Mathematics Encyclopedia Media As Android Based Learning

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Abstract: This research aims to: (1) create a mathematics Encyclopedia product for junior high schools, and (2) Determine the feasibility of a mathematical encyclopedia. Android can be used for various functions, one of which is for learning media. However, there are still few androids that are used by users, especially junior high school students for learning media. The stages of the research carried out refer to the ADDIE development model covering Analysis, Design, Development, Implementation, and Evaluation. The stages of the research that have been carried out are the analysis phase (goal analysis, curriculum and material analysis, analysis of the ability level and characteristics of the target users). Design (design of the items to be presented, preparation of material, preparation of material delivery flow in the form of flowcharts, making media storyboards, and the collection of materials needed in media development). Development (media making), implementation (assessment by media experts, material experts, and field practitioners as well as conducting limited trials), and evaluations (evaluations of developed media, done during the previous four stages). The subjects involved 21 students of class VIII as respondents. Feasibility test results were obtained 95% for media experts, 90% for material experts, 80% for field practitioners, and 83% for target users.

Index Terms: Android, Learning Media, Mathematics Encyclopedia

1. INTRODUCTION

Education is the learning of knowledge, skills, and habits of a group of people who are transferred from one generation to the next through teaching, training, or research. Education plays an important role in improving the quality of human resources so that in education there are always interesting things that must still be studied and developed. One of the interesting things that can be developed by educators is learning media. As knowledge regarding human development and learning has grown at a rapid pace, the opportunity to shape more effective educational practices has also increased. Taking advantage of these advances, however, requires integrating insights across multiple fields from the mathematical and neurosciences to psychology, sociology, developmental and learning sciences and connecting them to the knowledge of successful approaches that are emerging in education [1] In this 21st century, the term “technology” is an important issue in many fields including education. This because technology has become the knowledge transfer highway in most countries. Technology integration nowadays has gone through innovations and transformed our societies that have totally changed the way people think, work and live [2]. As part of this schools and other educational institutions which are supposed to prepare students to live in “knowledge society” need to consider ICT integration in their curriculum [3].Mobile application development refers to the process of making application software for handheld devices such as mobile phones and personal digital assistants. Though the usage of mobile apps, the user is provided with various features that will enable him to fulfill all his needs and much more. Apps should be interactive to the users. Apps can bedownloaded from various platforms such as the Google Play Store and iOS App Store. There are free apps as well as paid apps. Some apps can be used for free for a specific amount of time before subscribing fora premium membership. For apps with a price, about 20%-30% goes to the distribution provider(Example-iTunes) and the rest to the producer of the app [4].The importance of forming attitudes for early childhood will be a provision in future lives, which will show itself as a person of character. Education has been considered as a center of excellence in preparing excellent human character [5]. Android-based math encyclopedia is a manifestation of the development of modern technology.Math encyclopedia is a mobile application that has a more practical size and can store more information so that the scope and depth of information presented are more complete than conventional encyclopedias [6].E-learning is the use of Internet technology to improve knowledge and performance. E-learning technology offers students control over the content, learning sequence, learning speed, time, and often media, enabling them to tailor their experiences to meet their personal learning goals. to manage access to e-learning materials, consensus on technical standardization, and methods for peer review of these resources. Innovations in e-learning technology lead to a revolution in education, enabling learning to be individual (adaptive learning), increasing student interaction with others (collaborative learning), and changing the teacher's role. The integration of e-learning into education can drive change towards the application of adult learning theory, where educators no longer function primarily as content distributors but will become more involved as learning facilitators and competency assessors [7].The increasing number of people who own and use mobile devices opens up opportunities for the use of mobile technology in the world of education. The use of mobile devices (mobile devices) in the learning process came to be known as mobile learning (m-learning) [8]. Mobile learning as learning that learners (learners) are not silent in one place or learning activities that occur when learners utilize mobile technology devices[9]. The presence of m-learning indeed will not be able to replace e-learning (electronic learning) which is normal, let alone replace learning with face-to-face in class. The presence of m-learning is intended as a complement to existing learning and provides opportunities for students to re-learn material that is not mastered anywhere and anytime. This certainly can provide a different experience in the learning process for students.

