimedia as a reflection of the identity of the organization that wants information to reach the end user. User characteristics including user abilities also need to be considered because they can affect design making.

Design is making detailed specifications regarding program architecture, style, appearance, and material requirements for the program. The specifications are made detailed enough so that in the next stage, namely the material collecting and assembly stages, no new decisions are required, but use what was determined at the design stage. However, it is common for additional materials or application parts to be added, removed, or changed at the start of the project.

Material Collecting is the stage of collecting materials according to the needs being worked on. These materials include clipart images, photos, animations, videos, audio. This stage can be done in parallel with the assembly stage. However, it is also possible that the material collecting stage and the assembly stage will be carried out in a linear and not parallel manner.

The assembly stage is the stage of making all multimedia objects or materials. Making applications based on storyboards, flowcharts, and navigation structures. This stage usually uses authoring software, such as Adobe Flash CS6.

The testing phase is carried out after completing the assembly stage by running the application / program and seeing whether there are errors or not. The first stage at this stage is also known as the alpha testing stage (alpha test) where the test is carried out by the manufacturer or the manufacturer's own environment. After passing the alpha test, beta testing involving end users will be carried out.

At this stage the application will be stored in a storage medium. This stage can also be called the evaluation stage for the development of finished products so that they become better. The results of this evaluation can be used as input for the concept stage of the next product.

RESULT & DISCUSSION

1. Concept.

In Indonesian language subject matter, the material used in this application is the main sentence material and drama. This material is made in the form of practice questions, both about main sentences and about drama. In this part of the exercise students have to answer the questions before time runs out, to get the highest score. Each question consists of four answer choices, and students must choose the most appropriate answer.

In science subject matter, the material used in this application is material for the introduction of animals and plants. Each material consists of an introduction and exercises. The introductory section contains pictures of animals and plants as well as a brief explanation of the displayed animal or plant images. Whereas in the practice menu, students must answer the name of the animal or plant from the sound that comes out of this application quickly before the time runs out and get the highest score.

In social studies subject matter, the material used in this application is an introduction to temples in Indonesia, including Borobudur temples, Dieng temples, Prambanan temples and Clown temples. This material is divided into two, namely introduction and training in the form of games. The introduction section consists of pictures of the temples and a brief description of the temples shown. While in the game part, namely in the form of puzzle games or assembling broken temples into a complete temple, quickly before the time runs out.

2. Design.

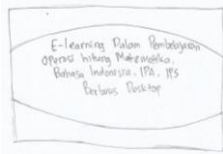
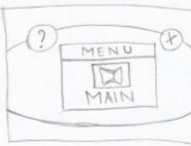
Design or design is the stage of making specifications regarding the program architecture to be made including style, appearance, and material or material requirements for the program. After the concept stage is carried out, a clear picture of what needs to be done has been obtained. After that thought how to form the system.

Storyboards are used to describe the flow of the display design for math, Indonesian, science, social studies games and describe a description of each scene by

including all multimedia objects and links to other scenes. While the determination of hardware and software is used to determine the hardware and software used in making educational games for mathematics, Indonesian, science, social studies.

An overview of the scene, the visual form of the audio design, description and sound will be made in the storyboard design. The results of the storyboard design will be a reference in making appearances at the implementation stage. The following is a storyboard table from the Math Education Game, Indonesian, Natural Sciences, Social Sciences.

Table 1, Storyboard of E-Learning model scenario.

No	Scene	Visual	Navigation	Sound	Keterangan
1	Loading		-	-	Initial display or loading to open the application
2	Dashboard Menu		1. About 2. Login/Logout 4. Layout Main	-	Main menu display on the Application
3	About		Back	-	The about view contains the creator's brief profile information
4	Material		Back	-	The material menu contains material contained in the application, namely math, science, Indonesian and social studies material

