Development of Mathematics Learning Media "MedLearn Math" on Three Variable Linear Equation Systems Material

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Article Info	Abstract
   	This research was motivated by the basic problems of students, namely difficulties in understanding the material on Systems of Linear Equations with Three Variables, how to use methods to solve them, and not maximizing the use of technology as a learning medium. The aim of this research is to develop learning media in the form of an MedLearn Math on three-variable linear equation systems. This development research uses the ADDIE model. The results of the research show that the level of feasibility of media and material experts received a very feasible category with scores of 97% and 90% respectively. The results of students' responses to the media obtained an average percentage of 83.3% in the very good category, while the test results of 3 randomly selected students obtained an average percentage of 89.2% in the very good category. So the MedLearn Math developed as a learning medium on three-variable linear equation systems is "very feasible" and "very good" and easy to use anytime and anywhere.

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1. INTRODUCTION

Indonesia is a developing country that has a big vision to achieve the SDGs (*Sustainable Development Goals*) one of which is to realize high quality education by 2030. This vision was formed because of remembering

Currently, education plays an important role in human life which is the basis for advancing the nation through improving the quality of human resources [1]. Technology, which continues to develop rapidly, has become an inseparable part of everyday life. The development of information technology (ICT) has had a significant impact in various fields including education [2]. This phenomenon not only creates new opportunities, but also demands adaptations in the way we learn, teach and interact and provides great potential in the field of education.

In education in the 20th century, the learning process requires students to play a more active role in the classroom as the main actors, while educators act as facilitators who facilitate students to understand the material, both by providing learning facilities and infrastructure and guiding learning [3]. Education is one of the main pillars in shaping individuals and society as a whole. In this era of globalization, the importance of education supported by learning media is increasingly felt, because it is not only about transferring knowledge, but also forming the character, values and skills needed to face complex challenges in an ever-changing world.

The role of learning media is increasingly important in supporting the educational process. Learning media can be an effective tool in supporting a quality and meaningful learning process for students [4]. The use of learning media can arouse new desires and interests, generate

motivation and stimulation of learning, and will have psychological influences on students, therefore there is a link between learning media and technology [5]. Learning media provides a variety of means for conveying information, reinforcing concepts, and increasing student involvement in learning. From classic textbooks to technologies such as the development of MedLearn Math, learning media has opened the door for educators to a variety of new ways to facilitate effective learning.

Harnessing potential smartphones as a learning medium, teachers can create learning experiences that are dynamic, interactive and relevant to students' lives in this digital era [6]. MedLearn Math development can utilize interactive features such as learning materials, example questions, practice questions, and supported by audio and video to make it easier for students to understand the material, to make learning mathematics more interesting. This helps in maintaining students' interest in learning mathematics. Utilizing learning using MedLearn Math can overcome problems related to limited space and time. In the world of education, the use of technology such as MedLearn Math can help and make things easier for students, and support learning which is a good thing in this modern era [7].

From the results of initial observations by conducting interviews with the teacher and one of the students in class. In addition, it is feared that the time allocation for studying the material on Systems of Linear Equations with Three Variables (SPLTV) is limited, because most of the learning time is spent studying the previous material and is used for carrying out school activities as well as holidays, which has an impact on the speedy delivery of the material. The use of learning media with current technology can enable students to learn actively and independently. The use of technology in the form of MedLearn Math as a mathematics learning medium has never been done. To solve these problems, it needs to be developed Mobile Learning (M-Learning) based on Android [8].

Based on the explanation above, researchers are interested in conducting research with the title "Development of MedLearn Math as an Android-based Learning Media on Three Variable Linear Equation Systems Material" which was carried out at SMK Negeri 1 Hanaut Island class X Visual Communication Design (DKV).

2. METHOD

This research uses the R&D research method (research and development). The product produced in this research is an Android-based learning media, namely MedLearn Math, which contains material about three-variable linear equation systems. The model used in this research is the ADDIE model (Analysis, Design, Development, Implementation and Evaluation) [9].

