UTILIZATION OF EDUCATIONAL GAMES FOR DISTANCE LEARNING IN MATHEMATICS CLASS VIII MIDDLE SCHOOL

Anisa Nur Kholifah, Siti Masitoh, Irena Yolanita Maureen
Universitas Negeri Surabaya, Indonesia
Email: anisa.21001@mhs.unesa.ac.id, sitimasitoh@unesa.ac.id. irenamaureen@unesa.ac.id

ABSTRACT

KEYWORDS

Learning Media,
Mathematics learning,
Educational Games

The development of information and communication technology has now touched various domains that are able to change conventional methods into modern ones. As an example of technological developments in student learning media which are now varied and creative, such as the application of learning through educational-themed games. The game contains content in the form of interesting and interactive learning materials with the aim of being able to increase student interest in learning and form a fun learning environment. This study used the research and development (R&D) method with the aim of implementing a design game with the theme of educating mathematics subjects at the VIII grade level of junior high school in the distance learning process. The results of the study, namely educational game learning media, met the validity criteria with an average proportion obtained from expert validators of 85.94% and included in the "very valid" category. Educational game learning media also meet the practical criteria with an average proportion of results obtained from filling out student response questionnaires of 87.5% and are included in the "very practical" category.

INTRODUCTION

Mathematics is an important science in life and is the mother of all sciences (Tseng, Chang, Lou, & Chen, 2013). Mathematics learning is a process of student interaction with educators who teach about the structure of knowledge where nature and theory are deductive based on elements of truth that can be defined or not defined using symbolic language from various ideas carefully, clearly and accurately (Pujiastuti et al, 2020). By solving math problems, students learn to use mathematical concepts. And it is for this reason that reasoning skills are what make mathematics so important to teach in schools (Zuin et al, 2018). Although not all subjects use the concepts of algebra or trigonometry, basically every problem requires reasoning skills to understand events and requires a pattern of critical thinking before making a decision on something (Solomon & Croft, 2015). Based on the explanation above, it can be understood that learning mathematics aims to equip students with logical, analytical, systematic, critical, and creative thinking skills.

The development of adult technology has now touched the realm of teaching and learning in mathematics with the emergence of creative and fun technology-based learning media. Learning media with the theme of educational games with content containing mathematical concept material is an effort to increase student interest and learning outcomes. This is in line with the opinion of Putri et al (2019) the increase in student learning outcomes is influenced by several factors, one of which is the use of

learning media. Learning media is an intermediary that can be used to convey information in the teaching and learning process so that it can stimulate students' attention and interest in learning (Junaidi, 2019; Susanti et al, 2021). Learning media plays an important role in helping teachers in the form of communication to explain or convey messages to students so that they can provide meaningful experiences in the learning process (Pakpahan et al, 2020). Educational-based games are expected to become a new medium in the teaching and learning process that is more interesting so that it can increase students' attention and interest in learning.

Learning media in the form of games must at least be able to package mathematical conceptual material to be more interesting, interactive and easy to understand. Because the basic part of learning mathematics is the ability to understand mathematical concepts. This is in line with the opinion of Zaslavsky (2019) learning must be focused on conceptual understanding to improve mathematical abilities in the classroom. In addition, conceptual understanding helps students avoid many critical errors in solving problems, especially errors from measurement. But in some cases, there are many teachers who only tell students to memorize formulas or concepts, which leads to rote learning methods (Pujiastuti et al., 2020). Such a teaching strategy would be counterproductive in cases where one learns by being confronted with new problems, applying examples to new situations where deep conceptual understanding is required to solve them. (Zaslavsky, 2019). So it can be understood that the ability to understand concepts is the ability to understand concepts, operations and relations in mathematics (Kilpatrick et al, 2001).

Understanding concepts has a lot of influence on students in learning something to be more efficient and effective because they can see deeper similarities between situations that are not superficially related (Mason, 2019). Thus, teaching habits to understand concepts must be cultivated early on in school (Simon, 2018). By the time students are in high school or even college, they will be used to understanding the logic behind mathematical concepts, which can result in the ability to apply these concepts to mathematics and real life problems (Shepherd & Sande, 2014).

