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Development of Media Interactive Problem Based Learning Android-Assisted to Improve Student at SMA Negeri 10 Medan

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Abstract. *The aim of this research is to develop learning media using that are valid, practical, and effective to improve students' ability to understand flat Derivative topics. The study was carried out at SMA NEGERI 10 MEDAN. The subjects of this research were students of class XI IPA-1. This research is research and development (R&D) using the ADDIE Model. The data collection technique uses a questionnaire assessment sheet for material experts, teaching material experts, learning practitioners and student responses. The results showed that learning media using Android Studio obtained an average percentage of 91.8% with the criteria of "very valid" according to the assessment of teaching materials experts and based on media material experts obtained an average percentage of 86.5% with the criteria " very valid". Based on the practice of learning carried out by the mathematics teacher getting 91,8% with the "very practical" criteria. Based on the effectiveness assessment of the 35 students, they got an average percentage of 86.5% with the criteria of "very effective". Thus, based on the results of the assessment of material experts, teaching materials experts, learning practitioners, and student effectiveness it can be said that learning media using Android Studiohave been tested as valid, practical and effective for use in learning.*

Keywords: *Development, Android Studio, Learning Media, Derivative.*

INTRODUCTION

Education is a forum that serves to prepare human resources who have competence in carrying out the functions of life. The education system should not be separated from the changes that occur in various fields as a result of globalization. The rapid development of science and technology today can have a significant influence on the world of education. All components of education are expected to be able to adapt so as not to experience gaps in facing the progress of the times. In an effort to educate the nation's life, improving the quality of education is very important for sustainable development in all aspects of human life. The national education system continues to be developed in accordance with local, national and global needs and developments (Mulyasa, 2004).

For some materials, mathematics is presented in real-life-oriented daily problems. It aims to make mathematical material easier to understand. Students are required to be able to solve real-life-oriented math problems.

There are several factors associated with low mathematical problem solving ability. According to Susanto (2013: 191) explains that:

"Factors such as the classic problem of applying mathematics learning methods are still centered on the teacher, while students tend to be passive. Another classic factor is the

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application of conventional learning models, namely lectures, questions and answers, and giving assignments or homework."

Based on observations made in class XI IPA-I SMA Negeri 10 Medan, it shows that conventional learning methods with lectures and question and answer activities (teacher-centered approaches) are dominantly used in learning mathematics.

The problems obtained from the observations are:

1. The mathematics learning system in class is saturatesd and monotonous.
2. Students do not carry out interactive activities in following the learning process in class.
3. The learning system in schools is still limited to conventional learning (not using learning media).
4. There is still a lack of use of media that functions as a student learning companion that can support learning so that it is necessary to have student assistance in the learning process on the material on derivative.

The following results were obtained based on interviews with the Mathematics teacher of class XI IPA-I SMA Negeri 10 Medan.

1. The obstacle experienced by the teacher lies in the students. Students tend to be less active in asking and answering during the learning process.
2. Teachers use lectures, questions and answers, discussions, and assignments in learning.
3. Most students still find it difficult to understand the subject matter, primarily material that is not easy to learn.
4. The ability of students to solve real-live (daily) problems is still in low category because students find it difficult to interpret story questions such as which statements and which questions are in the question.

Table 1. Data for Even Semester Observation Values for 2021/2022 Class XI Mathematics Subjects

KKM	Score	Student	Percentage
70	< 70	23	65.7%
	>70	12	34.2%
Total		35	100%

Based on table 1.1 above, it can be seen that the results of observations on derivative on Odd Semester students of SMA N 10 Medan who have a KKM in mathematics are 70, students who meet the KKM are 12, namely 34.2% students, namely as many as 23 students have not met the KKM while 23 students are 65,7%.

The low score of students' mathematics occurs because during the learning process there are always obstacles for students to understand it. Such as the lack of mastery of the material by students so that it has an impact on low learning outcomes. This is also in accordance with the results of an interview with UmmiAulia, S.Pd as a mathematics teacher, that in learning mathematics, due to the limited media available in schools, teachers mostly explain the material from the textbooks provided and do not use learning media. The lecture method is one of the learning models that is often used by teachers, the use of this method causes students to have low learning desires and students feel bored quickly and the lack of practice questions given to students makes students less active in participating in learning. in class and it tends to be difficult to get the KKM standard score set by the school.