This research was conducted at SMK Negeri 1 Pulau Hanaut which is located on Jalan Bapinang Pagatan, Bapinang Hulu Village, Pulau Hanaut District, East Kotawaringin Regency, Central Kalimantan. The subjects of this research were all students of class The selection of students is based on the problems experienced in accordance with the characteristics required by the researcher.

The research instruments used in the research are media expert validation, material expert validation, student response questionnaires and tests. Media expert validation and material expert validation provided data regarding the feasibility of using MedLearn Math as a learning medium, as well as class The test questions contain 2 questions which are used to determine students' ability to solve the test questions with the help of MedLearn Math itself.

3. RESULTS AND DISCUSSION

In this research, Android-based MedLearn Math media was developed for system material on Systems of Linear Equations with Three Variables (SPLTV) with steps according to the ADDIE model. *(Analysis, Design, Development, Implementation, and Evaluation).*

a. Analyze *(Analysis)*

1) Analyze research school problems

It is known that all students at the research site, namely SMK Negeri 1 Pulau Hanaut, as a whole already have smartphones and are all Android users, but their use is still not maximized as a learning medium. Based on the results of initial observations, students still have difficulty understanding and completing mathematics material, especially System of Three Variable Linear Equations (SPLTV) material in solving mathematical problems. In addition, it is feared that the time allocation for studying the material on Systems of Linear Equations with Three Variables (SPLTV) is limited, because most of the learning time is spent studying the previous material and is used for carrying out school activities as well as holidays, which has an impact on the speedy delivery of the material.

2) Analyzing Learning Outcomes (CP), Flow of Learning Objectives (ATP), and Learning Objectives (TP)

At this stage, an analysis of Learning Outcomes (CP) is carried out, indicators of achievement that must be achieved by students in learning the Three Variable Linear Equation System (SPLTV). Learning Objectives Flow (ATP) is a series to achieve learning objectives by students. Apart from that, Learning Objectives (TP) are also formulated based on previously determined competency achievement indicators.

3) Analyzing Material

At this stage the researcher makes a concept analysis as a form of analysis of the material so that the relationship between each concept can be known and to make it easier for the researcher to determine the material properly and correctly in making MedLearn Math. This concept analysis was carried out with the aim of finding out the relationship between each concept in the Three Variable Linear Equation System (SPLTV) material.

4) Analyzing Media

In developing this media, the software used is *Microsoft* Powerpoint *2013* And *Website 2 Apk Builder v5.0*. Minimum hardware specifications *(hardware)* on each *smartphone* to be able to install MedLearn Math as a learning medium for the Three Variable Linear Equation System material as follows:

Table 1. Specifications *Smartphone* To Install the Application

Specification	Detail (minimal)
Screen	1,600 X 720 Pixels
Ram	512 Mb
Operating System (You)	*Android* 4.1 (Jelly Bean)
Memory Space	30 Mb

The problems that a smartphone will experience if it does not have the minimum specifications as above will experience problems such as: 1) Problems when installing, applications that have been downloaded and entered the installation stage will take a long time if the remaining memory on the smartphone is only small or full. Steps that can be taken are cleaning up the rubbish *cache* on frequently used applications. Apart from that, failure

during installation can also occur because the Android operating system is below the minimum. 2) Constraints on screen size *smartphones*, when the screen size is below the minimum, the layout will shift so it looks untidy. However, this layout change does not affect the function of each button in the application. Conversely, if the application is opened with a smartphone If the screen size is above the minimum, the layout will be normal and look neat.

b. Planning *(Design)*
1) Create Flowcharts and Storyboards

A flowchart is a flow diagram from start to finish in general regarding MedLearn Math on three-variable linear equation systems. *Storyboard* contains pictures that show the appearance of the learning media from start to finish. After that, the researcher arranged *hyperlink* on each button symbol in the application to make it easier for users to operate MedLearn Math, such as moving from one page to another.

