Development of Android-based Learning Applications in Mathematic Learning at Madrasah Ibtidaiyah Jayapura City

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Abstrak: *This research was conducted to produce an educational game-based learning media in Mathematics at Madrasah Ibtidaiyah Jayapura City. This research is a Research and Development (R&D) method with a total sample of 10 students of grade V Madrasah Ibtidaiyah Kota Jayapura and a questionnaire data collection tool, analyzed descriptively to see the quality of the products created. The research results show that the Mathplay application learning media for Mathematics, which was developed and obtained an ideal percentage of 94.57% with a very good grade category and is very helpful based on the results of data acquisition, this Mathplay application media is in line with the cognitive development of elementary school-aged children and is suitable for use as a learning resource for grade V Madrasah Ibtidaiyah Jayapura City. Based on the data acquisition results, it shows that the Mathplay Application learning media is in accordance with the cognitive development of elementary school-aged children and is suitable for use as a student learning resource.*

Keywords*: Learning Applications, Android, Mathematics Learning*

INTRODUCTION

In the 4.0 era, special and effective educational activities are needed, so that technology can be an alternative to improve learning activities. According to the International Telecommunication Union (ITU), Indonesia's level of technological development ranks 108th out of 167 countries in the ICT Development Index (IDI). Based on research conducted by the Ministry of Communication and Informatics of the Republic of Indonesia in 2017, Papua and Maluku have around 9.5% technology users, with 4.13% having computers, 11.50% having laptops, and 27.68% having smartphones. According to Kominfo research in 2018, technology was used for e-learning by 2.8% and games by 24.5%. Based on these data, it is necessary to develop a unique educational approach in Jayapura City as a preventive measure against inappropriate use of technology. (Mukti, 2022).

Technology is developing very rapidly, resulting in institutions in the field of education needing developments in teaching and learning activities (Gunawan & Amaludin, 2021; Maritsa dkk., 2021; Ma'ruufah dkk., 2021; Millati, 2021; Salsabila dkk., 2021; Santosa, 2021). Innovation is the existence of advanced quality education. So that, teaching and learning activities are expected to lead to a technology base in each educational unit (Ahmad, 2022; Othman, 2022; Sadikin, 2021; Yedithia dkk., 2022). Educational game-based learning media is a learning approach suitable for students because students prefer playing games to learning (Agbo, 2021; Gounaridou, 2021; Hsiao, 2021; Kara, 2021; Mulhem, 2021) Based on the data

above, the development of educational game-based learning media is very important, especially in Madrasah Ibtidaiyah Jayapura City.

Jayapura City Elementary School is an elementary school in Jayapura City. Madrasah Ibtidaiyah Kota Jayapura, in its learning system, still uses conservative learning media. This makes students feel bored in the learning process (Mukti, 2022). This problem aligns with some researchers who state that learning that is carried out using conservative media, such as media images, will make students not develop their ideas because they cannot interact with the media they observe.

Based on the explanation above, an increase in learning innovation is needed because Madrasah Ibtidaiyah students are elementary school-age children who like unique and up-to-date things in their development process (Fonseca, 2021; Kim, 2021; Krouska, 2022; Lampropoulos, 2022; Martín-Sómer, 2021; Poulain, 2021; Tyerman, 2021; Udeozor, 2021). Therefore, it is necessary to have learning media that can be used as an alternative to help achieve learning objectives. Therefore, this research will develop technology in educational game-based learning media, a practical alternative to increasing the understanding of Mathematics in Madrasah Ibtidaiyah. Learning media development is designed in an interesting way, with the hope that students will have a high sense of interest in learning so that learning is not boring and, of course, the learning objectives are achieved. Through the development of educational game-based learning media, it is designed so that students can learn while playing. Based on these data, this research is important, and the research that will be planned is "Development of Android-Based Learning Applications in Mathematics Learning at Madrasah Ibtidaiyah Jayapura City."

METHODS

This research is in the form of Research and Development (R&D), aimed at producing a learning application based on an application or refining an existing one, followed by testing the feasibility of a method (Trianto, 2013). In this research, we developed an Android-based learning application in Madrasah Ibtidaiyah Kota Jayapura. The development model used in this study is procedural, employing descriptive procedures and adhering to established syntax, resulting in a viable product or learning method suitable for use in the learning process (Tim Puslitjaknov, 2008). The development used in this research follows the 4-D model (Define, Design, Develop, and Disseminate)(Trianto, 2013), However, this stage is limited only until the Development phase in the limited trial.

