

Design and Development of Mobile-Based Learning Media as Teaching Materials in Grade VIII Phythagoric Theorem Material st SMP Negeri 1 Gondangrejo.

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Abstrak

The purpose of this study is to find out whether the Make A Match type. The aims of this research are: 1) To find out and assess the level of feasibility of designing mobile-based interactive learning media as a learning medium for Mathematics; 2) To find out the response or student learning outcomes in the use of mobile-based interactive learning media as learning media Mathematics class VIII at SMP Negeri 1 Gondangrejo. Researchers used the Research and Development (R&D) method with the ADDIE development model. Collecting data using interviews, observation, and questionnaires. Testing learning media based on construct 2 with the Blackbox testing method. Testing and validation by experts converted using a Likert Scale. The results of this study can be concluded that: 1) Construct-based learning media obtains appropriate criteria according to media experts who have an eligibility level of 84% according to material expert validation has an eligibility level of 100% with eligibility criteria and eligibility with feasible criteria mobile-based interactive learning media as learning media for Mathematics class VIII at SMP Negeri 1 Gondangrejo, namely showing that 93% of students went well and students were able to understand and know material from the Pythagorean theorem.

Keywords:

A. Introduction

Currently, education in Indonesia is experiencing a transition to the learning system following the Covid 19 pandemic which has spread to almost the entire world for 2 years. This has an impact on the education sector in Indonesia. The education system in Indonesia during the Covid-19 pandemic era, educational institutions in Indonesia implemented a learning process with a distance system or online learning. Online learning is a learning method without face-to-face meetings between teachers and students that is carried out online via the internet network. This online learning is carried out online from early 2020 to 2022. The educational process is inseparable from the curriculum. The curriculum is a very important guide to direct the learning objectives to be achieved. The curriculum is closely related to the quality of education, although the curriculum is not the only factor that influences the quality of education (Soleman, 2020). Prior to the Covid-19 pandemic, the curriculum used by Indonesia was the 2013 curriculum. However, the curriculum currently implemented by Indonesia is the Freedom to Learn curriculum. The independent curriculum is implemented in accordance with the needs, environmental conditions and competency achievements to achieve learning objectives.

Education is an important part of a person's life because education can produce intelligent, creative, skilled and noble human beings as provisions for a better future. (Primasari et al., 2019). In addition, according to (Sulianto et al., 2019) Education is a necessary process to achieve balance

and perfection in the development of individuals and society. Learning is an interaction between teachers and students. Learning itself is a process of learning and teaching. The components in learning include learning objectives, teachers, students, curriculum, learning strategies, learning media and learning evaluation. With the relationship between the learning components will shape the learning process. According to Wahyudin (2017: 3) in the context of learning, strategy is related to approaches in conveying learning material.

In the process of education is not far from the acquisition of learning outcomes. According to (Anjani et al., 2021) learning outcomes are the final results of learning that describe the success or failure of the learning process. In addition, according to (Pratiwi et al., 2019) learning outcomes are skills that students acquire after learning, both in terms of cognitive, affective, and psychomotor. In the application of the cooperative learning model, the principle of cooperation between groups is emphasized and the division of tasks and responsibilities in each group. Cooperative learning is based on the assumption that learning is more meaningful when students learn and interact with each other (Hasanah, 2021).

Mathematics is a science that originates from the results of human thought and is learned through logical reasoning. According to (Arieska, 2021) Learning mathematics plays an important role for future students to think critically, logically, creatively and systematically. Mathematics is the science of reasoning related to numbers or numbers. In mathematics, poor learning outcomes are often a problem for students, so teachers and parents must try to overcome these problems. In learning there are still many teachers who use the lecture method so that students become passive because the teaching and learning process is centered on the teacher. Therefore, different teaching methods are needed in learning mathematics (Anjani et al., 2021).

One of the causes that causes less than optimal learning of mathematics is the habits of teachers who dominate learning and the lack of a variety of approaches, models, methods and media, so that students' interest in learning is still lacking. Regarding the not yet optimal learning outcomes of fourth grade students at SD Negeri Mranggen 4, efforts are needed to solve appropriate problems. To overcome this, it is necessary to develop a more multifaceted approach that combines theory with reality on the ground. The use of appropriate learning models can help the teaching and learning process, so that the communication process during learning takes place smoothly and effectively. The learning model is a guide used by the teacher to plan learning in order to achieve learning objectives, starting from the preparation and evaluation of learning devices, media or tools used (Jamal, 2020).

The cooperative learning model is a learning model that is carried out together in small groups of four or six people to collaborate so as to create active learning in the classroom (Hasiholan, 2020). In addition, according to Feida Noorlaila Istiadah (2020: 212) Model learning cooperative is model learning Which held in a manner collaborative in group small members four or six person For Work The same so that student active Study.