2) Creating Instruments

The instruments used in this research were validation sheets for media experts, validation sheets for material experts, student response questionnaires and creating tests and interview guidelines.

c. Develop *(Development)*

At this stage, the development of learning media that has been designed is carried out *PowerPoint* And *Flip PDF Professional* then made into an application by using *Website 2 Apk Builder V5.0*. The application developed called MedLearn Math consists of 47 pages and there are 4 main buttons, namely *home, table of contents, next page dan before page*.

Page 1 contains the START button to start MedLearn Math, the question mark button (?) as a user guide, and the exclamation mark button (!) as a Short Profile and audio is provided to increase students' interest in starting learning. Page 2 contains a Table of Contents with 6 buttons, namely Learning Outcomes (CP) & Learning Objectives (TP), materials, examples, videos, exercises and glossary. It can be seen in image 1 and image 2 below.

Figure 1. Main page   Figure 2. *Table of Content*

Pages 3-4 contain Learning Achievements (CP) & Learning Objectives (TP). Pages 5-18 contain material, which consists of apperception, the meaning of SPLTV, the general form of SPLTV, and the method for solving SPLTV, which can be seen in Figure 3-4.

Figure 3. CP and TP

Figure 4. Material

Pages 19-38 contain examples, which consist of 3 examples, each of which uses a different solution method, namely the substitution, elimination and combined solution methods (substitution & elimination). Pages 19-38 contain examples, which consist of 3 examples, each of which uses a different solution method, namely substitution, elimination and combined solution methods (substitution & elimination) which can be seen in Figure 4 and Figure 5.
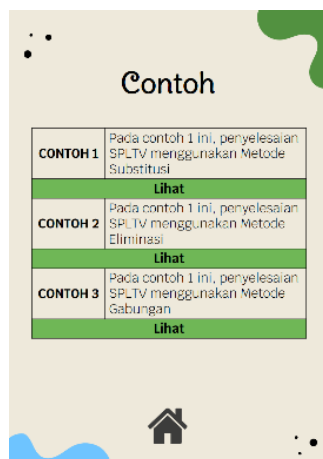
Picture 5. Example

Figure 6. Video

Pages 41-42 contain exercises by using the DO IT button to start taking the test. By adding the DO IT button, if you click it, you will immediately see a Google form containing practice questions and there are buttons for the previous page, home, table of content and next page. in figure 7. Pages 43-45 contain a glossary, which is a collection of lists of important words or terms about Systems of Linear Equations with Three Variables arranged alphabetically. On this page there are also buttons for the previous page, home and next page, which can be seen in figure 8.

Figure 7. SPLTV training

Figure 8. Glossary

Page 46 is the user instructions page where the button has been placed on the main page in the form of a ask button and there is only a home button. Page 47 contains the last page, namely the Research Team page, the button has been placed on the main page in the form of an info button and on this last page there is a home button and a criticism and suggestion button, if you click it you will go directly to the Google form to fill in criticism and suggestions for MedLearn Math. used These two pages can be seen in figure 9 and figure 10 below.

Figure 9. Instructions for Use
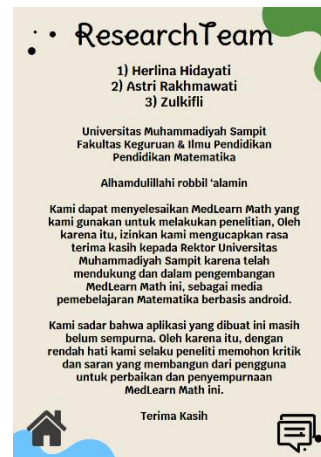
Figure 10. *Research Team*

After developing MedLearn Math as a learning medium on three-variable linear equation systems and having created a research instrument, the next activity, namely MedLearn Math, was validated by experts with the aim of finding out the level of feasibility of the MedLearn Math that had been created before implementing it. The following validation results in the media and material fields can be seen in Table 2 and Table 3.

