

## Development of Teaching Materials on Geometry Materials to Develop Students' Critical Thinking Skills According to the Criteria for Critical Thinking 4C's

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### ABSTRACT

*This study aims to determine the development of students' critical thinking skills through LKS teaching materials on flat plane geometry for class VII SMP/MTs are valid and practical. This research is a development research using the ADDIE method (Analysis, Design, Development, Implementation, and Evaluation). The analysis technique of this study uses validity test in the form of score scores from material experts and the value of the teacher's response to LKS teaching materials which is the value of the questionnaire. Practicality test in the form of responses from students and criticism or suggestions from validators. The results of this study produce a product in the form of LKS teaching materials. Product eligibility obtained based on the results of the validation test and practicality test. Assessment by material experts gets a score by 83% with a very valid classification or very feasible to use. Response questionnaire results the teacher got a score of 87% with a very valid classification or very feasible to use. The result of the student response questionnaire got a score of 87% with a very practical classification. Based on these results it can be concluded that the LKS teaching materials are very feasible to use.*

**Keywords :** *Teaching Materials; Geometry; Critical Thinking; 4C's.*

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### INTRODUCTION

Education is one of the most important factors to improve the quality of human resources human power. Along with the development of science and technology, humans are required to have the ability to think critically, systematically, logically, creatively, reason, and work together effectively so that it can develop forward in this era of globalization (Harahap, 2017). Formal education in terms of this has an important role in the development of the things mentioned above, namely by provide quality learning. One of the most influential things in learning is the manufacture of appropriate teaching materials.

Teaching materials are one of the learning tools that can help and train students in learning. The teaching materials in question are good and interesting which can make it easier students in understanding the material presented so as to improve student learning out comes. Teaching materials are one of the most important components in the mathematics learning proses (Annisah, 2018); (Satiti et al, 2021). Thus, the mathematics teaching materials used must be in accordance with the needs of students. In this case, teaching materials can facilitate the development of mathematical critical thinking skills to the maximum.

Geometry is a branch of mathematics that is taught starting from basic education until college. Geometry is a concept that connects various fields in mathematics (Paradesa, Retni, 2016); (Wardani & Khotimah, 2020). From this it can be concluded that geometry is very important. The importance of studying geometry, namely: (a) geometry helps humans have a complete appreciation about his world; (b) exploration of geometry can help develop solving skills problem; (c) geometry plays a major role in other areas of mathematics; (d) full geometry with challenges and interesting.

Critical thinking is a clearly organized process used in mental activity such as solving problems, making decisions, persuading, analyzing a assumptions, as well as carrying out scientific research

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activities (Musafak, Sunismi, & Alifiani, 2021). Think Critical thinking is a mental activity that cannot be separated from human life (Nasrulloh & Umaradiyah, 2020). The critical thinking ability of each individual is different from one another others that need to be nurtured from an early age. Thinking occurs in every human mental activity which serves to formulate or solve problems, make decisions and seek reason (Hidayatulloh et al, 2020).

Based on researcher interviews with teachers, during the pandemic period students were less than optimal in develop critical thinking because learning is carried out online. Lots students who do not open online assignments. In addition, students also do not understand the material because many students do not open the material sent via video. To develop thinking skills critical of students, media and practical methods are needed for learning. Students are very enthusiastic and enthusiastic about learning mathematics if learning uses media/methods that are in accordance with the material and student character, as well as relaxed and fun.

Based on these problems, the writer can conclude that the problem indicates that students' critical thinking skills have not functioned effectively maximum. Therefore, researchers want to develop students' critical thinking skills on the material flat plane geometry through worksheets teaching materials. The formulation of the problem in this research is how development of students' critical thinking skills through LKS teaching materials on geometric materials that valid and practical. The purpose of this research is to know the development of thinking skills students critically through LKS teaching materials on valid and practical geometry materials.

## METHOD

This research is a research and development (*Research and Development*) . Research methods development as a research method used to produce certain products and test the practicality of the product. The product referred to in this research is teaching materials.

The purpose of this study is to determine the development of students' critical thinking skills through LKS teaching materials on flat plane geometry for class VII SMP/MTs that are valid and practical. This study uses the ADDIE model. The researcher chose the ADDIE model because the model ADDIE development is effective, dynamic, and supports the performance of this research program. Model ADDIE development which consists of five stages which include analysis, design, development, implementation, and evaluation (Sugiono, 2015). This research was conducted in the even semester at MTs Al-Ihsan Kalikejambon. As for the students who used as research subjects amounted to 30 students.

