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THE DEVELOPMENT OF CONTEXTUAL APPROACH E-MODULES TO IMPROVE STUDENTS' MATHEMATICAL PROBLEM SOLVING ABILITY ON JUNIOR HIGH SCHOOL

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ABSTRACT

This study aims to develop an E-Module that can be used by teachers to support the learning process so that students more easily understand material in interactive mathematics at SMPN 4 Cipeundeuy. In order to do so, this research using research and development (Reaserch and Development) with the 4D development model (Define, Design, Develop, and Disseminate). Research conducted using this model is limited to step 3 (Define, Design, Develop) due to time and cost constraints during the research. The subjects of this study were class IX students for limited trials and class VIII students for wide trials. The data that has been collected is then analyzed using Microsoft Excel. The results of the study on the feasibility of teaching materials were seen from the results of the assessment of lesson plans, worksheets, and media with a percentage of 93.80% and the results of assessments by two mathematics teachers with a percentage of 89%. Teaching materials were tested for practicality using a student response questionnaire with a percentage of 90%. Thus this teaching material can be implemented and can be used. The results of this study can be categorized as valid, practical, and very feasible because they have received a good due diligence.

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INTRODUCTION

The importance of problem solving abilities in various fields of science, especially in mathematics because it can train students to think in solving problems and can increase student learning activities, therefore, mathematical problem solving skills must be owned by every student. Actually, when students are faced with a problem, they will find something new that can develop their knowledge. This is confirmed by Mulyasa's statement (2021) which says, "if students/learners are faced with a problem, in the end they not only solve problems, but also learn something new".

Basically the ability to solve mathematical problems is an important mathematical ability and needs to be mastered by students who study mathematics. The rationale underlying the truth

of this statement include: a) Mathematical problem solving is an ability listed in the curriculum and learning objectives of mathematics (Kemendikbud RI, 2006; Kemendikbud RI, 2013), NCTM, 1995); b) In fact, according to Branca (in Hendriana et al. (2014) and Setiawan & Sari (2018) problem solving is one of the abilities that must be mastered by students, therefore problem solving is called the heart of mathematics.

Apart from that, problem solving is a basic ability in learning mathematics; c) Mathematical problem solving helps individuals think analytically; d) Learning to solve mathematical problems is essentially learning to think, reason and apply the knowledge that you already have; e) Mathematical problem solving helps think critically, creatively, and develop other mathematical abilities. Thus the ability to solve problems is very important in mathematics, not only for those who will later study or study mathematics, but also for those who will apply it in other fields of study and in everyday life (Alhaddad, 2012; Hidayat & Sariningsih, 2018; Muchlis et al., 2018; Wahyu, 2014; Widada, 2016; Yusdiana & Hidayat, 2018; Zakiah et al., 2018).

According to Fauziah (2010), the reality in the field shows that students' mathematical problem solving abilities, especially junior high school students, are still low. The 1999 report showed that junior high school students' abilities were relatively better in solving questions about facts and procedures, reasoning, ability to understand mathematical problem solving and other abilities well and were able to take advantage of the usefulness of mathematics in life. Based on observations made at the school, it is known that mathematics learning is going quite well. However, in the ongoing learning process students are less actively involved in learning activities. This makes learning activities less meaningful for students.

In fact, learning will be more meaningful if children/students "experience" what they learn, not "know" (Saefudin & Berdiati, 2014:20). This is because the teaching materials used do not help students in constructing their own knowledge. In addition, it is known that several schools in the implementation of learning still use teaching materials purchased from publishers which tend to contain material summaries and a collection of questions. This is not used effectively in the teaching and learning process, because good teaching materials are teaching materials that are able to facilitate students to understand and construct their own knowledge through the activities carried out.

In response to this, existing teaching materials should be optimized again. Things that can be done include developing teaching materials with varied learning approaches. In this case, teaching materials will be as useful as they should be if they are adapted to the characteristics of students as a reference for learning and developed based on a learning approach. This learning approach is chosen by considering the conditions and needs of students, and it is hoped that students can construct their knowledge according to themselves. The teaching materials developed should make it easier for students to understand the subject matter. One of these learning approaches is the contextual approach.

Based on the problems above, researchers think that E-Module Development with a contextual approach to improve mathematical problem solving abilities is suitable for use, because the contextual approach can help students understand teaching material by relating it to students' real life contexts which are based on the main principles of the contextual approach which include : constructivism, questioning, inquiry, learning community, modeling, reflection and authentic assessment. Therefore, researchers developed an E-Module based on a contextual approach to junior high school students' mathematical problem solving abilities so that students are able to solve mathematical problems on flat-sided geometric material.

METHOD

This research was conducted at SMP Negeri 4 Cipeundeuy which is located in West Bandung Regency. The subjects in this study were 10 students in class IX and 30 students in class VIII. The research was carried out for 2 days, starting from March 20-21 2023. The type of research used was development research (R&D) with a 4D development model (Define, Design, Develop, Disseminate).

