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DEVELOPMENT OF LIVE LIVEWORKSHEETS-ASSISTED TEACHING MATERIALS USING A PROBLEM-BASED LEARNING MODEL ON STUDENT'S LEARNING OUTCOMES

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ABSTRACT
Interactive learning can be one solution to attract students' interest in participating in learning activities and help to answer the problem of students' low understanding of mathematics. Liveworksheet is a platform that can be used in the educational sector. This research aims to produce teaching materials that are valid, practical and have the potential to influence improving student learning outcomes. The research method used is the design research model development studies method which aims to develop a product. The subjects of this research were 42 class X students of a private vocational school in the city of Cimahi. The liveworksheets-assisted teaching materials developed are adapted to the steps of the problem-based learning model. First, students are introduced to a contextual problem and then guided through questions that allow students to conclude the results of their analysis. The teaching materials developed have gone through a validation stage from material experts, meaning that the teaching materials are in accordance with the material to be taught. The research results showed that the teaching materials developed were proven valid based on the assessment results of two material expert validators and were proven practical from the results of one-on-one and small-group tests. Data analysis used in this research uses inferential statistics with the type of processing of two dependent samples. The teaching materials developed have been proven to be able to improve students' mathematics learning outcomes when viewed from the Minimum Completeness Criteria.
Keywords: Problem-Based Learning, Student Learning Outcome, Teaching Materials

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PRELIMINARY

Mathematics is one of the Required subjects studied by students To use support in life daily. In fact, mathematics is Still become Subjects considered difficult for students that influences understanding student to Mathematics subjects. Understanding students' eyes lesson mathematics Can be categorized as low. According to Amintoko (Diana et al., 2020), students' low ability to understand mathematical concepts can be caused by several factors, both teacher external factors and student internal factors. In accordance with research

conducted by Oktaviani (2020), shows that there are several factors that cause low student learning outcomes, namely (1) six out of ten people do not like mathematics; mathematics is considered difficult because they do not understand the concept, (2) six out of ten people call the lesson boring; explanations can be understood according to how the teacher explains, (3) five out of ten people answered that they did not ask questions during learning because they were embarrassed. Meanwhile, the ability to understand mathematics is very necessary for everyday life. Simple things about using mathematical concepts include comparing pocket money, calculating the weight of objects, and various other disputes. Mathematics also subconsciously plays a very important role in resolving conflicts between people (Tampubolon et al., 2019). According to Buyung et al., (2022), several causal factors students experience difficulty in Studying mathematics are attitudes and interests of low students. The low-interest students in mathematics subjects cause students to become No like lesson mathematics so that student become not pay attention to the teacher when lesson mathematics taking place. To overcome the things mentioned above, teaching materials that provide stimulus to students and create learning become more pleasant.

According to *the National Center for Competency-Based Training* (Putra, 2019) Teaching materials are all forms of materials used to help teachers or instructors in carrying out the learning process. The teaching materials created also have good benefits for teachers and students to support learning activities. According to Sofan (Legendari & Raharjo, 2016) The benefits of teaching materials for teachers are:

a) Teaching materials are obtained that are by curriculum demands and by students' learning needs.
b) No longer dependent on textbooks which are sometimes difficult to obtain.
c) Enriching because it was developed using various references.
d) Increasing teachers' knowledge and experience in writing teaching materials.
e) Building effective learning communication between teachers and students because students will feel more trust in their teachers.
f) Increase the credit number if collected into a published book.

Meanwhile, according to (Lestari, 2018), the benefits of teaching materials for students are that learning activities become more interesting, have the opportunity to learn independently reduce dependence on the teacher's presence, and make it easier to learn each competency that they must master. The teaching materials created must also be under the curriculum and technological advances. Good and correct teaching materials are teaching materials that are

in accordance with the curriculum and in accordance with the characteristics of students (Fajri, 2018). The curriculum currently used is the independent curriculum where the curriculum focuses more on learning activities and is more focused on students for exploration. The independent curriculum, which was born to overcome educational problems during this endemic era, formulated several new policies that conceptually provide freedom for both institutions and students in implementing the learning process. (Ardianti & Amalia, 2022). According to Sartini & Mulyono (Syaripudin et al., 2023), the aim of implementing an Independent curriculum is actually to prepare teachers to be able to compete in 21st-century learning. In the 21st century, teachers must be more literate in using technology to support learning activities. So the teaching materials are designed using technological assistance called *liveworksheet.*