The implementation of educational-based games is a brilliant innovation in creating a fun and memorable learning environment for students. The learning process emerged as an innovation in a fun learning design for students (Su, 2017). This enables game users to engage in daily activities and workflows with rewarding, enjoyable and unforgettable experiences (Soboleva, Galimova, & Maydangalieva, 2018). Users feel that they have achieved something and become addicted to their daily activities (Fan & Xiao, 2015). In the context of education, the power of games lies in their ability to motivate people, especially teenagers, to want to learn, keep learning, know what they remember, and want to learn more (Su & Hsaio, 2015). Game media will bring students to go beyond rote learning methods (Lin, 2017). Based on this explanation, this study aims to find the use of games as a medium for distance learning in class VIII students of junior high school.

METHOD RESEARCH

The type of research method used in this study is the research and development (R&D) method. According to Sugiyono (2017) the research and development research method is defined as a scientific way to research, design, produce and test the legitimacy of the products that have been produced. This study uses the ADDIE development model. According to I Made Tegeh, I Nyoman Jambel, and Ketut Pudjawan the ADDIE development model consists of five steps, namely analysis, design, development,

implementation, and evaluation (Salas-Rueda, Salas-Rueda, & Salas-Rueda, 2020; Widyastuti & Susana, 2019). This research was conducted at SMP Tunas Pembangunan Ciparay, Bandung Regency in the even semester of the 2020/2021 academic year.

Based on the development procedures carried out by researchers using the ADDIE development model, there are five steps, namely:

1. Analysis Stage

   In the analysis stage, the researcher analyzes the potentials and problems that exist in the research area, such as curriculum analysis, learning method analysis, and student analysis. This stage is carried out in the first month for 16 days.

2. Design Stage

   At the design stage, the researcher prepares the initial materials for the learning tools used, such as the preparation of instruments and the design of learning media. This stage is carried out for one month in the second month.

3. Development Stage

   The next stage in this research is the development stage with the following sequence of activities: Design Validation. This stage was carried out for 70 days.

4. Implementation Stage

   At the implementation stage, the first step taken by the researcher was a small-scale class trial by taking 1 class using learning media. Researchers will ask for responses by filling out a questionnaire after students can use the developed Android-based edutainment game learning media. Feedback from students will be used as a reference for improving the Android-based edutainment game learning media being developed. This stage was carried out for 4 weeks.

5. Evaluation Stage

   At the evaluation stage, the first step taken by the researcher was a class tryout by taking 2 class VIII students at SMP Tunas Pembanguna Ciparay. This stage was carried out for 2 weeks in the last month.

Learning Media Data Analysis

1. Analysis of Learning Media Validity

   Learning Media Validity Analysis is used to determine the validity level of the developed Android-based edutainment learning media. game. The formula used to process data from the validation results by the validator is as follows (Akbar, 2013):

$$AP = \frac{Actual\ Score}{Ideal\ Score} \times 100\% =$$

Information :

AP = Percentage Number

Actual Score = Score given by the validator or expert

Ideal Score = Maximum score the product of the number of items with the maximum score of each item.

In this study the development of learning media involved 3 validators (media experts, material experts, mathematics teachers), so to find out the overall percentage, the average formula was used as follows (Akbar, 2013).

$$AP = \frac{v1 + v2 + v3}{3} = \cdots \%$$

Information :

AP = Percentage Number

V1 = Validator Number 1
V2 = Validator Number 2
V3 = Validator Number 3

This validity test was carried out using a validity sheet made by the researcher and analyzed using validity criteria. To determine the validity level of the learning media developed, the validity criteria according to Akbar (2013) are used which are shown in table 1 below.

Table 1
Kriteria Validasi

Validation criteria	Validation Levels
85,01% –100,00%	Very valid, or usable without revision.
70,01% –85,00%	Fairly valid, or usable but needs a bit of revision.
50,01% –70,00%	Invalid, it is recommended not to use it because it needs major revisions.
01,00% –50,00%	Invalid, or may not be used.