2 METHODOLOGY

The stages of the research carried out refer to the ADDIE development model developed by [10], covering Analysis, Design, Development, Implementation, and Evaluation. The stages of the research that have been carried out are the analysis phase (goal analysis, curriculum and material analysis, analysis of the ability level and characteristics of the target users). Design (design of the items to be presented, preparation of material, preparation of material delivery flow in

the form of flowcharts, making media storyboards, and the collection of materials needed in media development). Development (media making), implementation (assessment by media experts, material experts, and field practitioners as well as conducting limited trials), and evaluations (evaluations of developed media, done during the previous four stages).In this research development, the learning media validation was carried out in two stages. The first stage is validation for media experts and material experts. The second stage, namely validation to field practitioners and target users involving 2 education mathematics lecturers at IKIP Budi Utomo Malang and 21 students of Class 8 Junior High School Sri Wedari Malang. Data collected in the form of quantitative and qualitative data. Quantitative data were obtained from the results of the assessment and responses by expert validators, field practitioners, and target users.Meanwhile, qualitative data was obtained from criticisms, suggestions, and responses provided by the test subjects. Data collection instruments used in the form of a closed questionnaire and advice. The assessment aspects used to refer to the assessment aspects developed by [11] Meanwhile, data analysis techniques use percentage data analysis techniques. The formula used is

$$P = \sum x / n \times 100\%, NA = \sum P / n \quad (1)$$

To determine the level of validity of the learning media developed, criteria for qualification assessment based on [12] will be used as shown in table 1.

Tabel 1 Validity Valid category

Persentase(%)	Validity Level	Category
76-100	Valid	Feasible/no revision needed
50-75	Ouite Valid	Quite feasible/partial revision
26-50	Less Valid	Less feasible/partial revision
<26	Invalid	Infeasible/total revison

3 RESULTS AND DISCUSSION

The results in this study are (a) a mathematical encyclopedia software has been developed; (b) The mathematical encyclopedia results of this study have been validated by experts to determine validity and eligibility. The results of research tests show that this mathematical encyclopedia has fulfilled valid categories based on expert validation assessments, namely mathematicians and computational experts. Whereas based on the field test the assessment results obtained from teachers and students on the developed mathematical encyclopedia that reached practical and effective criteria. Based on the validity criteria, practicality and effectiveness of the developed media are met, and a final product is obtained in the form of a mathematical encyclopedia.Learning media developed in the form of an Android application based on Adobe AIR (Adobe Integrated Runtime) that can be run on Android-based mobile devices. So the developed learning media can be run anytime and anywhere. This learning media is included in the category of learning media based on mobile learning. This is in accordance with the definition of mobile learning stated by [9], namely learning that learners (learners) do not remain silent in one place or learning activities that occur when learners utilize mobile technology devices.The trial results show that many 8th grade students are interested in this application because it is very easy to open. They are already dependent on android so they feel it is appropriate as a medium for learning at home and anywhere.

Figure 1. *Cover and front page of Mathematics Encyclopedia*

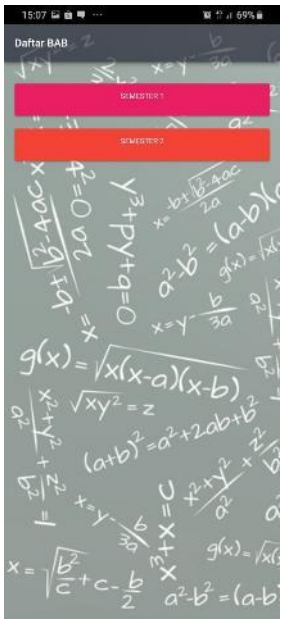

Figure 2. *Choice of material in semester 1 & 2 in the Mathematics Encyclopedia*

In this application, there are several main menus, encyclopedia cover, choice of material in Semester 1 and semester 2, material for each semester in accordance with student books. The "Cover" menu contains the title of the encyclopedia as well as the author. On the "semester options" menu contains the semester options to be selected according to student needs. In the "Material" menu, users can access all the desired material that contains several terms related to the material presented. This is in accordance with the opinion of [13] about several criteria that make mobile learning effective.

