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## DESIGN OF TEACHING MATERIALS WITH A SCIENTIFIC APPROACH ON ALGEBRAIC FORMS OF MIDDLE SCHOOL VII CLASS MATERIALS

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### ABSTRACT (10 PT)

This study aims to determine the accuracy of the product of LIP and SW teaching materials with a scientific approach to Algebraic material for junior high school students and the validity of teaching materials developed based on expert validation. The method used in this research is development research which leads to two stages of implementation, the first is to design teaching materials based on a scientific approach. And the second validates the teaching material products that have been made. The results of this study develop teaching materials that were developed after being validated by expert validators and field practitioners and supported by articles that support the results of the validation of the Learning Implementation Plan (LIP) and Student Worksheet (SW). The final criteria are good and are in the valid category. This means that the teaching materials are worthy of being tested in learning.

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## INTRODUCTION

With the development of science and technology today, humans already exist in the era of globalization with highly qualified human resources. These resource standards are obtained from work, talent, creativity, and cannot be separated from education. Education can be the main factor, education is seen as the quality of the nation, education can be very important to support and improve human resources, in learning education can be a process that really helps the community because basic education is a very appropriate tool and means. Strength in helping the community, therefore the nation that is aspired to, namely a cultured and intelligent society. In general, education is given formally with several levels, including primary, secondary, and upper education. Informal education, mathematics is usually a compulsory subject and is studied at every faculty level, mathematics can be a science used in

lifestyle, most aspects of life use mathematics, either specifically or not specifically. From school to high school, mathematics may be an important science in education. Mathematics also has important potential in supporting human resources in this globalization era. Mathematics is also important because mathematics is an efficient and efficient tool needed for various scientific fields and various fields of activity in human life.

According to Wijaya (2020), Mathematics can be a very important subject to be taught in schools because mathematics is always used as a lifestyle. Therefore, mathematics lessons should be based on mathematical concepts that lead to real life. So that students can apply basic mathematical concepts in lifestyle. In addition to the scientific field, in various activities of human life, ranging from housewives, traders, and students, they use mathematics according to their respective needs. That is why mathematics is seen as the most important subject in the curriculum of academic institutions. Suherman (2019), revealed that mathematics is the basic science of logic which contains form, arrangement, then quantity and other related concepts in large numbers and is divided into three concepts, namely: algebra, analysis, then geometry. Therefore, students are expected to have good problem solving skills to practice their critical and artistic thinking. And this is in line with the opinion of Marlina (2017), that understanding the concept is the most important part in learning mathematics.

According to Suhartini (2016), the teacher is a vital element in carrying out the educational process. As a tutor, the teacher is tasked with guiding and then fostering students to become moral, active and independent individuals. Teaching activities that are usually applied by teachers do not only teach various lesson materials to students, teaching and learning activities will run well if teachers can improve student learning activities. In learning mathematics, students are strongly influenced by various factors, both internal and external. One of them is wrong in choosing the review time in class because students tend to be more enthusiastic about learning mathematics in the morning. But that does not mean the time difference will have a bad impact. According to Laelasari (2018), the purpose of learning mathematics is the goal to carry out a process of interaction or communication between teachers and students in learning activities, to realize the goal of an education that has intellectual abilities and character, skills to present give birth to an abstraction, build facts, interpreting an idea and mathematical affirmations, connecting ideas with icons, graphs, schematics and different instruments for explanations or problems, to have the behavior of appreciating the benefits of arithmetic in life, namely having a love of data, attention, and desire to learn mathematics, and hard work . In solving a problem.

A teacher should plan in advance for each lesson. planning in learning is a very important role in integrating the teacher to carry out his duties as a tutor. To make good plans and be able to organize the process for perfect learning. Learning tools at the school level are very important to use because they can help make it easier for teachers as teachers to facilitate students so that they can make it easier when learning takes place, and can attract students' interest during learning. In most schools there are still many teachers who only use textbooks that only contain material, sample questions and a collection of questions that are classified as monotonous. Therefore, it is necessary to develop learning tools so that they can help students to find out for themselves directly, researchers view that the development of teaching materials in the form of worksheets has an important role to foster student interest in learning, especially in the subject of Algebra.