One of the cooperative learning models is the Make A Match learning model . According to Sulistio (2022: 54) the Make A Match learning model is a cooperative model that involves students looking for answers to questions through a pair card game. According to Rusman (2014: 223) the application of the Make A Match learning model begins with a technique, namely students are asked to look for pairs of answer cards or questions that are limited by time and students who have found pairs of questions and answers get points. The advantage of this learning model is that

the learning model is fun because it contains elements of play and can increase students' understanding of subjects that can affect student learning outcomes. This learning model can be applied to any subject, including mathematics.

Based on observations that have been made at SMP Negeri 1 Gondangejo, class VIII teachers at SMP Negeri 1 Gondangrejo, in class learning, the teacher uses a less varied model. Learning only focuses on the teacher, so it is not able to stimulate student activity in class. During learning, the teacher explains the material through a lecture model and gives assignments to students. Student learning activity in class is also low because students only listen to what is explained by the teacher without any interaction occurring. Therefore, we need a learning model that encourages students to actively participate in learning in class. One of the aims of the researchers in conducting this research was to find out the increase in student learning outcomes using the Make A Match learning model in Mathematics class VIII at SMP Negeri 1 Gondangrejo .

B. Research Methods

This research was conducted at SMP Negeri 1 Gondangrejo, which is located in Tuban Kulon Hamlet, Tubang Village, Gondangrejo District, Karanganyar Regency, Central Java Province 57188. The research was conducted for approximately 7 months, starting from December 2022 to June 2023. In research on the design of learning media, researchers use this type of research and development, or it can also be called R&D (Research and Development) using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) . This research was conducted in classes, especially class VIIIA as a sample from one batch. Planning procedures for Construct 2 Based Learning Media for class VIII In the Pythagorean Theorem material following the development of ADDIE, the flow of this research is explained as follows:

In the ADDIE development research model the first stage is to analyze the need for new product development (models, methods, media, teaching materials) and analyze the feasibility and requirements of product development. The development of a product can be initiated by a problem in an existing/applied product.

At this stage, the researcher analyzes the problems behind the emergence of this learning media. Collect complete information and needs by means of field observation. The problem is the lack of students' understanding of the Pythagorean theorem. Then a solution emerged to create mobile-based learning media that conveyed briefly and clearly the material needed so that students could learn and practice their abilities through the media that will be made in this study.

The design activity in the ADDIE development research model is a systematic process that starts with designing the concept and content in the product. A design is written for each product content. Instructions for implementing the product design or manufacture are written in a clear and detailed manner. At this stage the product design is still conceptual and will underlie the development process in the next stage.

Development in the ADDIE development research model contains activities for the realization of product designs that have previously been made. In the previous stage, a conceptual framework for implementing the new product has been prepared. The framework that is still conceptual is then realized into a product that is ready to be implemented. At this stage it is also necessary to make instruments to measure product performance.

The application of products in the ADDIE development research model is intended to obtain feedback on products that are made/developed. Initial feedback (initial evaluation) can be obtained by asking questions related to product development goals. The application is carried out referring to the product design that has been made.

The evaluation stage in the ADDIE model development research was carried out to provide feedback to product users, so that revisions were made in accordance with the evaluation results or needs that had not been fulfilled by the product. The ultimate goal of evaluation is to measure the achievement of development goals.

Data analysis is one of the research processes carried out by researchers after all the necessary data has been collected. The research data was in the form of a score from a feasibility questionnaire for learning media obtained from completing the questionnaire by 1 material expert, 1 media expert, and educator from SMP Negeri 1 Gondangrejo.

This study used the ADDIE data analysis technique which was then analyzed using descriptive statistics. The measuring instrument used in this study was a questionnaire using a Likert measurement scale with a score of 1-5. The hope is that using this scale can give freedom to the questionnaire fillers in conducting assessments of learning media. Calculation of scores on a Likert scale.

C. Results and Discussion

Based on observations that have been made at SMP Negeri 1 Gondangrejo, class VIII teachers at SMP Negeri 1 Gondangrejo, in teaching and learning in the classroom the teacher uses a less varied model. Learning is only centered on the teacher, namely lectures, so it is less able to stimulate student activity in class. So that students feel bored quickly and find it difficult to understand the material. This design research produced a mobile-based learning media product "MEPPY" on the subject of the Pythagorean Theorem. This study used the Research and Development (R&D) method with the product designed to be learning media. The development model used in this research is ADDIE with the stages of Analysis , Design , Development , Implementation , and Evaluation . Based on :

1. Analysis (Analysis)

At this analysis stage it aims to collect information related to products that will be designed later in order to overcome learning problems that exist in schools. There are several stages of analysis carried out at this stage, starting from needs analysis, student analysis and also task analysis. The results obtained are as follows:

a. Needs Analysis

Based on the analysis found in the field, it is necessary to design learning media that can support the learning process of students to easily understand the Pythagorean theorem material itself. Based on this, the researcher designed a learning media called "MEPPY" based on mobile.