2. Analysis of Learning Media Practices
   The practicality analysis of learning media is used to determine the practicality of edutainment game learning media developed through a student response questionnaire. The scale used on the student response questionnaire sheet is the Guttman scale with the checklist method (Ismail & AlBahri, 2019; Sandjaja & Purnamasari, 2017). The final results of the student response questionnaire scores will then be percentaged using the following formula (Akbar, 2013):

$$\text{NP} = \frac{TSEp}{Skor\ Ideal} \text{ x } 100\%$$

Information :
NP = Practice Value
TSEP = Total Empirical Practice Score
Ideal Score = Maximum Score Expectations.

To describe the results of the developed learning media practices, the practice criteria presented in table 2 below will be used:

Table 2
Practice Criteria

Criteria	Information
80,01% –100,00%	Very Practical, or can be used without revision.
60,01% –80,00%	Enough Practice, or can be used but needs a little revision.
40,01% –60,00%	Enough practice, or can be used but needs a little revision.
20,01% –40,00%	Not Practical, or may not be used.
00,00% –20,00%	Very Impractical, or should not be used.

RESULTS AND DISCUSSION

The research process begins with implementing the ADDIE development model which is divided into 5 stages namely, analysis stage, design stage, development stage. Implementation stage and evaluation stage. For more details will be described below:

1. **Analysis Stage**

   The analysis phase is the first stage which aims to determine the potential and problems needed in the development of learning media. The analysis carried out included an analysis of the curriculum, learning, students, and situations and conditions. The curriculum used at the time this research was carried out was the Merdeka Learning curriculum which was a form of evaluation of the previous curriculum, namely the 2013 Curriculum. This curriculum was officially launched by Medikbudristek Nadiem Makarim in February 2022.

   Learning analysis analysis is carried out to analyze indicators of achieving competence, namely teaching mathematical concepts. So that students are able to understand theories and concepts holistically and not just memorize formulas and concepts. Student analysis was carried out by conducting interview sessions with teachers and students through chat messages and observations by visiting the homes of several students. This stage shows that students still have difficulty understanding mathematical concepts, 80% of student learning outcomes are still in the form of memorization, students tend to be lazy in learning and are more busy with other activities that are more interesting to them.

2. **Design Stage**

   At the design stage, the preparation of instruments, the selection of learning media, and the initial design of learning media are carried out. The results of the design phase are as follows:

3. **Media Validation**

   Validation of Android-based educational game learning media that has been compiled based on 10 statements of media experts, 8 statements of material experts, and 20 statements of practitioners (teachers).

4. **Results of student questionnaire responses**

   Student response questionnaires consisting of 5 negative statements and 5 positive statements were used to assess several aspects including understanding, fun, enthusiasm, interest, activeness, and student attention in using Android-based educational game learning media.

5. **Learning Outcomes Test Question Sheet**

   The learning outcomes test sheet consists of 4 questions in the form of essay questions to measure the achievement of the success of learning activities using educational media based on android games.

6. **Math Educational Game Design**
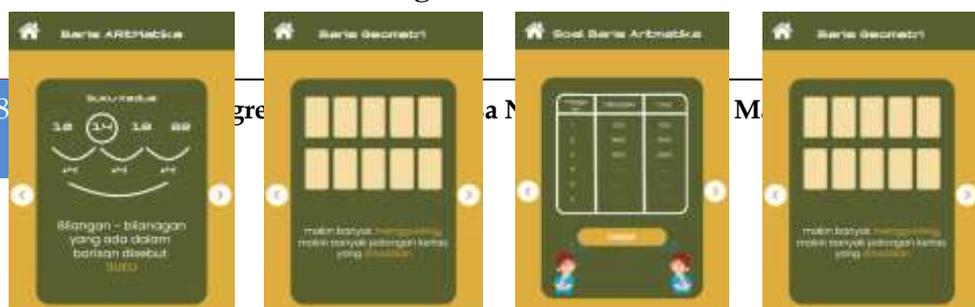
7. Tahap Pengembangan

At the development stage, design validation and phase I revision were carried out on the Android-based educational game learning media. In more detail the activities at this development stage are explained in table 3 as follows

Table 3
Learning Media Design Validation

Validation Results	Validators		
	V1	V2	V3
Actual Score	52	68	64
Ideal Score	66	72	72
Percentage Number	74, 61%	93,34%	89,87%
Percentage Combined Figures		85.94%	

Based on the validation criteria in table 1, the results of validating learning media designs with a percentage of 85.94% are included in the very valid category and can be used without revision.

