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Developing Android-Based Mathematics Learning Media for Package C Equivalence Education at the Faradika Community Learning Center in East Jakarta

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ABSTRACT: The rapid development of Science and Technology has greatly influenced various aspects of the nation's life, including the field of Education. Relevant to the emergence of the fourth industrial revolution era, this research focuses on the utilization of mathematics learning applications in the Package C equivalent education based on Android at the Faradika Community Learning Center (PKBM) in East Jakarta. The advent of virtual reality technology has been able to create simulated classroom environments and conduct virtual learning based on Android. The aim of this research is to describe the process of Android-based virtual reality as a means of developing mathematics learning in the Package C Program. The research method is qualitative. Data collection techniques include interviews, reflective journals, observations, and document analysis. The output of this research is the model application and publication of articles in reputable national and international journals. The results of the research show the creation of Android-based equivalent education learning media in mathematics, which contains information about learning objectives, material presentation, assignments, and feedback provided by tutors and media developed with an Android basis that has been able to support the mathematics learning process optimally. The development of Android-based media consists of five stages: analysis, development, design, implementation, and evaluation. The evaluation technique is formative with expert review and field testing. Summative evaluation includes pre-experiment one-group pre-test and post-test. The conclusion of the research is that the results of the media development are able to support the learning process optimally, so that the learning process runs smoothly, and learners are also active, enthusiastic, and passionate about participating in the learning process.

KEYWORDS: Include at least 5 to 6 keywords or phrases

I. INTRODUCTION

The rapid advancement of digital technology has disrupted every aspect of life. Findings from digital technology experts from various international research institutions, such as We Are Social, Hootsuite, Google, Gartner, and CORE Education. Wahyudin, Purnomo, and Yondri (2019) indicate that recently, global digital indicators have shown a significant upward trend. According to the Digital 2020 report cited by We Are Social and Hootsuite, Bagus Ramadhani mentioned that the number of internet users worldwide has reached 4.5 billion people.

In Indonesia, internet usage has also experienced significant growth. The number of internet users continues to increase from year to year. According to a survey by the Association of Indonesian Internet Service Providers (APJII) until the second quarter of 2020, the number of internet users in Indonesia reached 196.7 million people or 73.7 percent of the total population of Indonesia, which is 266.9 million based on BPS data. Various advancements in the field of Science and Technology have influenced other aspects of life, including education. Education is a systematic process to enhance human dignity holistically. Non-formal Education (PNF) or Community Education is one of the education pathways in the national education system aimed at meeting the learning needs of the community that cannot be reached and fulfilled by formal education pathways.

Non-formal education units include course institutions, training institutions, study groups, community learning centers, study groups, and similar educational units (Sisdiknas, 2003:3). The Community Learning Center (PKBM) is a forum for various community learning activities aimed at empowering potential to drive development in social, economic, and cultural fields. PKBM is formed by the community, owned by the community, and managed by the community to expand the provision of learning needs for the community (BPKB Jayagiri, 2003:3).

The issue is whether educators in these non-formal education units already have knowledge and skills about Android. According to preliminary research at the Faradika Community Learning Center, data shows that 18 people (90%) of learners at the Faradika Community Learning Center stated that they did not know about Android-based learning. 17 people (85%) of mothers-

learners do not engage in self-learning. Digital technology in education provides an overview of the preparation of educational facilities, in the process of research implementation, development, organization, and use of learning resources.

The research team is interested in researching with the title "Development of Android-Based Package C Equivalency Education Learning Model, especially in the subject of mathematics." Specifically, this research is expected to become an innovation for learning steps through a healthy communication system and learning strategies in the virtual, digital, online, mobile, and distance learning systems in the form of Android-based Mobile learning, in Package C equivalency education at PKBMFaradika East Jakarta

II. METHODOLOGY

The word "media" originates from the Latin word "medius," which literally means middle, intermediary, or conduit (Azhar Arsyad, 2006:3). According to Suranto (2005:18), media is a means used to convey messages from a communicator to a recipient. Meanwhile, according to Sutirman (2013:15), media is a component of learning resources or physical facilities containing instructional materials in the student environment that can stimulate students to learn.