RESULT AND DISCUSSION

The discussion results in this study are in the form of learning media that can be used via Android cell phones and laptops. This learning media is designed so that students can study independently at home. Media development in this application called Mathplay is presented in several menu options, including materials, quizzes, questions, and developers. All of these menus have different uses aimed at facilitating students in independent learning. Making this application is adapted to cognitive theory according to Jean Piaget, Jerome

Bruner, and Lev Vygotsky, who argue that media can be implemented by paying attention to students' thought processes and providing learning materials appropriate to their cognitive development stage. Apps can also present information that makes it easier to understand, such as visualizations or interactive simulations to help students understand complex math concepts (Amahorseya & Mardliyah, 2023; Ardiati, 2021; Handika dkk., 2022; Mifroh, 2020; Whildan, 2021).

The menu contains material about mathematics regarding the reproduction of plants and animals. In addition to material about Mathematics in this material, the author also inserts several menus of material related to Papua, such as special foods, customs, traditional dances, special animals, traditional houses, and so on. Then the Quiz menu contains Math practice questions about the reproduction of plants and animals as a learning companion, working on quizzes, and a medium for strengthening knowledge. Next, there is a developer menu containing information about developers or researchers. The menu used is simple because it is easier to use.

The procedure for developing learning media for the Mathplay application uses the 4P model, which consists of defining, designing, developing, and deploying. Due to time and ability limitations, the developer needed to disseminate. The procedure for developing learning media is carried out as follows.

1. Defining Stage

This Stage consists of the preliminary-final analysis stage, student character analysis, curriculum analysis, and material analysis. The preliminary analysis aims to identify the fundamental problems that cause the need to develop learning tools. The basic problem that needs to be solved is the limitations of learning media for plant and animal breeding. The next stage is an analysis of student characteristics to determine students' cognitive development level.

At this stage of cognitive development, elementary school-age children can think logically, understand conversational concepts, remember, understand, and solve concrete problems and think more dynamically. This is in line with Jean Piaget's cognitive theory. According to his research, the stages of individual intellectual development and changes in age greatly affect an individual's ability to observe science. The analysis phase of student characteristics provides information that can be used to prepare the subject matter. Curriculum analysis is carried out to provide subject matter to be developed in learning media because maybe not all subject matter is suitable to be developed with application media. Material analysis is carried out so that the material presented in this research is in accordance with applicable regulations and can be viewed systematically..

2. Stage Design

The stage design involves planning the Mathplay application prototype, which includes 2D image design. The design aims to build an application with the following criteria: easy to operate with hands, attractive and simple design, and sustainable and relevant usage. The design takes into account the characteristics of device usage. The required tools for design are PowerPoint and Adobe Illustrator 2022.

    a. Hardware requirements meet in building the system

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   1) Asus A455LA-WX667D laptop
   2) 4GB RAM capacity
   3) iSpring Suite 9
   4) Microsoft Office 2016 Windows version

b. Software requirements meet in building the system
   1) Smartphone with minimum Android 4.1 jelly bean
   2) Operatin System Windows Pro 10 Ultimate 64 bit

After the planning is done, the 2D design uses Adobe Illustrator 2022, where the files that have been designed are then exported to PNG and then copied to PowerPoint. After the preparation is done, the design is as follows.

a. Design build application

This stage is the stage where the Mathplay application is created. This stage is also what determines the Android-based Mathplay application builder because the design process, the determination of building the Mathplay application, is carried out at this stage so that the system built is Android-based.

1) Interface Design

The first display when the media is run is a splash screen which functions to sound the loading run so that users do not feel bored waiting. The main display of the learning media of the Mathplay application provides information about its use and is intended as user information applying the Mathplay application. The initial appearance is also adjusted to Papuan culture to adapt to the local culture. The word Mathplay comes from the word Technology Bili Yafenak, a combination of the Papuan language and means Light of Technology Knowledge. Here's what the Splash Screen looks like in Figure 1.

Figure 1. Splash screen *display*

The main display of the learning media of the Mathplay application provides information about its use and is intended for users who will use it. In operating the Mathplay application, the display is also adjusted for elementary school-age children.