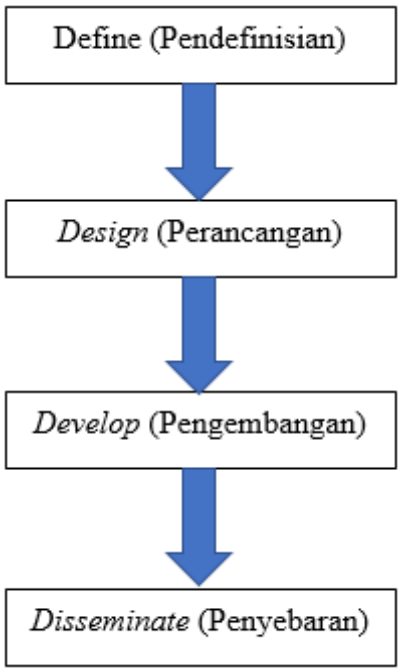

Figure 1. 4D Development Model Source: (Thiagarajan 1974)

Research conducted using this model is limited to step 3 (Define, Design, Develop) due to time and cost constraints during the research. The interview process was carried out before carrying out research on flat-sided geometrical teaching materials using a contextual approach assisted by a geogebra powerpoint. This aims to obtain data regarding the material that must be taught, the learning objectives to be achieved, and the teaching materials used by students so far. This research also requires information about whether school facilities support the learning process. As a source of information for this interview, the mathematics subject teacher, the curriculum representative for SMP Negeri 4 Cipeundeuy. Validation of experts, validation of learning outcomes test questions, and results of manuals for use by experts. The validators are lecturers in the Mathematics Education Study Program, FPMS IKIP SILIWANGI and Mathematics teachers at SMP Negeri 4 Cipeundeuy.

The questionnaire method is a measuring tool for measuring student responses after learning with the E-Module. The instrument for this questionnaire method consists of the ease of understanding the material in the media, the level of enjoyment and saturation of students using learning media, then repeating learning and the level of motivation of students after using learning media.

Data processing procedures for all data for this study were collected using Microsoft Excel in the form of: 1) Descriptive statistics to describe the stages of the development process and constraints during development, 2) Inferential statistics to see the feasibility of product effectiveness. Perform data processing analysis which will later be used to formulate research results. The results of this analysis are the answers to the existing problems. This deep data processing analysis is the result of expert validation of the learning media assessment

evaluation instrument. Analyzing the result data from the expert team validation using a Likert scale. The percentage of validation results is calculated using the following equation:

$$P = \frac{\sum x}{\sum x1} \times 100\%$$

Information:

P : Desired percentage

$\sum x$: Total score of respondents' answers as a whole

$\sum x1$: Maximum total score overall

100% : Constant

Benchmarks are used to present validation scores

Table 1. Product Validation Criteria

Presentase	Criteria	Interpretation
81%-100%	Very Worth it	The product can be used immediately without repair
61% - 80%	Worthy	The product can be used with minor repairs
41% - 60%	Decent Enough	Products can be used with many improvements
21% - 40%	Not Yet Eligible	Products can be used with many improvements
0% - 20%	So inadequate	Product cannot be used

RESULTS AND DISCUSSION

Results

The results of this study aim to develop a flat sided e-Module. In addition to producing an interactive E-Module, researchers also want to see the feasibility of learning media used in the learning process. The results of research and development with 4D models which are limited to step 3 (Define, Design, Develop) are explained as follows:

Define

The analysis carried out in the mathematics curriculum for grade VIII Junior High School is about the flat sided geometric shapes which will be designed using Filip. Because the flat sided geometric material must be explained with reasoning and understanding. To understand the flat sided geometric shapes, it is necessary to develop interesting teaching materials so that students can understand the concept because students will not be able to use props enough because most students find it difficult to understand the steps that must be done With the teaching materials that will be developed, it is hoped that it will make students understand more about the steps in the flat sided space building material.

Student character analysis was carried out by interviewing the teacher of class VIII at SMP Negeri 4 Cipeundeuy, namely Mr. Teguh Wiryanto, S.Pd and interviewing several class VIII students, namely two of them Ahmad and Restu, the interview results explained that the E-Module needed to be used to support delivery of material to students in class. The method used by the teacher in learning mathematics is the method of discussion, question and answer, group work. It can help teachers to explain material to students, but students are currently happy with technology. Because students like technology such as computers and cellphones, students themselves have a very high curiosity. With this E-Module students will be interested in learning and will not feel bored with the learning material that will be delivered. The teacher's opinion about this E-Module is very good, because it is able to help teachers in the learning process to be more practical and able to build student learning motivation. different.

An analysis of student needs was carried out to obtain the result that teaching materials are truly valid in learning mathematics. The results obtained for students are that students are

students with all different characters and abilities. The learning objectives to be achieved by the teacher should pay attention to the needs of students according to their character. The teacher is not only the dominant party in controlling learning in class because every student has curiosity, the ability to express opinions and needs learning that attracts his attention so that students' interest in learning grows. The abilities possessed by these students require interactive teaching materials, namely E-Modules. Observations were made on learning at SMP Negeri 4 Cipeundeuy, it was seen that during the lesson the teacher had not used interactive teaching materials (E-Modules).