According to Kartika (2018), the concept of Algebra in ordinary everyday life may always be used, either intentionally or unintentionally, especially for those who have taken the school level, but the reality on the ground shows inappropriate results in learning the form of Algebra. According to Hasibuan (2015), that very many students always ask their teachers to repeat their explanations in every Algebra lesson and there are still many students who often

make mistakes in working on the problems given related to Algebra problems. Therefore, appropriate learning strategies and approaches are needed so that the learning of Algebraic forms can be understood by students well and meaningfully for students, one meaningful strategy so that students can play an active role in understanding the concept itself needs to be designed and developed by the teacher so that students can actively involved in carrying out learning in the classroom. Based on the results of interviews conducted by Adha & Refianti (2019), the students at Annajiyah Junior High School Lubuklinggau obtained information that SW is a tool in the learning process, which is commonly used by teachers in delivering learning. So the conclusion is that student worksheets (SW) are designs made and designed by teachers so that students can broaden their horizons and understandings in order to support learning outcomes that foster enthusiasm and interest in learning so that the learning process is more meaningful.

According to Ardina & Sa'dijah (2016), the Capacity of Student Worksheets (SW) is not only to make it easier for students to master the material but also to grow the various capacities needed by students. One of the main abilities to create is relational or communication skills. Communication is an important part because with communication we can work together with other people. According to Damayanti (2013), student worksheets (SW) are learning materials that have been made in such a way, so that students are required to get used to the material that is displayed independently. Based on the information above, that the purpose of preparing SW in learning as a whole is to show students what the goal is to achieve achievement. SW presents a grouping of steps that are useful for understanding the substance of the material in compiling and achieving the expected learning objectives and developing themselves in learning materials. Therefore, we want to update the learning tools by using model methods and learning approaches that are fun and attract students' attention. Learning methods and models that make students maximize their learning activities and emphasize active student participation to discover concepts or principles that they do not know about. previously made students active, namely creating challenging learning conditions and making students play an active role in learning both individually and in group learning. Based on the above background, the researcher conducted a study entitled "Design of teaching materials with a scientific approach to the material of Algebra for class VII SMP".

## METHOD

This research method is development research that refers to two stages of implementation, the first is to design teaching materials based on a scientific approach and the second is to validate the teaching material products that have been compiled previously. The SW (Student Worksheet) and LIP (Learning Implementation Plan) are based on a scientific approach for junior high school students which focuses on Algebraic Forms material that is adapted to the 2013 curriculum.

**Table 1.** LIP Validation Sheet Grid

Aspects Seen	Item Number	Number of Item
Conformity of Indicators of Achievement of Learning Outcomes with Basic Competencies	1	1
Clarity of Learning Outcome Achievement Indicators	2	1
Measurability of Learning Achievement Indicators	3	1
The Relationship Between Learning Outcome Achievement Indicators	4	1
The suitability of the material to be taught	5	1
The use of language in terms of the Indonesian language	6	1

rules		
Suitability of Time Allocation With Activities Performed	7	1
Suitability of Data and Learning Resources	8	1
Suitability of Learning Activation With Learning Approach	9	1
Clarity of Teacher and Student Activities	10	1

**Table 2.** Validation Sheet Grid

No	Aspects Seen	Item Number	Number of Item
1.	Hint Aspect	1, 2, 3	3
2.	Content Eligibility	4, 5, 6, 7, 8, 9, 10, 11, 12, 13	10
3.	Procedure	14, 15	2
4.	Question	16, 17	2

As for the Likert scale assessment for the analysis of the validity of the learning device as a whole. Data from the validation of experts and field practitioners by changing the assessment from qualitative to quantitative data with the provisions as presented in the following table data:

**Table 3.** Scoring Guidelines

Qualitative data	Score
Very Good (VG)	5
Good (G)	4
Pretty Good (PB)	3
Not Enough (NE)	2
Very Not Enough (VNE)	1

After all the data is collected, the authors perform calculations on the data that has been obtained using the following formula:

$$\bar{x} = \frac{\sum x}{n}$$

Keterangan :

$\bar{x}$  = Average Score of Each Component

$\sum x$  = Total Score of Each Aspect

$n$  = Number of Indicators Assessed

After knowing the calculated mean score, it is converted into qualitative data with the criteria according to Syaodih (2008)

**Table 4.** Standards for Conversion of Quantitative Data into Qualitative Data

Score	Interval	Criteria
A	$X > X_i + 1,8 S_{Bi}$	Very Good
B	$X_i + 0,6 S_{Bi} < X \leq X_i + 1,8 S_{Bi}$	Good
C	$X_i - 0,6 S_{Bi} < X \leq X_i + 0,6 S_{Bi}$	Enough
D	$X_i - 1,8 S_{Bi} < X \leq X_i - 0,6 S_{Bi}$	Not Enough
E	$X \leq X_i - 1,8 S_{Bi}$	Very Not Enough

Definition of Symbols in the Data Above:

Average ideal score ( $X_i$ ) =  $\frac{1}{2}$  (Ideal Maximum Score + Ideal Minimum Score).

Standard Deviation of Ideal Score (SBI) =  $\frac{1}{6}$  (Ideal Maximum Score – Ideal Minimum Score)

X ideal = Empirical Score

## RESULTS AND DISCUSSION

### Results

The products compiled and developed in this study are SW (Student Activity Sheet) and LIP (Learning Implementation Plans) teaching materials based on a scientific approach for junior high school students which focus on Algebraic Forms material that is adapted to the 2013 curriculum. These teaching materials were validated first as a reference whether it is worth testing or not, validation is carried out by 3 experts consisting of lecturers and teachers who have experience in teaching and have a mathematics education background which aims to obtain information, criticism and suggestions so that teaching materials based on a scientific approach to this Algebra form material are appropriate and quality in material and technical writing. The LIP validation sheet in this study consisted of 10 questions and the SW validation sheet as many as 17 questions which had a maximum score of 5 and a minimum score of 1 for each question item. For each assessor, it is seen from the LIP and SW that have been made and each validator is given a validation sheet to be filled in as needed. This validation aims to determine the extent to which the teaching materials made can be used properly in accordance with existing curriculum standards and make steps that are in accordance with the approach used. Teaching materials are made in accordance with the required curriculum standards, so that students can stay in learning corridors that are in accordance with interesting teaching materials and trigger students so that students can think critically by not leaving an attitude of togetherness to discuss with their friends to solve the problems presented.

The results of recommendations from a team of experts and field practitioners on several components of the assessment of teaching materials that are prepared based on a scientific approach the aspects assessed in the LIP validation process include a description of indicators, learning materials, learning activities/steps with the final results showing good criteria, and for aspects those assessed on the SW include aspects of instructions, aspects of content feasibility, aspects of procedures, and aspects of questions that get a final score with good criteria. The following table shows the validation of lesson plans and worksheets carried out by expert validators:

**Table 5.** Results of Validation of Learning Implementation Plans

No	Rated aspect	Score	Category
1	Conformity of Indicators of Achievement of Learning Outcomes with Basic Competencies	4,7	Good
2	Clarity of Learning Outcome Achievement Indicators	5,0	Very Good
3	Measurability of Competency Results Achievement Indicators	4,7	Good
4	The Relationship Between Learning Outcome Achievement Indicators	4,7	Good

5	The suitability of the material to be taught	4,7	Good
6	The use of language in terms of the Indonesian language rules	4,7	Good
7	Suitability of Time Allocation With Activities Performed	4,3	Good
8	Suitability of Data and Learning Resources	4,0	Good
9	Suitability of Learning Activation With Learning Approach	4,7	Good
10	Clarity of Teacher and Student Activities	4,7	Good
Average		4,6	Good

The results of the assessment of expert validators and field practitioners for the lesson plans presented in the data table above show the criteria with the final results in the good category with the average score of each question being 4.6 with good criteria, meaning that the lesson plans are valid and worth testing. try it.