Table 2. Media Expert Validation Results

Statement Items	Validation		Percentage
	Member 1	Member 2	
1	4	5	90
2	5	5	100
3	4	5	90
4	5	5	100
5	5	5	100
6	5	4	90
7	5	5	100
8	5	5	100
9	5	5	100
10	5	5	100
Rate-rate			97
Information			Very Worth It

Based on Table 2, it can be seen from the validation of 2 media experts on MedLearn Math as a learning medium in the Three Variable Linear Equation System (SPLTV) material that they got an average percentage of 97% with a very feasible category.

Table 3. Material Expert Validation Results

Statement Items	Validation		Percentage
	Member 1	Member 2	
1	5	5	100
2	4	4	80
3	3	5	80
4	4	4	80
5	4	5	90
6	4	5	90
7	5	5	100
8	4	5	90

9	4	5	90
10	5	5	100
Rate-rate			90
Information			**Very Worth It**

Based on Table 3, it can be seen from the validation of 2 material experts on MedLearn Math as a learning medium in the Three Variable Linear Equation System (SPLTV) material that they got an average percentage of 90% with a very feasible category.

d. Apply *(Implementation)*

MedLearn Math, which had been declared feasible by media experts and material experts, was then tested on 18 class The student response questionnaire used a Likert scale including five categories of answer choices 1 (strongly disagree), 2 (disagree), 3 (somewhat agree), 4 (agree), and 5 (strongly agree).

The results of students' responses to the use of MedLearn Math as a learning medium in the Three Variable Linear Equation System (SPLTV) material can be seen in Table 4.

Table 4. Results of Student Responses to MedLearn Math

Learners	Score	Learners	Score
1	80	10	90
2	88	11	80
3	76	12	94
4	72	13	84
5	80	14	80
6	92	15	80
7	72	16	86
8	86	17	92
9	88	18	80
Total		**1500**	
Rate-rate		**83,333**	
Information		**Very good**	

Based on Table 4, it can be seen that the overall response of students to MedLearn Math in solving mathematical problems in the Three Variable Linear Equation System (SPLTV) material received an average percentage of 83.333% with a very good response category.

The sampling technique used in determining test and interview subjects is *Probability Simple Random Sampling*. This technique provides an equal opportunity for each element to be selected as a member of the sample. It is said to be a (simple) sample because the sampling of sample members from the population is carried out randomly without paying attention to existing strata. The sample for collecting data on test results and also interview results was 3 students with information (S1), (S2), and (S3). The following is a scoring table for test results for S1, S2 and S3 subjects obtained from test answers and also interview results.

Table 5. Test Result Scores

Subject	S1	S2	S3
Test question number 1	95	95	100
Test question number 2	100	45	100
Average/Subject	**97,5**	**70**	**100**
Rat-rat	**89,2**		
Information	**Very good**		

Based on Table 5 in test question number 1, the three subjects, namely S1, S2 and S3, were able to complete the test questions well, with details of S1 getting a score of 95, S2 getting a score of 95 and S3 getting a score of 100. In test question number 2, S2 was less able to complete the test questions, but did not finish doing it in the S2 work in completing test number 2, getting a score of 45. Meanwhile, S1 and S3 were able to solve the test questions correctly with a score of 100 each. Each subject got the average of the two questions. The tests that have been taken are S1 getting a score of 97.5, S2 getting a score of 70, and S3 getting a score of 100. Of the three subjects, the average score is 89.2, this average score can be categorized as "very good". .

e. Evaluate *(Evaluation)*

Evaluation is carried out at the developing stage *(development)*Before the application is distributed to the appraiser, you should ask first about the type of smartphone what to use. This is related to the specifications of *smartphones* which can install and operate applications normally if it has the minimum specifications as in Table 1. If you don't have these specifications, there will be problems when installing and opening applications such as changing the layout of sentences, images, icons, and so on. This also affects validation from media experts and material experts, validators think that the settings in the application are like what they see when opening the application *smartphone* whose specifications do not reach the minimum requirements previously explained.