The product used in this research is worksheets teaching materials. Data collection techniques that used are interview techniques, validation techniques, questionnaire response techniques for teachers and students, and documentation. The data analysis technique used is using the validity test and test practicality. Validation test obtained from the assessment of the questionnaire by material experts and teachers. Practicality test derived from the results of student response questionnaires. Analysis of the data using the criteria of validity and the practicality of learning media, as shown in the following table:

**Table 1.** Categories of Validity and Practicality

Score Interval	Category
0% - 20%	Very Invalid/Very Impractical
21% - 40%	Invalid/Impractical
41% - 60%	Sufficiently Valid/Sufficiently Practical
61% - 80%	Valid/Practical
81% - 100%	Very Valid/Very Practical

(Sugiyono : 2013 with researcher modification)

The formulas used in the Validation Test and Practicality Test are:

$$\text{Indeks (\%)} = \frac{\text{total score}}{\text{maximum score}} \times 100\%$$

Information :

Maximum score = number of respondents  $\times$  highest score likert

## RESULTS AND DISCUSSION

Regarding the results of research that has been carried out, including the results of the validity and practicality of teaching materials LKS at MTs Al-Ihsan Kalikejambon school. These results go through the validity test and practicality test. For more details about the results of this study, it will be explained below.

### Result

Presentation of data includes data from the analysis phase (*analysis*), data from the planning phase (*design*), data on the results of the development phase (*development*), data on the results of the development phase (*implementation*) and data the results of the evaluation phase (*evaluation*).

Based on the analysis stage carried out by researchers by conducting interviews and observations during PPL activities, researchers found that during the pandemic period students were less maximum in developing critical thinking because learning is carried out online (on line). Many students do not open online assignments and also do not understand the material that has been read sent by the teacher. To develop students' critical thinking skills, media and media are needed practical methods for learning. Students are very enthusiastic and enthusiastic about learning mathematics if learning using media/methods that are in accordance with the material and character of students, as well as relaxing and fun. Based on these problems, it is necessary to develop media more active and effective learning in mathematics. Researchers will provide an effective solution by developing LKS teaching materials on geometry for class VII SMP/MTs.

At the design stage, the developed teaching materials are described in the following stages: 1) Designing parts of teaching materials, 2) Collecting supporting components, 3) Making materials teaching materials, and 4) Printing teaching materials.

At the development stage, the product design that has been prepared is developed based on the following stages: the following stages: 1) Researchers edit teaching materials to make them more communicative by adding questions related to daily activities. After that, the researcher re-corrected the result media development by asking for guidance from the supervisor before being validated, if it is appropriate then the product is ready to be validated, 2) Validation of teaching materials is carried out by material experts. The purpose of validation is to get assessments and suggestions from material experts regarding suitability of the material, and 3) After receiving input from material experts and being validated, it is known his weakness. These weaknesses are then tried to be reduced by improving the material developed teaching. The data from this development were obtained from the validation results of material experts and teachers. Based on the validity test using the validity assessment sheet instrument, the results are shown in Table 2 as follows :

**Table 2** Validity Test Result

No	Validator	Score	Total Score	Result Presentation	Category
1.	Material Expert	46	55	83%	Very Valid
2.	Teacher	57	65	87%	Very Valid
Average				85 %	Very Valid

From table 2 it is known that the average value of the results of the validity test of LKS teaching materials is 85% with very valid criteria according to the category of the level of validity. This shows that the LKS teaching materials are very worth using.

At the implementation stage, trials were carried out on class VII students of MTs Al-Ihsan Kalikejambon. During the trial, the researcher made notes about the shortcomings and constraints that still occurs when the process of developing teaching materials is implemented, besides that students also given a response questionnaire regarding the practicality of teaching materials. The researcher also gave a questionnaire to the teacher to find out the teacher's response to the LKS teaching materials that the researchers developed. Stage data This implementation was obtained based on the results of product trials on students of MTs Al-Ihsan Kalikejambon totaling 30 students. Assessment is done by filling out a response questionnaire students after using learning media. Based on the results of the response data recapitulation students can be stated that the LKS teaching materials are very practical to use in teaching and learning activities learning.