In making mobile-based learning media, media analysis is also carried out by analyzing hardware and software that will be used to determine the suitability of learning media that will be used later applied to Android smartphones. It is intended that the learning media that has been made can be applied in learning activities properly and without any interference in its use.

The minimum hardware specifications that must be owned by a smartphone in using the "MEPPY" learning media . If a smartphone doesn't have a minimum specification, then there will be a number of problems that can be experienced during installation and during use.

b. Student Analysis

Based on the results of interviews with class VIII teachers at SMP Negeri 1 Gondangrejo that the students' abilities varied, depending on the child's level of understanding. In assessing students, the teacher only assesses based on the character values in the curriculum. From the results of the analysis taken through direct interviews, it can be seen in the appendix, the researcher found problems starting from students' lack of understanding of the material presented, the difficulty of students remembering the formulation in the Pythagorean Theorem . This underlies researchers to create mobile-based learning media that can support student learning processes.

2. Design (Design)

At this design stage the researcher begins to design the learning media that will be used later.

a. Create Flowcharts

The next step is to create a flowchart . Which at this stage will make a flowchart regarding the flow of learning media that will be developed to be used.

b. Make Learning Media Design

MEPPY learning media design includes the main page, material page, quiz page, assessment, selection of sound effects , and also selection of background music . The following is a display of MEPPY learning media :

Main page , the researcher makes the main page consisting of the menu button to enter the second page, namely the choice of material, quizzes and profiles. Apart from that, on this main page there are buttons to turn sound effects on and off .



Figure 1. Home Page Display of Mobile-Based Learning Media

Material page On this material page later students or anyone who will use this media will be presented with material regarding the Pythagorean Theorem starting from the basic material to several formulas for calculating angles and side lengths. It will also display a back button on the main page, and a next button to open the next material page.



Figure 2. Material Page Display



Figure 3. Material Page Display

Design Quiz , In the quiz page section , this is a page for testing students' abilities, where this page displays several questions that must be completed by students and I give a timer to answer questions, so that when students take too long to answer existing questions, it will automatically the question will immediately change to the next question, and the student must and is considered the previous question not answered.



Figure 4. Quiz Page Map Display



Figure 5. Display Quiz Media Page

Value Display, in each question that must be done by students there are 5 questions. And for each correct answer the student will get 20 points for the value and if they don't answer then the value is 0, but if the answer is wrong the student will get a point deduction of 10 points. So that at the end of the valuation it will automatically accumulate.



Figure 6. Assessment Page Display

Selection of sound effects and background music, the researcher gives a sound effect to this learning media every time students open one page at a time in this section of learning media it will be accompanied by a sound effect that can help students focus more on studying the material presented, even when working on the quiz.

3. Development (Development)

ADIIE development process is the Development stage. This stage aims to see how far the feasibility of the media will be used as learning material later, after the media design is completed at the design stage, then it is continued with validation tests from the experts needed, and also field tests in the previous research process.

MEPPY learning media is a mobile -based learning media that can be installed on a smartphone, which has an operating system, at least Android 4.0. Next is the display of the design of the development of learning media, which if this learning media application has been downloaded and installed on a smartphone device, After this learning media is developed and the instrument is made, the next step is to do product testing using the blackbox testing method and expert validation to determine the feasibility of the learning media that has been made before.

The following are the results of testing using the MEPPY learning media blackbox testing method which can be seen in the test table below.

Table 1. Blackbox test results

Case/Tested	TEST Scenario	Expected results	Test result
Open the MEPPY learning media application	Open the learning media application by pressing the application icon	The application opens and displays a loading screen, then enters the main learning media page	Valid

Options menu button	Press the option menu button	Switch to the second page which contains material and quiz buttons	Valid
Material button	Press the material button	Moves to the material page, which explains the Pythagorean material	Valid
Quiz button	Pressing the quiz button	Move to the quiz page containing practice questions	Valid
Back button	Press the back button	Moves from the current page to return to the second page	Valid
Profile menu button	Press the profile button	Move on to the profile page	Valid
Music button	Press the music button	The music turns off when there is a cross or strikethrough on the music keys, and the music turns on if the music keys have no cross marks.	Valid
Answer button on the quiz page	Pressing one of the answer buttons on the quiz page	There are four buttons for answering practice questions which contain buttons for correct answers and wrong answers, if you choose the correct answer you will get points, and if you get the wrong answer you will get a point deduction in the final result.	Valid

Source: Research Data

The conclusion from the application test table is that the buttons in the application function properly and are in accordance with the expected results. Researchers draw the conclusion that mobile-based learning is ready and can be continued for feasibility testing by experts and students.

a. Media Expert Validation

Media experts who were used as validators in this study were lecturers from the Department of Information Technology Education at Slamet Riyadi University, Surakarta who are experts in the media field aiming to know the feasibility of the learning media being developed. Media experts give an assessment according to the media expert grid.