Liveworksheets is a service in the form of a free website to help teachers create interactive teaching materials and change from print media to online media. Meanwhile, according to (Fauzi et al., 2021) Liveworksheets is a platform in the form of a website that provides services for educators to be able to use the available teaching materials and make the E-teaching materials themselves interactive online. According to Andriyani, Hanafi, Safitri, & Hartini (Amalia & Lestyanto, 2021). According to (A. B. Lestari, 2022) several advantages of using liveworksheets: 1). Easy to operate with a mobile phone; 2). Can be accessed anywhere and anytime; 3). Increase students' interest in learning; 4). Makes it easy to study the material; 5). Make it easier for teachers to give assignments. *liveworksheets* have advantages for teachers and students. The advantage for teachers is that it saves time and paper, while for students it is interactive and motivating. The teaching materials developed use liveworksheets with the aim of making the teaching materials more interactive and saving paper usage. Apart from using the help of live worksheet technology, this material also uses *problem-based learning* model steps with the hope that students can more easily achieve the ability to collaborate, communicate, be able to think critically, and be more creative and innovative.

According to Susanto (2020), based on expert opinion, he concluded that the *Problem-Based Learning model* is a learning model that seeks to apply problems that occur in the real world as a context for students to practice how to think critically and gain skills in problem-solving and is unforgettable. to gain important knowledge and concepts from the teaching material discussed. The PBL model was chosen because it has several advantages, including 1) The problem-solving provided can challenge and awaken students' critical thinking skills and provide satisfaction in discovering new knowledge, 2) Learning using the

PBL model is considered more fun and is more liked by students, 3) The PBL model can increase student activity in the learning process, and 4) The PBL model can provide students with the opportunity to apply the knowledge they have in the real world (Susanto, 2020). This is because the problem-based learning model has steps that can guide students to think critically. As for (Novelni & Sukma, 2021) The steps for the problem-based learning model are as follows. 1). Student orientation towards problems; 2). Organizing students to study; 3). Guiding students in individual and group investigations; 4). Develop and present students' work; 5). Analyze and evaluate the problem-solving process. The use of teaching materials designed with the help of technology and also *problem-based models* of *learning* is expected to improve student learning outcomes.

Mathematics learning outcomes are the final results that students have or obtain after experiencing the mathematics learning process which is marked by a scale of values in the form of letters symbols or numbers, and this is usually used as a benchmark for whether the student is successful or not in learning mathematics (Sembiring & Mukhtar, 2013). From the narrative We can create and develop teaching materials by utilizing live worksheets and using the expected problem-based learning model can increase results for Study students. But in fact, the field is rare very learning uses teaching materials that apply technology and use a problem-based learning model. In accordance with the results research conducted by Zayyadi et al., (2017), mention that is one of the factors reason minimal use based teaching materials technology ie lack of knowledge they in use application computer For create a media-based technology. Leave from the advantages and benefits of teaching materials, however lack of use-based teaching materials technology, the researcher intends For float teaching materials assisted teaching materials liveworksheet using a problem-based learning model to increase results study students.

METHODS

This research focuses on developing teaching materials sequence and series to help Liveworksheets use the approach of *Problem-Based Learning* to results Study student mathematics. This research is a design research type *development study*. Development study is an activity to develop design principles for areas of practical use. Development research is carried out in two stages, namely the preliminary design stage and the formative evaluation (Purwitaningrum & Prahmana, 2021). At the stage preliminary researcher does three stages ie stage preparation, stage analysis, and design stage. At stage preparation, the researcher determines the place and subject of study. Study This is located in one School Menengan

Vocational Private Sector in Cimahi City with subject 42 students class X. Next, the researcher do stages analysis. At this stage, This researcher analyzes characteristics that made students subject to research, starting from the curriculum used until the analysis material that will tested. After do stages of preparation and analysis furthermore researcher does the design stage. At the research design stage teaching materials are adjusted rows and series with the curriculum used, characteristics of students, and also depth of the material presented is obtained from stage analysis.