8. Implementation Stage

At the implementation stage, it begins with conducting trials with small class scales, learning Android-based educational games. Small class trials were conducted at Ciparay Development Shoots involving one class VIII. To find out the practicality of learning media, students were asked to fill out a student response questionnaire through the Google form after the learning process using Android-based educational game learning media was complete. The results of the practicality analysis of learning media at the small class trial stage are presented in table 4 below

Table 4
Results of Learning Media Practicum Analysis

Respondents		

Results	R1	R2	R3	R4
Total Empirical Practice Score (TSEP)	9	10	12	11
Ideal Score	12	12	12	12
Percentage Number	75%	83,33%	100%	91,67%
Percentage Composite Number (Vp)	87.5%			

Based on the practice criteria in table 2, the results of learning media practices with a percentage of 87.5% are included in the very valid category and can be used without revision.

9. **Evaluation Stage**

At the evaluation stage, large class trials were carried out and data analysis was carried out on Android-based educational game learning media. Large-class trials were conducted at SMP Tunas Pembangunan Ciparay involving 2 class VIII students as research subjects. The results of the practical analysis of learning media are presented in table 4 below

Table 5
Results of Learning Media Analysis Practice

Total Empirical Practice Score (TSEP)	210
Ideal Score	240
Percentage Composite Number (Vp)	87,5%

The results of filling in the student response questionnaire in the large class trial based on table 4.8 show the number 87.50% so that it can be concluded that the developed Android-based educational game learning media meets practical criteria with a very practical category and can be used without revision.

CONCLUSION

Based on the results of the presentation of the research conducted in the use of Android-based educational game learning media, it can be concluded that the developed Android-based educational game learning media is feasible to be used as a distance learning media because it can help the process of learning mathematics. Android-based educational game learning media on material understanding mathematical concepts fulfills the validity criteria with an average percentage result obtained from expert validators of 85.94% and is included in the "very valid" category. Android-based educational game learning media on mathematical concept material meets the practical criteria with an average percentage of results obtained from filling out student response questionnaires of 87.5% and is included in the "very practical" category.

REFERENCES

Jonathan, S. (2006). *Metode Penelitian Kuantitatif dan Kualitatif*. Graha Ilmu.

Abi Hamid, M., Ramadhani, R., Masrul, M., Juliana, J., Safitri, M., Munsarif, M., ... & Simarmata, J. (2020). Media pembelajaran. Abi Hamid, M., Ramadhani,

R., Masrul, M., Juliana, J., Safitri, M., Munsarif, M., ... & Simarmata, J. (2020). Media pembelajaran. Yayasan Kita Menulis.

Aini, B. O., Ayu, K. C., & Siswati, S. (2019). Pengembangan Game Puzzle Sebagai EdugameBerbasis Android Untuk Meningkatkan Kemampuan Berpikir Matematika Siswa SD. JTAM | Jurnal Teori Dan Aplikasi Matematika, 3(1), 74.

Akbar, S. (2013). Instrumen Perangkat Pembelajaran. Bandung: PT Remaja Rosda Karya.

Cahyani, A., Listiana, I. D., & Larasati, S. P. D. (2020). Motivasi Belajar Siswa SMA pada Pembelajaran Daring di Masa Pandemi Covid-19. IQ (Ilmu Al-Qur'an): Jurnal Pendidikan Islam, 3(01), 123–140.

Chakraborty, U. K. (2008). Genetic And Evolutionary Computing. Information Sciences, 178(23), 4419–4420.

Fan, K., & Xiao, P. (2015). The Effects of Learning Styles and Meaningful Learning on the Learning Achievement of Gamification Health Education Curriculum. Eurasia Journal of Mathematics, Science & Technology Education, 11(59), 1211–1229.

Fu, Q.-K., & Hwang, G.-J. (2018). Trends in mobile technology-supported collaborative learning: A systematic review of journal publications from 2007 to 2016. Computers & Education, 119, 129–143.