Table 2. Media Expert Validation Results

Assessment Aspects	f	N	Percentage	criteria
<i>software</i>	9	10	90%	Very Worth it
<i>Visual</i>	17	20	85%	Very Worth it
Learning Media Criteria	16	20	80%	Very Worth it
Total	42	50	85%	Very Worth it

Based on the results of the data obtained from the assessment of media experts, the overall score was 42 with an average percentage of 85% with Very Eligible criteria . So mobile-based learning media on Pythagorean Theorem material gets very decent criteria.

b. Material Expert Validation

Validation data from material experts was obtained by giving a questionnaire covering three aspects, namely the curriculum, the content of the material and also the presentation of the learning media. When conducting validation, material experts are accompanied by researchers. The following are the validation results from material experts:

Table 3. Material Expert Validation Results

Assessment Aspects	f	N	Percentage	criteria
curriculum	15	15	100 %	Very Worth it
Content Material	20	20	100%	Very Worth it
Presentation of Learning Media	15	15	100%	Very Worth it
Total	50	50	100 %	Very Worth it

Based on the results of the data obtained from material experts as a whole got a score of 50 with an average of 100% with the criteria of "Very Decent". So the mobile-based learning media on the Pythagorean Theorem material that is being developed gets very feasible criteria and the results of a feasibility assessment questionnaire by material experts.

c. Student response

The results of students' responses to the MEPPY learning media from every aspect, namely the use of learning media, the impact of using learning media and supporting facilities can be seen in the following table:

Table 5. Student Response Results

Assessment Aspects	f	N	Percentage	criteria
use of learning media	32	32	100 %	Very Worth it
impact of using learning media	94	96	98%	Very Worth it
supporting facilities	81	96	85%	Very Worth it
Total	207	224	93%	Very Worth it

Based on the results of the data obtained from the eligibility assessment, the students as a whole received a score of 207 with an average value of 93% with the criteria of "Very Eligible". So the mobile-based learning media that was developed got very decent criteria.

The results of research on designing media for learning are in accordance with the results of research that has been carried out by:

- Anggraeni Widya Purwita and Meini Sondang Sumbawati (2016) in their research entitled "Development of Construct 2-Based Learning Media in Class X Multimedia Subject Computer Systems at State Vocational High School 1 Cerme"
- Research by Mala Climateah and Yudha Anggana Agung in 2017 with the title "Development of Interactive Learning Media Using Construct 2 Software in Basic Electronics Subjects at State Vocational High School 1 Sidoarjo".
- Afina Auliani, regarding the Development of Educational Games as Learning Media for Human Movement Systems for Class XI High School Using Construct 2, has developed a 2D educational game made using the Construct 2 tools by presenting six levels, each of which has different challenges.
- Research by Dear Putriani, Nur Hadi Waryanto and Kuswari Hernawati in 2016 with the title " Development Of Learning Media Based On Android By Using Construct 2 On Solid Geometry ".
- Lukni Maulana (2017) in his research entitled "Development of Construct 2- Based Learning Media with the Android Platform Material on Occupational Health Safety and Environment (K3LH) in the Electricity Study Program for Vocational High School Students".
- Koderi, Achmad Maulana, Umi Hijriyah, Dwi Prasetyo, Rukimin (2019) in his research entitled "Development of Construct 2- Based Learning Media for Teaching Arabic at MAN Lampung, Indonesia".

D. Conclusion

Based on the results of research and discussion on the design of mobile-based learning media on the Pythagorean Theorem material for class VIII SMP Negeri 1 Gondangrejo, it can be concluded that:

1. resulting product is a mobile -based learning media application on the Pythagorean Theorem material for class VIII SMP Negeri 1 Gondangrejo.
2. Media u learning based on android is tested for its feasibility using the media u assessment feasibility test system , obtained from the score u the percentage of eligibility by material experts is 85% with a very decent category, from media experts u get a feasibility percentage score of 100% with a very decent category, and students get a feasibility percentage score of 93% with very decent category.

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