After the stage preliminary, the next is entering the formative evaluation stage. The formative evaluation stage consists of self-evaluation, prototype (expert review, one-to-one, small group), and field test. The data collection technique (Self-evaluation) is used in research. This uses observation, interviews, and tests cognitive material sequence and series. Interview done For see the characteristics of students, the curriculum used and also used For see the extent of the material the rows and series conveyed to the student. Expert review on research This was done by 2 material experts who already have an understanding of teaching and also the material of sequences and sequences. Observations were carried out to see the level of practicality of the teaching materials developed during one-to-one and small groups. Test cognitive (field test) is carried out To see the effectiveness of the developed teaching materials on student learning outcomes in sequence and series material.

RESULT AND DISCUSSION

Preliminary design

In stages, preliminary design research do three stages that is stage preparation , stage analysis and ending with design stage. At stage preparation, researcher do search and determine the subject to be used during the research process. From the results search for that subject researcher take students on one School Intermediate Surprise Private sector in Cimahi City. After determine subject to be used during the research process, next researcher do analysis to that subject. Analysis carried out covers analysis curriculum used, analysis activity learning up to the analysis understanding student related material to be tested. After do stages preparation and stages analysis, next researcher create a design for teaching materials developed and adapted with results analysis on the subject study.

Formative Evaluation

After researcher do stages plimanary design, next ie do stages formative evaluation. In stages formative evaluation, researcher do three stage study ie self evaluation, prototype (expert review, one-to-one, small group), and field test. The first step to take researchers in

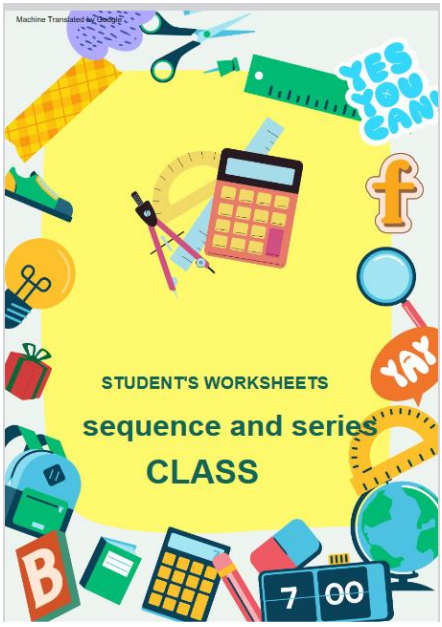
formative evaluation, namely self-evaluation. In stages self evaluation, designed teaching materials in accordance with The results of the analysis were assessed by the researchers themselves regarding the suitability between the designed teaching materials and the steps of the problem based learning approach. The results of the self-evaluation stage are called prototype 1.

Prototype 1 teaching materials were carried out validation by experts is called expert review. The validation stage is carried out to see the suitability of teaching materials in terms of content, construct and language. The characteristics of teaching materials in terms of content are the suitability of the material to the elements and achievements in curriculum independent as well as there is element Strengthening Profile Existing Pancasila students in the teaching materials. Meanwhile, the characteristics of teaching materials are seen from the construct, namely the suitability of teaching materials with the steps of the broblem based learning model. And the teaching materials developed must use good and correct language in accordance with EYD as well sentences used easy to be understood and not ambiguous. Following is comments /suggestions provided by relevant validators developed teaching materials. After The teaching materials are reviewed by experts and stated worthy to be tested, the next step taken by the researcher namely one-to-one test. An on-to-one test is performed For see clarity of language used in designed teaching materials as well as For see difficulties student For finish the teaching materials. Comment from students who describe difficulties experienced and input from expert will become consideration researcher in repair the teaching materials. Suggestions/comments from the validator is presented in the table below This.