With the rapid advancement of technology, learning media has also evolved, inseparable from technological progress. Through technological advancements, learning at the educational unit level, including at PKBM, has undergone significant changes. This condition occurs massively and globally. Reports from global research studies such as those from Finland, England, Germany, New York, and Japan (Inventure Knowledge, Yuswohadi, et al., 2020) state that the learning system will become a rapidly evolving system, forming a global digital learning community. This condition also gives rise to the Ministry of Education's policy, participation, and innovation in online digital learning (Scherer and Teo, 2019), which becomes a new force in the education revolution in the era of "New Normal Education Practices."

The media used in the learning process can be divided into several types. According to Arief S. Sadiman, et al. (1996:28), the types of media commonly used in teaching and learning activities are: 1) Graphic media, which includes visual media used to convey messages from a source to a message receiver. The channel used involves the sense of sight. Messages to be conveyed are expressed in visual communication symbols. Some types of graphic media include: pictures/photos, sketches, diagrams, charts, graphs, cartoons, posters, maps, globes, flannel boards, and bulletin boards. 2) Audio media, which is related to the sense of hearing. Messages to be conveyed are expressed in auditory symbols, both verbal and non-verbal.

There are several types of audio media, including: radio, magnetic tape recorder, vinyl records, and laboratories. 3) Static projection media, which is similar to graphic media in presenting visual stimuli. Some types of static projection media include: frame films, sequential films, overhead projectors, and opaque projectors.

Based on the opinions above, it can be concluded that learning media is divided into two types: electronic learning media and non-electronic learning media. The definition of Android according to Sugeng Purwantoro, Heni Rahmawati, and Achmad Tharmizi (2013:177) states, "Android is a software used on mobile devices, including operating systems, middleware, and core applications." Android, according to Satyaputra and Aritonang (2014:2), is an operating system for smartphones and tablets. The operating system can be illustrated as a bridge between the device and its usage, allowing users to interact with their devices and run applications available on the device.

The application of the mobile learning equivalence education model based on Android allows learners to learn without limits of place and time. Durotul Yatimah (2020) in her research titled "Building Digital Literacy Culture in Millennial Generations in DKI Jakarta" concludes that: the role of online digital learning innovation such as Android-based mobile learning is a new force in the education revolution in the era of the New Normal. Durotul Yatimah (2019) in her research titled "Public Awareness of Digital Literacy Culture in East Jakarta" also concludes that the community realizes that technology-based digital learning, in the form of Android-based mobile learning, can increase learning motivation, allowing learners to experience real and enjoyable learning experiences, without limits of time and place. Android-based mobile learning media facilitates learners in interpreting the material they are learning. This research aims to produce an Android-based mobile learning model application for mathematics education in equivalence education at PKBM, enabling learning processes without limits of place and time. The research results will be published in accredited national and international journals.

Based on the above description, this research will discuss the "Development of Package C Equivalence Education Learning Model Based on Android, especially in the subject of mathematics." Specifically, this research is expected to be an innovation for learning steps through a healthy communication system and learning strategies in the virtual, digital, online, mobile, and distance learning systems in the form of Android-based mobile learning, in Package C equivalence education at PKBM Fatadika East Jakarta.

The characteristics of this research are focused on gaining a deep understanding of the research context. Therefore, the appropriate paradigm is the Interpretivism paradigm, which focuses on understanding the natural conditions of the research and the research subjects. In this paradigm, the reality being studied is constructed based on the facts of social phenomena. The research methodology is qualitative. Each stage of the research is interpreted to understand the phenomena in the field.