At this evaluation stage, it is carried out to analyze the media at the implementation stage there are weaknesses and weaknesses or not. The evaluation is obtained from the results of the student response questionnaire after studying geometry material using LKS teaching materials. Students show response

which is good is indicated by the validation results obtained by 87% in the Very Practical category. Evaluation is also obtained from suggestions and criticisms from students after studying geometry material using LKS teaching materials. Students show good responses and are enthusiastic about using LKS teaching materials

### **Discussion**

One of the most influential things in learning is making the right teaching materials. Teaching materials are the basis in the learning process in other words as a guide, that is the importance of this teaching material, it needs more attention in its design (Harahap, Muhammad Syahril, 2017). The success of mathematics learning objectives is strongly influenced by the teaching materials used. Based on the explanation above, we can know that the role of a teacher in designing or compiling teaching materials is crucial to the success of the learning and learning process through a teaching materials.

In designing teaching materials, there is one very important stage, namely the test validation. Validation test is carried out as an effort to produce good and relevant teaching materials on the basis of development theory. It is also important to do a practicality test that the learning media is practical when used in the learning process.

Based on the results of the analysis of the validation sheet instrument carried out by material experts and teachers obtained an average validation value of 85% with very valid criteria. This shows that LKS teaching materials made are suitable for use by educators and students in the learning process.

Judging from the results of the material expert validation, it was declared very valid by the validator with a value of 83%. Thing This shows that the material contained in the LKS teaching materials on geometry material is appropriate with indicators and learning objectives to be achieved. This LKS teaching material can make it possible students to develop their critical thinking skills in mathematics. This teaching material too can train students to practice problems and solve problems.

Judging from the results of teacher validation, it was declared very valid with a value of 87%. This shows that the material contained in the LKS teaching materials is in accordance with the needs of students. This shows that the LKS teaching materials are feasible to be developed.

In addition, in terms of the results of the student response questionnaire, it shows that the LKS teaching material is very practical with a value of 87%. It can be concluded that students accept and respond to good with the LKS teaching materials.

Overall the LKS teaching materials have met the very valid and very practical category with 85% value. However, small revisions are still made to improve the learning media according to with suggestions that have been given by validators from material experts, subject teachers, and students. The revision action taken was by adding contextual questions. This matter is done so that the learning media developed can be used properly in learning. The following is a display of LKS teaching materials developed by researchers:



**Figure 1.** Display Of LKS Teaching Materials

### **CONCLUSION**

This development research produces a product, namely LKS teaching materials which are packaged in a book form. This research was developed using the ADDIE model. Development style It has 5 stages consisting of analysis, design, development, implementation, and evaluation. The material discussed in

this teaching material is the geometry of quadrilaterals. This teaching material equipped with material content and practice questions.

Based on the results of the development that has been carried out, the final product of development research is a worksheet for teaching materials on geometry. The research conducted is a type of research development or *Research and Development (R&D)* using the ADDIE model. The *analysis* stage is carried out by observations were made during PPL activities and interviews with mathematics teachers at school to be studied. Interviews were conducted to determine the need for media development learning. At the *design* stage, it is done by *designing* parts of teaching materials, collect supporting components, make teaching materials, and print materials. Step *development* is done by validation to material experts and teachers. Next step is carried out *implementation* by conducting product trials to students of MTs Al-Ihsan Kalikejambon which amounted to 30 students by providing a response questionnaire to students on the media developed learning. The last stage is the *evaluation* stage, this stage is carried out to find out whether the teaching materials made are in accordance with the objectives or not by looking at the results questionnaire data validity and practicality.

The feasibility of the product was obtained based on the results of the validation test and practicality test. Rating by experts the material got a score of 83% with a very valid classification or very feasible to use. The results of the teacher's response questionnaire got a score of 87% with a very valid or very feasible classification used. The results of the student response questionnaire got a score of 87% with a very high classification practical. Based on these results, it can be concluded that the LKS teaching materials are very feasible to used. The advantages of LKS teaching materials on geometry material are: (1) teaching materials can used by students wherever and whenever, (2) the material presented is easy to understand, (3) contains KI, KD, and Indicators, and (4) trains students to practice questions. LKS teaching materials that have been developed also has several weaknesses, namely the material is only limited to geometry only.

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