Apart from that, conclusions were also made regarding MedLearn Math by looking at the validation results from material experts, media experts, and student responses. Validation provided by material experts, media experts and the results of student responses were analyzed using a Likert scale. From the evaluation results, it was concluded that the media obtained a very appropriate level of suitability from material experts as well as from media experts and student responses showed a very good category. Meanwhile, from the results of tests and interviews conducted on 3 randomly selected students, namely S1, S2 and S3. In test number 1 S1, S2 and S3 were able to solve mathematical problems well and correctly, while in test number 2 S2 was less able to solve mathematical problems, only able to complete the planning stage and completing a small part at the implementing the plan stage. On the other hand, S1 and S3 were able to solve the mathematics problem in test number 2 well and correctly.

Based on the results of the description above, it is found that the development of MedLearn Math as a learning medium for the Three Variable Linear Equation System material is one form of technology utilization in this era. MedLearn Math is designed not only to be used during classroom learning, but can be used anytime and anywhere. The use of this technology can certainly make it easier for students to receive and understand the lesson material [10].

The Android-based MedLearn Math learning media on the three-variable linear equation system material was developed using the ADDIE (Analysis, design, development, implementation and evaluation) model. The advantage of the ADDIE model is that the stages are arranged systematically and are easy to learn because the model is very simple compared to other models, making it easier to develop a product [11]

MedLearn Math as a learning medium for the Three Variable Linear Equation System material convert This application is made with a graphic selection background that is appropriate to the material contained, combined with appropriate colors and images and videos that are made attractive. This media is also supported by audio which can be set off and on. Placement of each button It is also adjusted to suit hand distance and the application is easy to use. In this media, there are practice questions that are packaged attractively, equipped with a button that, when clicked, will go directly to a Google form which contains the name, class, question, and a place to send answers in the form of images. Through practice questions, it will improve students' ability to think and understand concepts to solve questions regarding the subject matter [12].

Validation by media experts on MedLearn Math as a learning medium in the Three Variable Linear Equation System material contains two assessment aspects, namely the programming aspect and media display. There are 10 statements in the media sector, consisting of 8 statements containing media display aspects and 2 statements containing programming aspects. MedLearn Math validation in this field was carried out by 2 people consisting of 1 Informatics lecturer at Muhammadiyah Sampit University and 1 Visual Communication Design (DKV) teacher at SMK Negeri 1 Hanaut Island. Based on Table 2, it shows that the overall average score obtained from media experts is 97%. So MedLearn Math is in the very feasible category so it can be implemented. The conclusion regarding suitability by media experts 1 and 2 is that the media can be used without revision. Media expert 1 provided suggestions and input regarding the use of text in the title headline choose normal and clearly legible ones. The material contained in MedLearn Math is adapted to CP, ATP and TP including understanding the System of Linear Equations with Three Variables (SPLTV), the solution method, examples of SPLTV using different solution methods and practice SPLTV questions. The material presented is arranged systematically with text, audio, video and images so that it is easy to follow and well understood. The sentence structure and language used are made well according to Indonesian language rules so that it is easy and with example questions that are closely related to everyday life.

The material expert assessment at MedLearn Math in solving mathematical problems in the Three Variable Linear Equation System (SPLTV) material contains two assessment aspects, namely the learning and linguistic aspects. The number of statements in the material area consists of 10 items, where statements 1 to 3 are statements about learning and items 4 to 10 contain statements about language. The assessment was carried out by 2 people consisting of 1 lecturer from the Mathematics Education Study Program at Muhammadiyah Sampit University and 1 Mathematics teacher at SMK Negeri 1 Hanaut Island. Based on Table 3, the average validation results from material experts show that the feasibility level is very feasible with a value of 90%. From this average, it can be seen that MedLearn Math as a learning medium for the System of Three Variable Linear Equations (SPLTV) material from material experts is declared suitable for use. With notes from material expert 1, namely a lecturer in the Mathematics Education Study Program at Muhammadiyah Sampit University, he gave suggestions, namely improving the use or writing of good and correct grammar, eliminating unnecessary buttons. As for notes from material expert 2, namely the mathematics teacher at SMK Negeri 1 Hanaut Island, he suggested that the glossary should

be arranged alphabetically. After getting advice from material expert 2, the next step was to improve MedLearn Math as a learning medium for the System of Three Variable Linear Equations (SPLTV) material to make it even better.