Researchers observe and interview tutors and learners about the implementation of the Mobile Learning (Android)-based learning model. Researchers also observe through the instrument of developing 21st-century skills. The quality standards or assessment of data validity in this research are trustworthiness and crystallization. This is done through credibility (via member checking), transferability (via thick description), dependability (via emergence), and confirmability (via data audit trail), and crystallization, so that researchers can analyze the same situation from different perspectives both from the educator's and learners' sides.

Research procedures according to Mega Sholihah (http://mega sholihah 33 blogsport.com (2019) are conducted as follows: (1) Analysis of learning needs (2) Literature review on Android-based learning (3) Classroom observation at PKBM (4) Development and validation of the Android-based Equivalent Education Learning model (5) Implementation of the initial PKBM Android-based learning model (6) Data collection, data analysis including: 1. Profile of 21st-century learning model development 2. Android-based PKBM learning application 3. Proceeding Conference Draft National and International Journals. Roger Kaufman et.al. in Needs Assessment A User's Guide. (1993,4) states that needs analysis is a process carried out to identify gaps between actual results and expected results. The most crucial gap is considered a priority to be re-examined to find the actual conditions and emerging needs so that the most appropriate way or solution to address the gap and meet the emerging needs can be identified. Needs analysis conducted to analyze gaps, identify needs, and determine appropriate solutions is a complex process. This is reinforced by Allison Rossett (1992, 97) in the Handbook of Human Performance Technology: A Comprehensive Guide fo Analyzing and Solving Performance Problems in Organizations, which states that in analysis, one identifies opportunities, discovers and describes problems, asks questions, builds hypotheses, reduces possibilities, describes relationships between parts and elements, separates facts from fiction, and provides assessments and recommendations. Thus, it is evident that needs analysis is a complex matter. The goal to be achieved through needs analysis is not only to discover the gaps but also, more than that, to identify the causes of the gaps to understand the root of the problem, so that the actual needs can be identified.

In detail, the research stages according to Mega Sholihah (http://mega sholihah 33 blogsport.com (2019) are conducted as follows:

1. Needs Analysis Stage: Analysis of data from literature studies is conducted through observations at PKBM Faradika East Jakarta with interviews with tutor cadres. The results of this analysis serve as a reference for the development of Android-based media.
2. Design Stage: Developing material designs according to the needs of respondents, which is mathematics learning through Android applications, Designing materials, Determining the infrastructure for media development such as laptops, internet access, Flip to PDF Corporate software, and Canva applications, Developing assessment instruments for media feasibility, and Preparing post-tests and pre-tests for users.
3. Development Stage: Pre-Production Stage: This is the stage before media development. Researchers develop the Flip To PDF Corporate software installation, prepare material in digital booklet media integrated into Microsoft Word, and Production Stage: This is the initial stage before media development. Developers produce by accessing the Canva website, selecting theme templates suitable for the presented material

III.RESULT

Research results indicate that the main outcome of media development is the enthusiasm of learners to use the media. This is evidence that this Android-based learning media can attract the interest and motivation of learners. This can be seen in the table below:

Table 1. Student Changes

Cognitive		***Affective***		***Behavior***	
Before	After	Before	After	Before	After
Using Antic learning media, the average score is 57.27	Using Antic learning media, the average score is 75.00	Using the Antic media, data was obtained indicating low affective levels of students, dischonestly (cheating), lack of creativity in seeking solutions, and lack of	Using the Antic media, data was obtained . showing an increase in the affective levels of students, such as, more honestly (speech consistent with	Using android media: . During class discussions, students do not paya attention to the teacher, but each is busy, chatting, listening to music, or even	Using android media: . Student are enthusiastic about using this learning media because it is an application that can be installed on android devices. With

	independence	actions), more creativity (able to find solutions to problems), and more independence (able to adapt to the PKBM).	using social media, despite the teacher is warnings, but the behavior repeats, such as tiredness from working overnight. . Student cannot solve problems different from the examples given by the teacher . Some students sometimes fall asleep during the teacher is explanation of the material, despite being warned, but they always have reasons. . Student have not understood the lesson material, even though it has been explained . Some student cheat and do not believe in their own ability . Students do not care about their grades, even though they have been warned	this, student can be use android device for learning. . With the presence of evaluation questions along with explanations, students are trained to work on various problem and they continue to practice repeatedly until they achieve perfect scores . Student are not bored and do not fall asleeo during teacher explanations . Students are interested in learning because the media is in the form of an application that is considered trendly . Student no longer cheat and can understand the mathematics learning material . Student start to care about their grades and repeatedly practice until they achieve perfect scores to be recorded their grade book