Development through innovation of teaching media for mathematics textbooks is required by using e-learning/mobile android media which can improve the quality of education in an application called Android Studio. Based on this description, researchers are interested in conducting research and trying to develop learning modules in learning mathematics. The development of mathematics learning modules is very important in order to motivate and increase student achievement to learn and make students active in the teaching and learning process and will help students to learn mathematics easily. Therefore, it is necessary to conduct a research entitled development of media interactive learning problem based learning android-assisted to improve student outcomes and motivation at SMA Negeri 10 Medan.

RESEARCH METHODOLOGY

Research Location and Time

This research will be conducted in class XI IPA-I semester I SMAN 10 Medan, Jl. Tilak No.108, Sei Rengas I, Kec. Medan Kota, Kota Medan, Sumatera Utara 20214, Indonesia. The research will be carried out in the even semester of the 2022/2023 academic year. The timing of the research refers to the school's academic calendar.

Data Collection Techniques

- **Interview**

According to Esterberg in Sugiyono (2015: 72) an interview is a meeting conducted by two people to exchange information or an idea by means of question and answer, so that it can be reduced to a conclusion or meaning in a particular topic. In this interview conducted to obtain information on matters relating to research. Asking the condition of the class in mathematics, systems or teaching and learning processes and learning media used previously and also other questions in interviews.

- Questionnaire

According to Sugiyono (2013: 199) the questionnaire is a data collection technique which is done by giving a set of questions or written statements to the respondents to be answered. In this study, questionnaires or questionnaires were given to students who were used as control classes and experimental classes to determine the level of learning motivation in participating in the mathematics learning process before and after applying *Android Studio* based learning media in the classroom. This questionnaire is also a direct assessment of the learning media used. Show values that can be taken into consideration for the effectiveness, practicality, and validity of using *Android Studio*-based learning media in the classroom.

- Test Method

The test used in this study is useful for showing whether the learning media used in the classroom during mathematics lessons has an effect or not on students' knowledge. This test will be given in an *Android Studio* based learning media display. This test will be carried out twice in class, the first time being given when students have never studied algebra material in class using *Android Studio* based learning media and after *Android Studio* based learning media is given to students. This test is used as a comparison material whether this *Android Studio* based learning media affects students' grades and knowledge well in the classroom.

- Documentation

Documentation was carried out by researchers when conducting research at SMA Negeri 10 Medan. This documentation is in the form of photos, videos, school data needed for research purposes.

RESULT AND DISCUSSION

Validity Of Learning Media Based On Android Studio To Increase Student Outcome And Motivation

The validation process in this research involved the collaboration of two subject matter experts and a skilled practitioner who collectively evaluated the appropriateness and effectiveness of the student worksheets designed for enhancing mathematical communication skills through the Problem based learning model. Beyond merely gauging the suitability of these individuals in their roles as validators, their contributions extended to the invaluable provision of constructive feedback, insightful comments, and valuable recommendations aimed at enhancing the overall quality and educational impact of the evolving student worksheets. The individuals serving as validators in this study encompass:

Name of Media Expert Validation Result:

Table 2. The Result of Student's Observation in Cycle-I

No	Name	Ocupation
1	**Didi Febrian, S.Si., M.Sc.**	Mathematic Lecture at Universitas Negeri Medan
2	**Said Iskandar Al Idrus, S.Si., M.Si**	Mathematic Lecture at Universitas Negeri Medan

Table 3. Validation Result:

No	Rated aspect	Validator		V Total	Percentage (%)
		V1	V2		
Language Clarity					
1	Used Language Clarity	4	4	8	100
2	Correct use Term	4	4	8	100
3	Suitability of language to students' level of thinking	3	3	6	75
4	Ease of understanding material through the use of language	4	4	8	100
Aspects of organizing material					
5	Creative and inovative learning media	3	3	6	75
6	Easy of touch function	4	4	8	100
7	Easy to operate the Media	4	4	8	100
8	Ease of entering and exiting the program	4	4	8	100
9	Reuseable	4	4	8	100
10	Can be managed and maintained easily	4	4	8	100
11	Opportunities to expand the media towards the development of science and technology	4	4	8	100
Visual Aspect					
12	Layout text and figure	3	3	6	75
13	Suitability of background selection	3	4	7	87.5
14	Suitability if color selection	4	3	7	87.5
15	Suitability if Font selection	4	3	7	87.5
16	Attractiveness of button used	4	4	8	100
17	Accuracy of button placement	4	4	8	100

18	Image display suitability	3	4	7	87.5
19	Balance of image proportions	3	4	7	87.5
20	Design attractiveness	3	3	6	75
Average	91.875				

After The validation process in this research involved the collaboration of two subject matter experts and a skilled practitioner who collectively evaluated the appropriateness and effectiveness of the student worksheets designed for enhancing mathematical communication skills through the Think, Talk, and Write approach. Beyond merely gauging the suitability of these individuals in their roles as validators, their contributions extended to the invaluable provision of constructive feedback, insightful comments, and valuable recommendations aimed at enhancing the overall quality and educational impact of the evolving student worksheets. The individuals serving as validators in this study encompass:

Table 4. Name of Material Expert Validator :

No	Name	Ocupation
1	Elfitra, S.Pd., M.Si.	Mathematic Lecture at Universitas Negeri Medan
2	Alpimer Lumbantobing, S.Pd	Mathematic Teacher at SMA Negeri 10 Medan

Table 5. Validation Result:

No	Rate Aspect	Validator		Vtotal	Percentage		
		V1	V2				
Relevant Material Aspect							
1	Suitability of material with basic competencies	3	4	7	87.5		
2	Clearance if Learning Objective	3	4	7	87.5		
3	Suitability of material with indicator	3	4	7	87.5		
4	Clearance if material with learning objective	2	4	6	75		
5	The truth of the material concept is viewed from a scientific aspect	3	4	7	87.5		
Aspects of organizing material							
6	Clarity of the sequence of material	2	4	6	75		
7	Systematic description of material	2	4	6	75		
8	Suitability of material to learning objectives	3	3	6	75		
9	Media appeal	3	4	7	87.5		

10	Completeness of material	2	3	5	62.5
11	Material Actualization	3	4	7	87.5
12	Example Clarity	3	4	7	87.5
Aspects of practice questions					
13	Correct answer key	3	4	7	87.5
14	Clarity of question formulation	4	4	8	100
15	Correctness of the concept of the question	4	4	8	100
16	Variety of question	4	4	8	100
17	Difficulty level of questions	4	4	8	100
18	Clarity of discussion of answers	3	4	7	87.5
Language Aspect					
19	Correct use of terms	3	4	7	87.5
20	Ease of understanding the material	3	4	7	87.5
Aspects for learning strategies					
21	Encourage students' curiosity	3	4	7	87.5
22	Encourage student independence	3	4	7	87.5
23	The ability of media to increase students' knowledge	3	4	7	87.5
24	The ability of media to increase students' understanding	3	4	7	87.5
25	The ability of media to increase students' motivation	3	4	7	87.5
Average		86.5			

After Based on the findings derived from the research, it becomes evident that the methodology have attained a commendable validity score of 86,5 % a score that squarely falls within the range categorizing it as "valid" according to the established validity scale table. Consequently, these student worksheets are deemed suitable for educational use, bearing the hallmark of standard validity, thereby underlining their appropriateness for enhancing mathematical learning outcome. It is noteworthy to acknowledge that the validation panel for this study comprised two experienced lecturers and one seasoned educator, all of whom played instrumental roles in the validation process.

The validation process encompassed an intricate evaluation of multiple aspects, namely the relevant material, organizing material, practice question, language, and learning strategies. Notably, the validators not only verified the validity but also enriched the development process by contributing a wealth of invaluable suggestions and constructive input, aimed at the continuous refinement and enhancement.