Table 1. Validator Comments

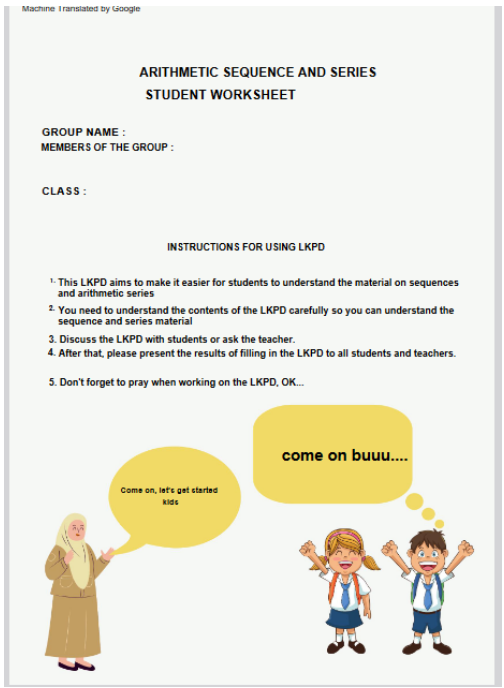
Number	Comments / Suggestions	Revision Decision
1.	Add question at the end created teaching materials For confirm understanding students on the material presented	Addition questions in section end teaching materials
2.	There is Lots error in writing vocabulary	Repair writing vocabulary
3.	There are no steps yet in the teaching materials suit with characteristics of the problem based learning model, especially in section organize student	Adapt return steps teaching materials with characteristics of the problem based learning model
4.	Sentences used in question too long-winded	Change use sentence in question become more concise and easy understood

The following is a student worksheet design that uses a problem based learning approach assisted by liveworksheets.



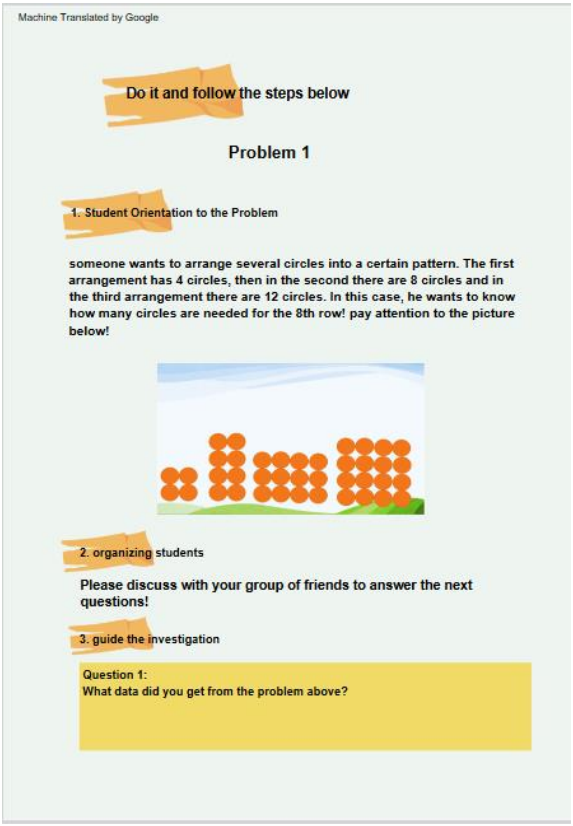
Picture 1. Cover of teaching materials

Figure one shows the cover of the Teaching Materials that was created and contains the material to be studied.



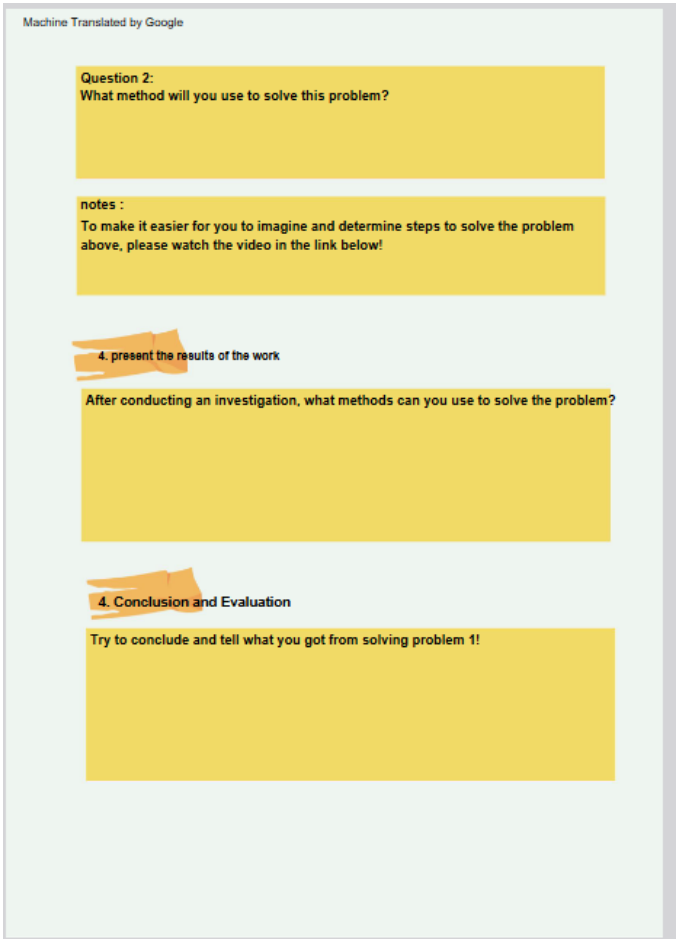
Picture 2. Identity and Instructions for Using Teaching Materials