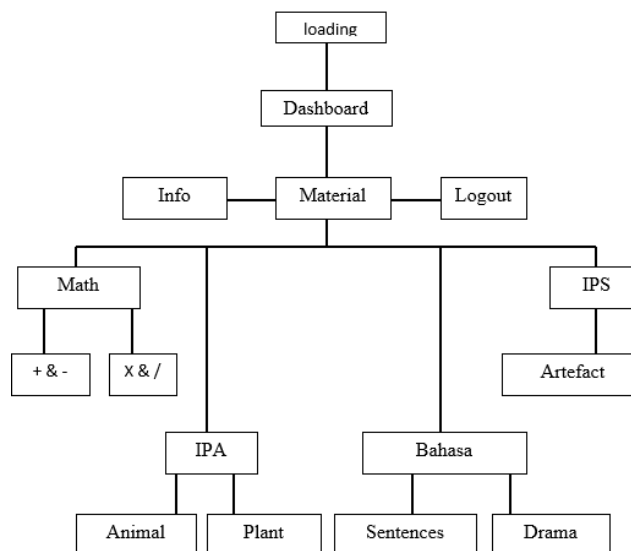


Figure 2, Navigation structure

3. Material Collecting.

The material collecting process can be carried out in parallel with the assembly or manufacturing process. The following is a material collection table.

Table 2, Material Collecting

No.	File Name	Format	Size	Description
1.	Loading : Background Teks	PNG Text	753 KB -	Made using Adobe Flash Professional CS6 and Adobe Photoshop CS6
2.	Main course : background Btn_about Btn_out Btn_main	PNG Button Button Button	753 KB 17 KB 17 KB 17 KB 17 KB	Made using Adobe Flash Professional CS6 and Adobe Photoshop CS6
3.	Menu About : background Board Box Text Btn Back	PNG PNG Text Button	753 KB 41 KB - 17 KB	Made using Adobe Flash Professional CS6 and Adobe Photoshop CS6

4. Assembly.

The assembly stage is the stage where all multimedia objects or materials are made. Game creation is based on the design stage. This stage is the stage of making all multimedia objects based on the designs that have been made before. The software used for this stage is Adobe Flash Professional CS6 and the coding program used is Actionscript 3.0.