After students use MedLearn Math as a learning medium for the Three Variable Linear Equation System material, then students fill out a response questionnaire to assess MedLearn Math which the researchers have developed. The student response questionnaire contains 10 statement items. 2 statements are included in the display aspect, 6 statements are included in the learning aspect, 1 statement is included in the programming aspect, and 1 statement is included in the linguistic aspect. Based on Table 4, it can be seen that the overall response of students to MedLearn Math as a learning medium in the Three Variable Linear Equation System (SPLTV) material received an average percentage of 83.3% with a very good response category.

After students use MedLearn Math as a learning medium for the Three Variable Linear Equation System material, then students take a test to determine the student's mathematical problem-solving abilities. The test contains 2 questions in the question category, namely C4, with different levels of difficulty and in the form of descriptions. Based on Table 5, it can be concluded that the three subjects, namely S1, S2 and S3, were able to solve test question number 1 well. In detail, S1 got a score of 95, S2 got a score of 95 and S3 got a score of 100. In test question number S2, he was less capable. In solving it, in the process S2 in solving test question number 2 got a score of 45. Meanwhile S1 and S3 were able to solve the problem in test question number 2 well, with a score of 100 each. Each subject got the average of the two test questions. That has been done, namely S1 obtained a score of 97.5, S2 obtained a score of 70, and S3 obtained a score of 100. From the test results, the three subjects obtained an average score of 89.2 in the "very good" category. Based on the assessment results of media experts, material experts, responses from application users (students) and student test results with the help of the MedLearn Math application, it can be concluded that the learning media developed on three-variable linear equation systems is very feasible and very good and practical to use in the process. learning.

Based on the discussion above, it is in line with the results of research conducted by Natalia Ayu Lestari Sidabutar and Reflina with the title "Development of High School Mathematics Learning Media Applications Animaker on Vector Material. In this development, the ADDIE model is used to produce products in the form of animation-based videos Animaker. Based on the validation results from media experts, they got 90.9%, and the validation results from material experts got 80.5% and from mathematics subject teachers it got 77.68% in the "Very Eligible" category. The results of students' and teachers' responses to the application Abimaker included in the positive category, obtained a score from teachers of 80% and students of 78%. It can be concluded that learning media with applications Animaker which was developed on vector material is feasible and practical to be applied in learning [13].

4. CONCLUSION

Based on the results of research carried out on the development of MedLearn Math which is used as a learning medium on Three Variable Linear Equation Systems material by class X Visual Communication Design (DKV) students, it can be concluded that MedLearn Math was developed using the ADDIE model *(Analysis, Design, Development, Implementation, and Evaluation)* very worthy and very good. Based on the validation results by media experts and material experts, successive values were obtained, namely 97% And 90% with a very decent

level of eligibility. The results of students' responses to MedLearn Math as a learning medium on three-variable linear equation systems, namely 83,3% with a very good response category.

Results by applying a test containing 2 questions with 3 students selected randomly, namely S1, S2 and S3. S1 and S3 have been able to solve the problems of these two questions, while S2 has also been able to solve the problem of question number 1, while S2 has been less able to solve the problem of question number 2. If you look at the scoring of the test scores, the three subjects, namely S1, got an average score 97,5, S2 obtained an average score 70 , while S3 obtained an average score 100. From these three subjects, the average score was again obtained, namely 89,2, the average score can be categorized as "very good". So it can be concluded that MedLearn Math as a learning medium in the Three Variable Linear Equation System material is "Very Appropriate" and "Very Good" and is practical for use in mathematics learning in the Three Variable Linear Equation System material.

5. SUGGESTION

The suggestion is for students to improve their ability to work on mathematics problems, so that they can continue to get better and achieve high achievements. Meanwhile, teachers are expected to provide new innovations in learning so that they can foster students' enthusiasm for learning and also achieve learning goals.

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