Picture two shows the second page of the student's worksheet which contains information about filling in the identity and instructions for using the Teaching Materials assisted by liveworkshets.



Picture 3. Steps to The Problem-Based Learning Model

The third image shows the third sheet of the Teaching Materials which is filled in with the steps for completing the Teaching Materials by students according to the syntax of the Problem-based learning model. The problem-based learning steps on the third page contain steps for student orientation towards problems, where an example of a contextual problem is presented, and students are asked to analyze and understand the problem. Apart from presenting certain questions, there are also pictures of patterns showing arithmetic sequences. After that, there is the next step, namely organizing students where students are asked to form a group in the process of completing the Teaching Materials. Then there is the stage of guiding the investigation where students are asked to answer questions systematically to make it easier for students to collect data from the analysis results.



Picture 4. The Final Step of The Problem Based Learning Model

The fourth image shows the fourth page of the Teaching Materials that was created. This page displays the final step, namely drawing conclusions and student discoveries during the observation process.

After the materials have been revised according to input from experts, the teaching materials are then tested on small groups called small groups. Small groups consist of 4 students woman and 2 students man . Small groups were conducted to see the practicality of the teaching materials being developed. At this stage students are asked to solve problems in the teaching material by means of discussion. After students have finished working on the teaching materials, they are given an observation sheet to see students' responses regarding the teaching materials developed and students' difficulties in solving problems in the teaching materials. Input from students will made consideration researcher in do improvements to the teaching materials. Teaching materials that have been resolved called with prototype 3. The results of the small group test are as follows:

Table 2. Small Group Test Results

Number	Indicator	Item Number	Percentage
1.	Aspects of content suitability	3, 9,10, 13, 18, 19	72.5%
2.	Aspects of appropriateness of presentation	5, 6, 8	63.3%
3.	Aspects of appropriateness of teaching materials according to BNSP	1, 2, 4, 7	82.5%
4.	Aspects of suitability to the approach	19, 15, 14	73.3%
5.	Aspects of suitability to students' cognitive abilities	16, 20, 11, 12, 17	68%
	Average		71.92%

Table 2 shows results from small group test data processing. In that table can seen that the average rating students on the developed teaching materials amounting to 71.92%. With results the can interpret that proven teaching materials practical For used student in the learning process.

The next stage is the field test. Prototype 3 teaching materials were tested on class X students at one of the private vocational schools in the city of Cimahi. Results of data processing obtained from failed test can seen in table 3.

Table 3. Field Test Processing Results

Number	Indicator	Number Item	Percentage
1.	Asepek appropriateness fill	3, 9,10, 13, 18, 19	79.38%
2.	Aspect appropriateness presentation	5, 6, 8	79.58%
3.	Aspect appropriateness teaching materials according to BNSP	1, 2, 4, 7	78.75%
4.	Aspect suitability with approach	19, 15, 14	82.1%
5.	Aspect suitability with ability cognitive student	16, 20, 11, 12, 17	77%
	Average		79.36%

Table 3 shows that the average rating student to developed teaching materials amounting to 79.3%. That matter showing that created teaching materials proven practical and possible used student in activity learning in the classroom.