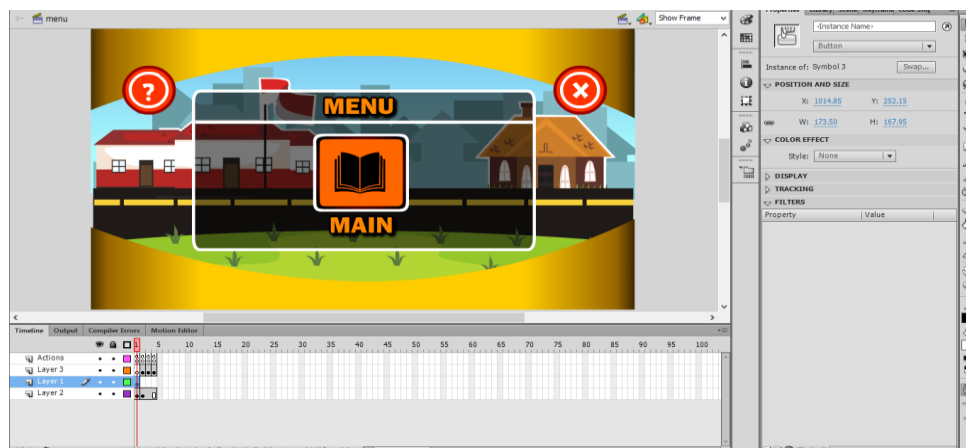


Figure 3, Make a dashboard menu

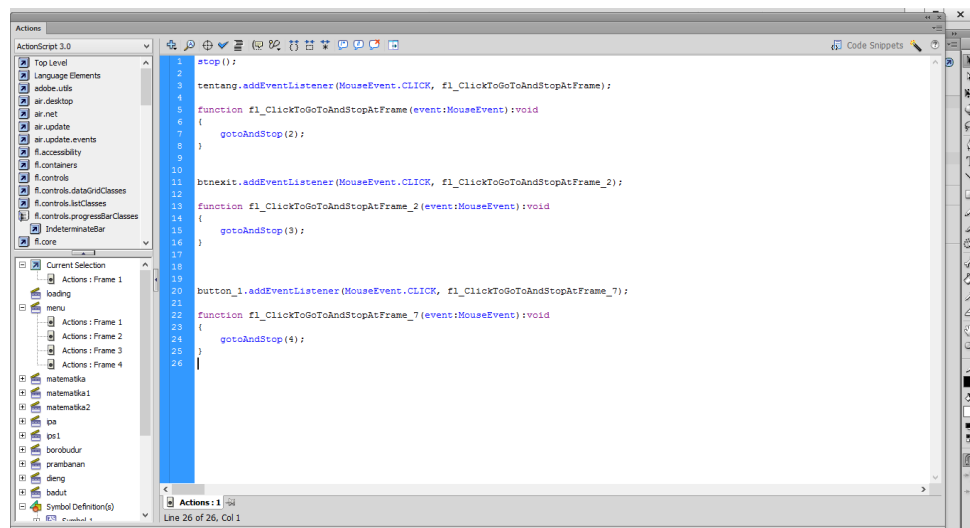


Figure 4, Structure Program with Action Script 3.0

5. Testing.

The choices given to respondents are Strongly Agree, Agree, Enough, Disagree, Strongly Disagree. There are 5 aspects proposed to respondents and will be calculated using a Likert scale with the following provisions:

Table 3, Question Value

Scale	Value	Description
Strongly Agree	5	Game has more performance than expected
Agree	4	The game has performance as expected
Enough	3	The game has less performance than expected
Disagree	2	The game has performance that is not as expected
Strongly Disagree	1	The game has very poor performance as expected

The following is the interpretation of the score based on the interval (distance):

- 1) Number 0% - 19.99% = Strongly Disagree
- 2) Figures 20% - 39.99% = Disagree
- 3) Number 40% - 59.99% = Enough
- 4) Number 60% - 79.99% = Agree
- 5) Figures 80% - 100% = Strongly Agree

the final results of testing Educational Games for mathematics, Indonesian, Natural Sciences, Social Sciences can be taken by the average index formula from student respondents as follows:

$$(90.63 \% + 88.75 \% + 83.75 \% + 90 \% + 53.13 \%) / 5 = 81.15 \%$$

The average index formula of teacher respondents is as follows:

$$(100 \% + 100 \%) / 2 = 100\%$$

So the average index formula of student respondents is 81.15%, which is in the very agree category, and teacher respondents are 100%, so they are in the agree category.

6. Distribution.

After the Educational Games for learning mathematics, Indonesian, science, social studies have been tested, the next stage is distribution. This stage begins with saving the application on each class VI math teacher's laptop, then the teacher distributes it to each student who has a PC/laptop in their respective homes. Distribution of this application can also be done via a flash drive for data transfer or you can use a data cable as a data transfer medium between PCs/laptops.

CONCLUTIONS

Based on the results of the research and discussion that has been compiled, the following conclusions can be drawn, (1) E-learning has been created as a learning medium for class VI students at SD Negeri 03 Karanggude Kulon in a Desktop-based educational game for mathematical arithmetic operations, Indonesian, Science, Social Sciences. This game is a media for learning mathematics, material for arithmetic operations for addition, subtraction, multiplication and division of integers, Indonesian language learning materials, science learning materials, and social studies learning materials for class VI. (2) After going through the testing phase using the alphatest, an educational game based on math, Indonesian, IPA, IPS-based arithmetic operations shows the results are in accordance with the design. In the beta test, the average index formula was 81.15% with the strongly agree category, which means that this game has the expected performance and is suitable for use as a learning medium.

Acknowledgement

The author would like to thank for the assistance from Amikom Purwokerto University which has provided the opportunity to use the multimedia laboratory, and to all lecturers who have guided in building this learning platform.

REFERENCE

- [1] I. Santiko, A. B. Wijaya, and A. Hamdi, "Smart Campus Evaluation Monitoring Model Using Rainbow Framework Evaluation and Higher Education Quality Assurance Approach," *J. Inf. Syst. Informatics*, vol. 4, no. 2, pp. 336–348, 2022, doi: 10.51519/journalisi.v4i2.258.
- [2] A. Wahyu Widodo, I. Solikhatun, S. Raharja, A. Abdun Salam, and F. Sri Wartini, "A Utilization of Information Technology on Education in Indonesia (2017-2020): A Systematic Literature Review," *J. Phys. Conf. Ser.*, vol. 1779, no. 1, 2021, doi: 10.1088/1742-6596/1779/1/012024.
- [3] M. W. Kisworo, "Implementing open source platform for education quality enhancement in primary education: Indonesia experience," *Turkish Online J. Educ. Technol.*, vol. 2016, no. july, pp. 295–301, 2016.
- [4] A. Faris and A. F. Lestari, "Rancangan Animasi Pembelajaran Interaktif Alfabet Pada Pendidikan Anak Usia Dini," *J. Tek. Komput. AMIK BSI*, vol. II, no. 1, pp. 59–67, 2016, [Online]. Available: <https://ejournal.bsi.ac.id/ejurnal/index.php/jtk/article/download/363/272>
- [5] I. Santiko, A. Wibowo, and B. Warsito, "The Post-Covid-19 Pandemic Education Model Is Effective, Let's Compare: Online Versus Offline Learning," *Proc. - 2021 Int.*