Implement

Results of Assessment of Learning Effectiveness by Students

Table 6. Student pre-test

No	Indicator	Scale Alternative				Total	Percentage
		1	**2**	**3**	**4**		
	I try to be present every day to learn	**5**	11	10	9	93	66.43%
	I will feel lost if I don't take lessons	16	8	7	4	69	49.29%
	I followed the lessons in class until the lesson was finished	10	9	11	5	81	57.86%
	Whoever the teacher teaches, I still follow the lesson	12	9	10	4	76	54.29%
	I am studying again at home with a regular study schedule	22	9	3	1	53	37.86%
	To better understand the subject matter, I took the time to study again at home	21	8	4	2	57	40.71%
	It is easier for me to understand learning by using LKS media	10	5	11	9	89	63.57%
	I like learning using worksheets that are used during the learning process	11	5	9	10	88	62.86%
	I like to invite friends to discuss working on worksheets when there are difficulties	8	7	10	10	92	65.71%
	I use worksheets to study again at home	16	6	5	8	75	53.57%
	I study hard so that my dreams can be achieved	12	5	15	3	79	56.43%
	I try hard because I want to achieve the highest achievements	11	8	9	7	82	58.57%
	Achieving better performance is important to me	9	8	16	7	101	72.14%
	I am happy when I get praise from the teacher	10	8	9	8	85	60.71%
	I try to answer the teacher's questions if given additional credit	8	12	9	6	83	59.29%

No	Indicator	Scale Alternative				Total	Percentage
		1	2	3	4		
	I became more motivated to do my assignments after getting good grades	6	8	16	5	90	64.29%
	I feel satisfied if my grades are not categorized as repeated	5	12	10	8	91	65.00%
	I find it difficult to understand lessons in noisy classroom conditions	7	14	9	5	82	58.57%
	I find it difficult to understand lessons when the teacher explains too quickly	4	11	10	10	96	68.57%
	I find it difficult to study in a dirty classroom	4	14	10	7	90	64.29%
Overall Percantage							59%

Based on data from a questionnaire that was filled in by 35 students, it can be concluded that students' interest in learning is still low with a percentage of 59%

Student Posttest

Based on data from a questionnaire that was filled in by 35 students, it can be concluded that students' interest in learning is still low with a percentage of 59%

Table 7 Post-Test

No	Indicator	Scale Alternative				Total	Percentage
		1	2	3	4		
	I try to be present every day to learn	3	10	7	15	104	74.29%
	I will feel lost if I don't take lessons	6	5	5	19	107	76.43%
	I followed the lessons in class until the lesson was finished	5	4	13	13	104	74.29%
	Whoever the teacher teaches, I still follow the lesson	2	5	7	21	117	83.57%
	I am studying again at home with a regular study schedule	3	5	12	15	109	77.86%
	To better understand the subject matter, I took the time to study again at home	5	2	10	18	111	79.29%
	It is easier for me to understand learning by using LKS media	5	2	6	22	115	82.14%
	I like learning using worksheets that are used during the learning process	2	4	7	22	119	85.00%

No	Indicator	Scale Alternative				Total	Percentage
		1	2	3	4		
	I like to invite friends to discuss working on worksheets when there are difficulties	3	2	4	26	123	87.86%
	I use worksheets to study again at home	1	4	12	18	117	83.57%
	I study hard so that my dreams can be achieved	2	1	11	21	121	86.43%
	I try hard because I want to achieve the highest achievements	3	3	8	21	117	83.57%
	Achieving better performance is important to me	4	1	2	28	124	88.57%
	I am happy when I get praise from the teacher	1	1	5	28	130	92.86%
	I try to answer the teacher's questions if given additional credit	4	5	3	23	115	82.14%
	I became more motivated to do my assignments after getting good grades	5	2	6	22	115	82.14%
	I feel satisfied if my grades are not categorized as repeated	6	2	7	20	111	79.29%
	I find it difficult to understand lessons in noisy classroom conditions	7	1	2	25	115	82.14%
	I find it difficult to understand lessons when the teacher explains too quickly	4	4	2	25	118	84.29%
	I find it difficult to study in a dirty classroom	3	1	7	24	122	87.14%
Overall Percantage							82.64%

Based on data from the questionnaire that was filled in by 35 students, it can be concluded that in this post test, students' interest in learning has increased by a percentage82.64%, which was initially only 59%.