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2) Menu Design

In the second stage, the Mathplay menu display contains a material, game, animation, developer, and bibliography menu. The menu displayed is comprehensive for students to run this Mathplay application. The following menu display in the Mathplay application can be seen in Figure 2.

Figure 2. Mathplay Menu

Figure 3. Game Display

The Matchplay application menu in Figure 2 consists of a material menu containing Mathematics material that students can easily access. The animation menu contains learning materials that are packaged using stories adapted to the Mathematics material to be discussed so that students can understand and interact with the application on this menu. The educational game menu contains questions to test the extent to which students knowledge of Mathematics material, as well as this educational game menu as a companion to the material and as an enhancer of learning information. The developer menu contains information related to developers or researchers. Then the bibliography menu is

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displayed so that students can access what is more authentic and credible and as reference material for the material to be used.

The design of the Matchplay app has undergone several revisions. The revision process is carried out from designing layouts and educational games to improving the application's appearance. Educational games can be seen in Figure 3; in that section, there is a star as a form of appreciation for students who answer correctly, besides that there is also a bar on the right that indicates the time period to answer, and there are also bird characters and other animals as players in educational games.

3. Develop Stage

At this stage, the mathplay learning media products produced are tested for quality before being tested on students. Reviewers perform this quality test. One class teacher carries out the assessment. Reviewers have competition in their fields so that they meet the qualifications set by the developer so that reviewers are qualified to assess the learning media of the MathPlay application. This is because the MathPlay application must have good quality and can be accounted for in display quality, software engineering, curriculum, material presentation, implementation, educational games, evaluation, and language. The results of assessing the quality of the MathPlay application learning media products are as follows.

a. Reviewer

Reviewers assess the MathPlay Application from several aspects: display quality, software engineering, curriculum, material presentation, implementation, evaluation, and language. The reviewer has met certain criteria set by the developer, so it is considered competent to review the MathPlay Application. The following are the results of the MathPlay Application assessment data by reviewers in Table 1.

Table 1. Assessment of MathPlay Application by *reviewers*

NO	Criteria aspects	Indicator	Score Max	Score Average	Percentage ideal (%)	Quality
1	Aspect of Display Quality	1,2,3,4,5	50	40	80%	B
2	Aspects of Software Engineering	6,7,8	30	30	100%	SB
3	Aspect Curriculum	9,10	20	20	100%	SB
4	Aspect of material presentation	11,12,13	30	30	100%	SB

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5	Aspect	of	14,15	20	20	100%	SB
	implementation						
6	Aspect	of	16,17	20	20	100%	SB
	evaluation						
7	Aspect	of	18,19	20	20	100%	SB
	linguistic						
Total Ideal Percentage						97,14%	SB

Based on table 1. above shows that the display quality aspect has a percentage of 80%, software engineering aspects has a percentage of 100%, curriculum aspects have a percentage of 100%, material presentation aspects have a percentage of 100%, implementation aspects have a percentage of 100%, aspects evaluation gets a percentage of 100%, and linguistic aspects get a percentage of 100%. Research on all aspects by reviewers can be seen in Table 1 with an ideal percentage of 97.14%; based on these data, it is classified as very good characteristics. The responses given by the reviewers are as follows.

"Attractive and in accordance with the needs of students in the digital era"

1. Limited Trial

A limited trial looked at student responses to the Mathplay application learning media product. Students are allowed to assess and provide input. Student assessment includes several aspects, namely, interest in learning shows that students prefer to play while learning. The material's ease of understanding can be seen when students complete the Mathplay game. The display aspect makes it easier for students to choose menus to interact with. The implementation aspect goes well because students can operate the application without problems. The results of the overall response to the Mathplay application carried out by 10 students (5 students and 5 female students) at Madrasah Ibtidaiyah Jayapura City Jayapura City resulted in 95% in the positive category in helping them learn.

CONCLUSIONS

Based on the development studies that have been carried out, a learning media based on educational game applications for Mathematics Subjects at the Madrasah Ibtidaiyah City of Jayapura is produced, which is named Mathplay. They are using the Research and Development method, using procedural and descriptive development media, showing the steps that must be taken to produce a product using a 4D model. The stages carried out are the defining stage, the stage design stage, and the development stage. However, this stage is limited to the limited trial development stage so that the final product is obtained through Mathematics learning, which can be operated on Android phones and laptops.

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