- Semin. Appl. Technol. Inf. Commun. IT Oppor. Creat. Digit. Innov. Commun. within Glob. Pandemic, iSemantic 2021*, pp. 212–216, 2021, doi: 10.1109/iSemantic52711.2021.9573238.
- [6] I. Santiko, T. Retnaning Soeprbowati, and B. Surarso, "Model review on the proposed new smart campus framework in achieving industry 4.0," *Proc. - 2021 IEEE 5th Int. Conf. Inf. Technol. Inf. Syst. Electr. Eng. Appl. Data Sci. Artif. Intell. Technol. Glob. Challenges Dur. Pandemic Era, ICITISEE 2021*, pp. 288–293, 2021, doi: 10.1109/ICITISEE53823.2021.9655813.
- [7] I. Santiko, "Desain Dan Implementasi Semantik Pada Fitur Pencarian Di Aplikasi Perpustakaan Stmik Amikom Purwokerto," *Semin. Nas. Teknol. Informasi, Bisnis, dan Desain*, pp. 265–271, 2017.
- [8] R. E. Saputro and D. I. S. Saputra, "Pengembangan Media Pembelajaran Mengenal Organ Pencernaan Manusia Menggunakan Teknologi Augmented Reality," *J. Buana Inform.*, vol. 6, no. 2, pp. 153–162, 2015, doi: 10.24002/jbi.v6i2.404.
- [9] K. Sukarini and I. B. S. Manuaba, "Pengembangan Video Animasi Pembelajaran Daring Pada Mata Pelajaran IPA Kelas VI Sekolah Dasar," *J. Edutech Undiksha*, vol. 9, no. 1, pp. 48–56, 2021, doi: 10.23887/jeu.v9i1.32347.
- [10] K. S. Kartini and I. N. T. A. Putra, "Pengaruh Penggunaan Media Pembelajaran Interaktif Berbasis Android Terhadap Hasil Belajar Siswa," *J. Redoks J. Pendidik. Kim. Dan Ilmu Kim.*, vol. 3, no. 2, pp. 8–12, 2020, doi: 10.33627/re.v3i2.417.
- [11] M. Y. H Herlina, Y Yulmaini, S Karnila, "Pengembangan Aplikasi E-Tourism Berbasis Android Sebagai Strategi Promosi Pariwisata Provinsi Lampung," pp. 9–10, 2015.
- [12] M. J. Dondlinger, "Educational Video Game Design : A Review of the Literature," *J. Appl. Educ. Technol.*, vol. 4, no. 1, pp. 21–31, 2007.
- [13] B. Setyawan, Nf. Rufii, and A. N. Fatirul, "Augmented Reality Dalam Pembelajaran Ipa Bagi Siswa Sd," *Kwangsan J. Teknol. Pendidik.*, vol. 7, no. 1, pp. 78–90, 2019, doi: 10.31800/jtp.kw.v7n1.p78--90.
- [14] F. Z. Adami and C. Budihartanti, "Penerapan Teknologi Augmented Reality Pada Media Pembelajaran Sistem Pencernaan Berbasis Android," *Tek. Komput. AMIK BSI*, vol. 2, no. 1, pp. 122–131, 2016, [Online]. Available: <http://ejournal.bsi.ac.id/ejurnal/index.php/jtk/article/viewFile/370/279>
- [15] M. S. Murfi and K. Rukun, "Pengembangan Rancangan Media Pembelajaran Augmented Reality Perangkat Jaringan Komputer," *INVOTEKJ. Inov. Vokasional dan Teknol.*, vol. 20, no. 1, pp. 69–76, 2020, doi: 10.24036/invotek.v20i1.702.