Results of Questionnaire Validity

Table 8. Teacher Questionnaire

No	Rated aspect	Answer Scale				Percent
		1	2	3	4	
	Compatibility of material with KD				✓	100%
	Clarity in the formulation of learning objectives				✓	100%
	Compliance of material with indicators				✓	100%
	Suitability of material to learning objectives				✓	100%
	The truth of the material concept is viewed from a scientific aspect			✓		75%
	arity of material description			✓		75%
	Systematic description of material				✓	100%
	Suitability of material to learning objectives				✓	100%
	Material attractiveness			✓		75%
	Material completeness			✓		75%
	Suitability of the level of difficulty and abstractness of concepts with students' cognitive development		✓			50%
	Clarity of the examples given			✓		75%
	Conformity of evaluation to material and learning objectives			✓		75%
	Correct answer key				✓	100%
	Clarity of question formulation			✓		75%
	The truth of the concept of the question			✓		75%
	Question variations			✓		75%
	Difficulty level of questions			✓		75%
	Clarity of discussion of answers				✓	100%
	Correct use of terms			✓		75%
	Ease of understanding the material			✓		75%
	Encourage students' curiosity			✓		75%
	Media support for student independence			✓		75%
	Media capabilities increase students' knowledge			✓		75%
	The ability of media to increase student understanding			✓		75%
	The ability of media to increase student motivation			✓		75%
	Appropriate display color selection				✓	100%
	Appropriateness of font selection				✓	100%
	Appropriate font size selection				✓	100%
	Accuracy of button placement Consistency of layout based on patterns				✓	100%
	Appropriate appearance of the images presented			✓		75%
	Balance image proportions			✓		75%
	Design attractiveness				✓	100%
Overall Percentage						84.09%

Based on data from the questionnaire filled out by the teacher, it can be concluded that the teacher's assessment of the media used is very satisfactory with a percentage of 84.09%

-Evaluation

The results of several evaluations from each stagefound that the SMA N 10 MEDAN level required the delivery of varied learning materials, so researchers developed learning media using Android Studio.Evaluation results were obtained from expert advice and teachers during mediatrials, sothatfromthis evaluationstage revised. Based on the results of theimplementation that was carried out by 35 students, the percentage of results was91.8% with the criteria of "Very Effective**".**

-Discussion

This research was conducted at SMA N 10 MEDAN class XI IPA-I. This research was conducted to determine the validity, practicality and effectiveness of learning media using Android Studio. This research uses the ADDIE development model which consists of 5 stages, namely analysis, design, development, implementation and evaluation.

At the analysis stage, interviews were conducted with the school so that through interviews and initial observations it was concluded that the school needed learning media. The needs analysis aims to find out the problems that exist in schools so that learning media can be developed using Android Studio. The second step is the selection of materials. The material chosen for developing Android Studio learning media is the Derivative topic.

The researcher chose the topic Derivatives. The curriculum currently used is the 2013 Curriculum. In the Core Competencies there are several basic competencies that students must achieve, including: (1) concepts and definitions of derivatives, basic derivative formulas, and operational functions. This analysis was carried out to find out what subtopics should be included in learning media using Android Studio.

After the analysis stage, the design stage includes searching for reference books for material derived from algebraic functions, example questions, mathematical terms in English as well as reference practice questions and answers contained in learning media using Android Studio and product design. Next is the development stage. The development stage is the stage of creating learning media using Android Studio. Making this learning media starts from the book cover along with the title, introduction, table of contents, materials, sample questions, student activities and closing. After the learning media using Android Studio is created, an evaluation is then carried out using a modified assessment questionnaire with a Likert scale of 1 to 4.

CONCLUSION

The conclusions that can be obtained from the research results are as follows :

1. The learning media using Android Studio on Derivative topic that has been develop edisde clare "valid" by validator with apercent age of 82.64%
2. The learning media using Android Studio on Derivative topic that hasbeen developed is declared "practical" by learning practitioners with apercent age of 91,8%%
3. The learning media using Android Studio on Derivative topic that has been develop edisde clared "effective" by student assessment with apercentage of 86,5%

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