***Figure 3**. material chapter in semester 1 in the Mathematics Encyclopedia*

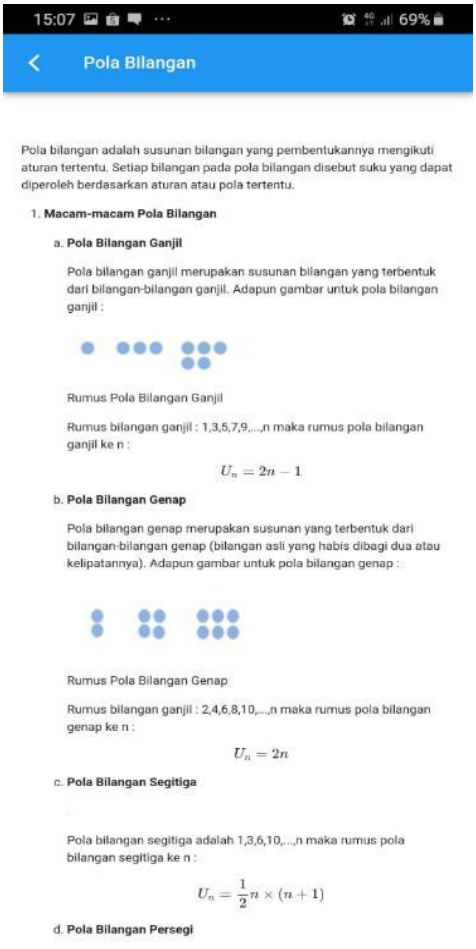

***Figure 4** material sub-chapter in semester 1*

***Figure 5.** Material chapter in semester 2 in the Mathematics Encyclopedia*

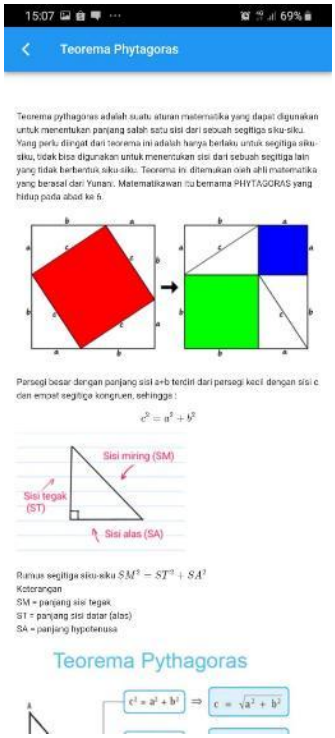

***Figure 6** material sub-chapter in semester 2*

Based on the results of trials that have been carried out, the results obtained are the application of a mathematics encyclopedia learning media that is developed to get a decent value for use. This is in accordance with the criteria of quality learning media based on the criteria put forward by [11].

***Table 2.**Comments and Suggestions by Validator Media Expert and Material Expert*

Expert	Comments and Suggestions
Media Expert	Given the back button
Material Expert	Added sample problems

Feasibility test results were obtained 95% for media experts, 90% for material experts, 80% for field practitioners, and 83% for target users. Therefore, the mathematics encyclopedia application developed is suitable for use as a learning media.

Learning media developed have several advantages and disadvantages. Excellence learning media developed, which can be operated on devices based on Android and Windows; presenting all material interestingly and easily understood; presents a clear definition to help students understand the material. In addition to the advantages mentioned earlier, the learning media developed also have weaknesses. The weaknesses of the learning media developed include that it cannot be operated on mobile devices with operating systems other than Android.

Table 3 *Comments and Suggestions by Practitioner Expert*

Expert	Comments and Suggestions
Practitioner	For evaluation, it would be better if there are more examples of problems

Table 4 *Comments and Suggestions by Users (students)*

No	Subject	Comments and Suggestions
1	A	Recommend adding a funny animation
2	B	Added a funny animation.
3	C	Very helpful for defining material
4	D	Learning to use the Android application is very effective used and interesting

Applications developed in this study cannot be run on all types of mobile devices because this application can only be run on Android-based mobile devices. Therefore, it is expected to develop similar applications that can be run on devices with different operating systems and on different materials. With the development of learning applications on mobile devices, it is expected to increase the benefits of mobile devices in the field of education and provide student motivation. In addition, the existence of applications like this can provide an interesting and new learning experience for students.