Table 6. Validation Results of Student Worksheets

Aspect	Item	Validator			Total Score	IMS	Average Score	Ceriteria
		1	2	3				
Hint Aspect	1	4	5	5	41	45	4,5	Good
	2	3	5	5				
	3	5	5	4				
	4	4	5	4				
	5	4	5	4				
	6	5	5	4				
Content Eligibility	7	4	5	4	134	150	4,5	Good
	8	4	5	5				
	9	5	5	4				
	10	3	5	5				
	11	3	5	4				
	12	4	5	4				
Procedure	13	5	5	5	27	30	4,5	Good
	14	4	5	5				
	15	4	5	4				
Question	16	4	5	5	27	30	4,5	Good
	17	4	5	4				
Total					229	225	4,5	Good

The results of the validator's assessment of the SW written in the data table above shows the percentage results for each aspect, namely 4.5 and the total percentage score is in the valid category. This shows that the worksheet is worth testing.

### Discussion

The learning devices that were compiled and developed in this study used a type of design research that was disruptive at the development stage. The learning tools developed are Learning Implementation Plans (LIP) and Student Worksheets (SW) which are compiled with the steps of a scientific approach. According to Muryaningsih & Mustadi (2015), LIP is a plan

which contains a description of a learning process to achieve the core skills set in basic skills and outlined in the syllabus which aims to achieve learning success. According to Bhoke, (2021), the Student Activity Sheet contains a collection of basic exercises that must be completed by students and to strengthen students' understanding in accordance with the markers of achievement of learning outcomes that must be achieved. By using SW in learning, it will help teachers in carrying out the learning process in the classroom.

Based on research by Alsagasylukmanhakim, Alsagaf, Boisandi, IraNofitaSari, Matsun (2018), learning based on the scientific approach is more effective than traditional learning. According to Mahmudi (2015) this scientific approach combines 5 experiences in learning, specifically observing, asking questions, collecting information or trying, as well as reasoning, and communicating. And according to Sabiq (2018) learning using this scientific approach creates a learning model that requires students to do activities like a science expert. According to Wardani (2017), this ability is not too easy to be mastered by students well if previously there was no preparation given by the teacher or teacher in class. So far, teachers will generally teach students in the traditional way. The material taught is only based on books and memorizing formulas in dealing with problems. Therefore, there is nothing wrong if we have the opportunity to learn first how to learn that is liked by students. To help achieve the 2013 Curriculum, it is scientifically oriented to cultivate higher order thinking abilities.

According to Sundari (2021), scientific learning is a 5M activity, namely observing, asking, trying, reasoning, and communicating, where students play a direct role both individually and in groups to gain knowledge during learning activities while the teacher's job is as a guide and as a mediator in the learning process. learning. In other words, the Scientific Approach is a learning activity so that students are more active and independent in the teaching and learning process that takes place and the teacher functions as a facilitator in the learning process in the classroom. After compiling teaching materials in the form of Learning Implementation Plans (LIP) and Student Worksheets (SW) validation was carried out by several validators or experts. According to Astriani & BayuAIDhana (2020) teaching materials are said to be valid for use in trials if the score from the analysis of each material displayed has a minimally valid category, in other words, if the results of data analysis do not meet the minimally valid category in this study, the item will be reconsidered. before being tested.

## **CONCLUSION**

From the development of learning tools that have been carried out, it can be concluded that the results of the validation of experts and practitioners in the field of learning materials in the form of Learning Implementation Plans (LIP) and Student Worksheets (SW) based on this scientific approach are feasible to be tested in learning for class VII junior high school students.

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