Table 1 explains the increase in cognitive, affective, and behavioral scores of learners after using the Android media. Although the increase is not significant, continuous improvement, combined with habituation and exemplary behavior from educators, will train affective aspects through Android-based learning media (Android Screencast O Matic). There are several challenges in the process of developing this Android media:

a. It requires a sufficient internet connection to run the application.
b. During the learning process, some learners at PKBM Faradika do not have Android devices or advanced smartphones.

The solution to these challenges is that learners must have sufficient internet quotas to access the application. If they do not have internet quotas, a system of sharing internet quotas among learners is implemented. The development of Android media in this research was carried out through the following stages:

1. Needs Analysis Stage, conducted through observation and interviews with tutor cadres. The analysis results will serve as a reference for the development of Android-based media. Data revealed that learning was often boring for learners. As many as 18 individuals (90%) of the learners stated that they were not familiar with Android-based learning. Seventeen individuals (85%) of the learners' mothers did not engage in independent learning. This needs analysis is crucial to identify the gap between actual and expected outcomes. This is in line with the opinion of Roger Kaufman et al. in Needs Assessment A User's Guide (New Jersey: Educational Technology Publications, Inc, 1993), p. 4, which states that needs analysis is a process to identify the gap between actual and expected outcomes. The most crucial gaps are given priority for reevaluation to identify actual conditions and emerging needs, allowing the most appropriate solutions to address gaps and meet emerging needs to be identified.
2. Design Stage involves designing materials according to respondents' needs, determining the facilities and infrastructure for media development such as laptops, internet, etc., compiling media feasibility assessment instruments, and preparing post-tests and pre-tests for users.
3. Development Stage includes:

- Pre-Production Stage involves media development.
- Production Stage involves media development by accessing the Canva website, selecting theme templates according to the presented material. Then, the editing process involves inserting prepared material followed by animations and relevant images. The development process of Android media aligns with the concept proposed by Mega Sholihah (http://megasholihah33.blogspot.com, 2019). Thus, the production process begins by accessing the Canva website, selecting theme templates suitable for the material presented. After selecting the template, the editing process involves inserting prepared material followed by animations and images relevant to the material. Then, it is saved in PDF format. Subsequently, videos are inserted using Flip To PDF Corporate software. Clicking on a new project with HTML 5 and inserting the PDF file from Canva, then setting the link and barcode from Flip To PDF Corporate software to access the digital booklet online.
- Post-Production Stage involves checking the digital booklet media to ensure there are no deficiencies/errors in the material, text placement, image placement, or appearance of images in the digital booklet media. If errors are found, they are corrected immediately and checked again to ensure there are no further errors. Developers also evaluate the media testers, consisting of media and subject matter experts. The digital booklet media must be validated for assessment by media and subject matter experts, then revised based on feedback and comments from media and subject matter experts until the media is deemed suitable for use

IV. CONCLUSIONS

Based on the research and development of Android-based learning media, it can be concluded that the Android-based mathematics learning media for equivalent education Package C at PKBM Faradika East Jakarta contains information about learning objectives, material presentation, assignments, and feedback from tutors. The development of this media supports the learning process optimally, so that the learning process runs smoothly, students are also active, enthusiastic, and eager to participate in the learning process.

In the development of Android-based media, there are five stages: needs analysis and literature review, development, design, implementation, and evaluation. The evaluation technique for this research includes formative evaluation as well as summative evaluation.

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