4 CONCLUSION

The product developed is a mathematical encyclopedia in the form of an Android application. Which can also be operated on a computer or laptop with a Windows operating system. The application installer is packaged in the form of a compact disc (CD). This application presents two sub-topics of material in each semester. In semester 1 there is material: Number Patterns, Cartesian Coordinate Systems, Relationships and Functions, Straight Line Equations, Linear Equations of Two Variables. While in semester 2 there is material: the Pythagorean Theorem, Circles, Building Flat Side Space, Statistics, and Opportunities.In this application, there are several main menus, encyclopedia cover, choice of material in Semester 1 and semester 2, material for each semester in accordance with student books. The "Cover" menu contains the title of the encyclopedia as well as the author. On the "semester options" menu contains the semester options to be selected according to student needs. In the "Material" menu, users can access all the desired material that contains several terms related to the material presented.Feasibility test results were obtained 95% for media experts, 90% for material experts, 80% for field practitioners, and 83% for target users. Therefore, the mathematical encyclopedia application developed is suitable for use as a learning medium. Learning media developed have several advantages and disadvantages. Excellence learning media developed, which can be operated on devices based on Android and Windows; presenting all material interestingly and easily understood; presents a clear definition to help students understand the material. In addition to the advantages mentioned earlier, the learning media developed also have weaknesses. The weaknesses of the learning media developed include that it cannot be operated on mobile devices with operating systems other than Android

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REFERENCES

[1] L. Darling Hammond, “Implications for educational practice of the science of learning and development,” Appl. Dev. Sci., 2019.

[2] M. Grabe, Integrating Technology for Meaningful Learning, vol. 2, no. 3. USA: Southwest Missouri State University, Springfield, MO, USA, 2007.

[3] & A. S. Ghavifekr, S., Afshari, M., “Management strategies for E-Learning system as the core component of systemic change: A qualitative analysis,” Life Sci. J., vol. 9, no. 3, pp. 2190–2196, 2012.

[4] K. Baktha, “Mobile Application Development : All the Steps and Guidelines for Successful Creation of Mobile App : Case Study,” Int. J. Comput. Sci. Mob. Comput., vol. 6, no. 9, pp. 15–20, 2017.

[5] M. S. A. Rokhman F, “Character Education for Golden Generation 2045 (National Character Building for Indonesian Golden Years)No Title,” Procedia - Soc. Behav. Sci., vol. 141, pp. 1161–1165, 2014.

[6] N. I. Hidayanti, Perancangan Dan Pembuatan Ensiklopedia Matematika Digital Dalam Komunitas Dan Pembelajaran Matematika. 2014, pp. 1–3.

[7] O. O. Jethro, A. M. Grace, and A. K. Thomas, “E-Learning and Its Effects on Teaching and Learning in a Global Age,” vol. 2, no. 1, pp. 203–210, 2012.

[8] D. Georgiev,Tsvetozar, “M-Learning – a New Stage of E-Learning,” in International Conference on Computer Systems and Technologies, 2004.

[9] C. O’Malley, “Guidelines For Learning/Teaching/Tutoring in a Mobile Environtment,” 2013.

[10] W. dan L. C. Dick, The Systematic Design of Instruction. USA: Scott, Foresman and Company, 1978.

[11] A. A. Elissavet, Georgiadou and Economides, “Evaluation Factors of Educational Software,” in Proceedings International Workshop on Advanced Learning Technologies (IWALT), 2000, pp. 113–120.

[12] S. Arikunto, Prosedur Penelitian Suatu Pendekatan Praktik. Jakarta: Rinerka Cipta, 2013.

[13] S. S. Terrell, Effective Mobile Learning, 50 + Quick Tips & Resources. 2011.