Hafida, Lilih, Wilanika, Ludi, & Sapta. (2020). Penurunan Motivasi dan Keaktifan Belajar Siswa Selama Pembelajaran Daring Di Tengah Pendemi Covid-19. Indonesian Journal Of Education Science, 2(2).

Humienny, Z., & Berta, M. (2015). A Digital Application For Geometrical Tolerancing Concepts Understanding. Procedia CIRP, 27, 264–269.

Ismail, I., & AlBahri, F. P. (2019). Perancangan E-Kuisioner menggunakan CodeIgniter dan React-Js sebagai Tools Pendukung Penelitian. J-SAKTI (Jurnal Sains Komputer Dan Informatika), 3(2), 337.

Junaidi, J. (2019). Peran Media Pembelajaran Dalam Proses Belajar Mengajar. Diklat Review: Jurnal Manajemen Pendidikan Dan Pelatihan, 3(1), 45–56.

Kacetl, J., & Klímová, B. (2019). Use of Smartphone Applications in English Language Learning—A Challenge for Foreign Language Education. Education Sciences, 9(3), 179.

Laar, E. Van, Deursen, A. J. A. M. Van, Dijk, J. A. G. M. Van, & Haan, J. De. (2017). Computers In Human Behavior The Relation Between 21st-Century Skills and Digital Skills : A Systematic Literature review. Computers in Human Behavior, 72, 577–588.

Lee, C. (2017). Evaluating Game-Brand Congruity and Flow on Brand Personality by Using Gamifying Learning. Eurasia Journal of Mathematics, Science & Technology Education, 8223(7), 3083–3097.

Lin, H. S. (2017). Effects of Comparison and Game-Challenge on Sixth Graders' Algebra Variable Learning Achievement, Learning Attitude, and Meta-Cognitive Awareness. Eurasia Journal of Mathematics, Science & Technology Education, 8223(6), 2627–2644.

Lubis, A. H. (2018). ICT Integration In 21st-Century Indonesian English Language Teachingmyths and Realities. Cakrawala Pendidikan, 37(1), 11–21.

Mason, J. (2019). Relationships Between Proof and Examples: Comments Arising from The Papers In This Issue. Journal of Mathematical Behavior, 53(August 2017), 339–347.

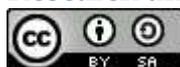Mcgrath, J., & Fischetti, J. (2019). What If Compulsory Schooling Was A 21st Century

Invention? Weak Signals From A Systematic Review of The Literature. International Journal of Educational Research, 95(April), 212–226.

Meredith D. Gall, Walter R. Borg, J. P. G. (2003). Educational Research: An Introduction (7th Edition) (p. 683). p. 683.

Mendikbud. (2020). Surat Edaran Mendikbud Nomor 4 Tahun 2020 | GTKDIKMENDIKSUS | 2020.

Pakpahan, A. F., Ardiana, D. P. Y., Mawati, A. T., Wagiu, E. B., Simarmata, J., Mansyur, M. Z., ... & Iskandar,A. (2020). Pengembangan media pembelajaran. Yayasan Kita Menulis.

Psycharis, S., & Kotzampasaki, E. (2019). The Impact Of A Stem Inquiry Game Learning Scenario On Computational Thinking And Computer Self-Confidence. Eurasia Journal of Mathematics, Science and Technology Education, 15(4).

Pujiastuti, H., & Fitriah, F. (2019). Design of Interactive Teaching Materials Based on A Scientific Approach To Support Junior High School Students' Learning: Line and Angles. Journal of Physics: Conference Series, 1157(3).

Zaslavsky, O. (2019). There Is More To Examples Than Meets The Eye: Thinking With and Through Mathematical Examples in Different Settings. Journal of Mathematical Behavior, 53(October 2017), 245–255.

Zuin, M., Rigatelli, G., Faggian, G., & Roncon, L. (2018). Mathematics and Thrombolysis: Role of The Mathematical Modelling in Understanding and Developing Blood Clot Fragmentation. European Journal of Internal Medicine, 54(June), e19–e20.