Assisted teaching materials liveworksheets use approach Problem based learning was used in 3 meetings. The first meeting used teaching materials that discussed arithmetic sequences and series and consisted of 4 contextual questions related to arithmetic sequences and series. The second meeting discussed geometric sequences and series, which contained four contextual questions regarding geometric sequences and series. Then at the third meeting, a series and sequence material test was held to see student learning outcomes after using the developed teaching materials.

a. Description of The Use of LiveWorksheets Assisted Teaching Materials

The learning process uses teaching materials that have been implemented in the field test stage. Learning begins with the opening of activities by the teacher which includes checking student attendance, instructing students to pray, together with the students carrying out Al-Qur'an recitations and delivering an apperception. The next stage is that the teacher conveys the material to be studied and conveys the learning objectives of the most important material and conveys a little about the learning model that will be applied. Next, the teacher provides a link to access students' worksheets using LiveWorksheets. After students have finished opening the worksheet that has been created using the link shared, the teacher asks students to fill in their identity and read how to use the worksheet. After that, students are asked to study the contextual problems presented in the worksheet. The next stage is forming groups consisting of 3-4 students in one group. After that, students together with their group of friends answer guided questions on the worksheet. After students have completed all the questions, the final step is to conclude and evaluate the discussion process. The teacher together with the students reflects after the entire process of using the worksheet is complete. The use of the PBL model in the learning process becomes more active and enjoyable for students because students understand more about things they often experience in everyday life (Nurkhasanah et al., 2019). Apart from making learning more active, the use of the problem-based learning model also guides students to think more critically. Learning using the problem-based learning model makes students more able to think critically in the steps of designing solution methods. In designing problem-solving methods, students must be able to think about what steps are important and support each other to be able to solve the problems they face (Yusri, 2018). During the learning process, students appear active and more interactive in solving problems in the teaching materials.

b. Student Learning Outcomes Use Teaching Materials Assisted by Live Worksheets With *Problem-Based Learning Models*

Learning outcomes are a representation of student learning outcomes. Learning outcomes are actions and performances that contain and reflect the competence of students who successfully use content, information, ideas, and tools in learning (Nurhasanah & Sobandi, 2016). Therefore, learning outcomes can be defined as the competencies and skills that students have after the learning period Student learning outcomes after using the developed teaching materials and before using teaching materials can be seen in the table below:

Table 4. Learning outcomes Student

Number	Name	Pre-test	Post-test	Number	Name	Pre-test	Post-test
1	US	33	75	13	MRZ	50	83
2	AF	58	79	14	MFM	40	75
3	ACS	58	75	15	MM	55	75
4	A	33	75	16	NA	45	80
5	AY	50	80	17	NO	68	80
6	BP	48	79	18	R.K	60	80
7	DF	38	75	19	RN	45	80
8	DFM	-	80	20	RFA	X	75
9	DCA	50	80	21	R.A	65	75
10	DJ	68	80	22	SPF	33	75
11	FEK	40	75	23	STM	63	80
12	GNW	65	80	24	SNFs	28	80
Pre-Test Average							50
Post-Test Average							78

The data that has been obtained is then processed using the SPSS application with two independent sample statistics. The hypothesis is as follows:

a. $H_0 = \mu_1 = \mu_2$

The learning outcomes of students who use teaching materials are not better than students who use ordinary learning.

b. $H_1 = \mu > \mu_2$

The learning outcomes of students who use teaching materials are better than students who use ordinary learning.

Table 5. Data Normality Results

		Mark
Most Extreme Differences	Absolute	,823
	Positive	,823
	Negative	-.029
Kolmogorov-Smirnov Z		3,366
Asymp. Sig. (2-tailed)		,000

Based on table 3, shows the results of the two independent sample tests Based on Figure 1, which shows results The test statistic for two independent samples in the 2-tailed Asymp significance section is 0.000, which means H_0it is rejected because it is less than 0.05 and H_1 accepted (Sugiyono, 2019). It can be concluded that the learning outcomes of students who use teaching materials assisted by liveworksheets with a problem-based learning approach are better than students who use a conventional approach. This means that the teaching materials developed can improve student learning outcomes. Learning using the

problem based learning model can indeed improve student learning outcomes. However, due to using teaching materials assisted by live worksheets, students must have adequate equipment.

CONCLUSION

The researcher can conclude that based on this research and the discussions that have been carried out, this research has produced teaching materials assisted by live worksheets with learning steps using a problem-based learning model for vocational school student learning outcomes that are proven to be valid and practical. The teaching materials developed have also been proven to have a potential effect on students' mathematics learning outcomes. Student learning outcomes before using the developed teaching materials got an average of 50 while the average student learning outcomes after using teaching materials got a score of 78. The results of data processing from 2 independent samples also showed that the learning outcomes of students who used teaching materials were better than the results students who do not use teaching materials.

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