Design

The next stage after defining is product design. The steps in designing media in the E-Module are 1. Gather reference materials and sources; 2. Designing the concept of media teaching materials with E-Modules; 3. Develop an outline of the contents of the learning media by making a design as a basic description of the entire learning media that will be made including the title, main menu, material to be conveyed in the learning media. At the stage of collecting materials and reference sources, researchers look for references from electronic media as materials for designing this learning media. The stage of designing the concept of learning media with E-Modules is carried out after obtaining materials and reference sources and based on the results of discussions with the supervisor. Furthermore, during the stage of compiling an outline of the contents of the learning media with the E-Module by making a design as an overview of the entire media to be made including: determining the media title, the main menu, and the material to be conveyed in the media.

E-Module Design; this is in accordance with the results of the analysis of learning conditions in schools which rarely use e-modules in every learning process, at this stage the selection of e-modules is also adjusted to the objectives of developing e-modules which can later assist the development process.

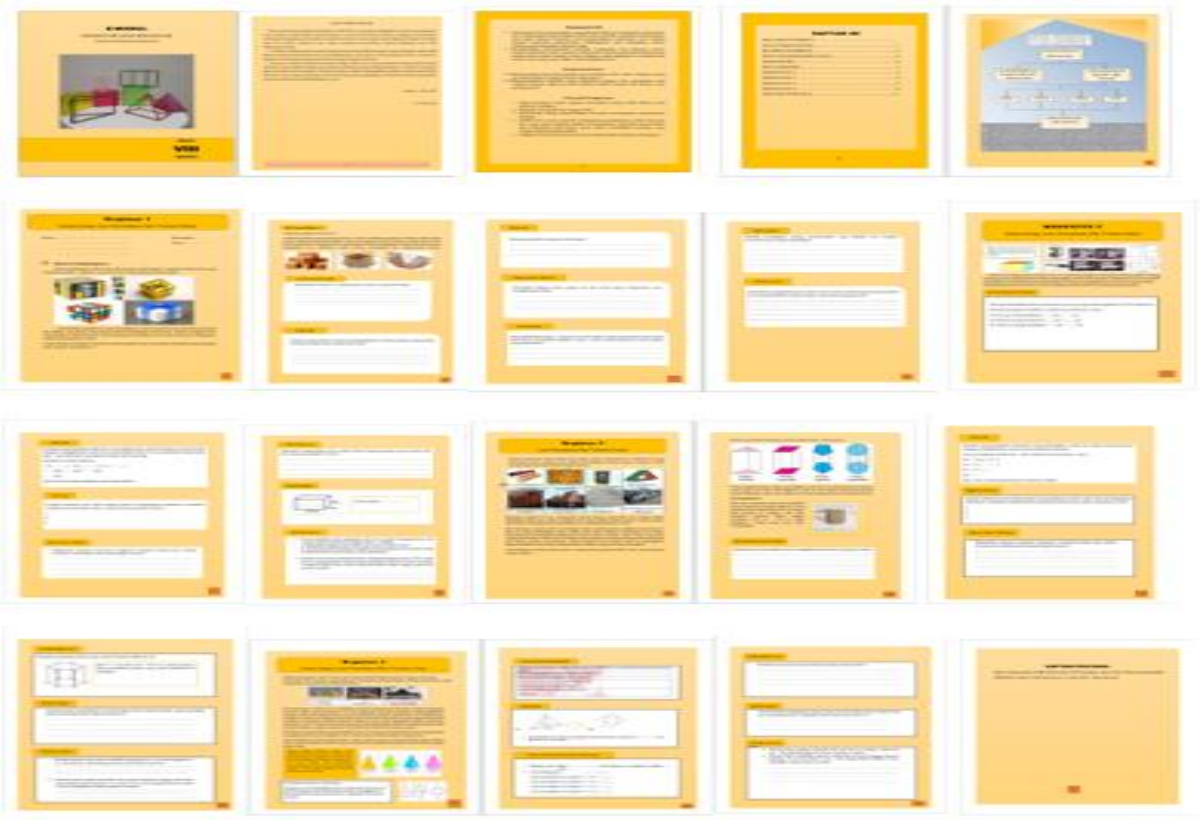

Figure 2. Draft E-Modul (https://anyflip.com/ezgfl/kdje/)

Develop

The development of the 4D model which is limited to step 3 (Define, Design, Develop) contains product design realization activities, in this case the E-Module, material for flat sided spaces. The manufacturing step in this research is to create and modify teaching materials. In the design stage, flowcharts have been made and realized in the form of teaching material development products that are ready to be implemented in accordance with the objectives of developing teaching materials. The results of the RPP assessment from experts are presented in table 2, namely:

Table 2. Results of the Validity of the RPP

No	Aspect	Total Score	Percentage	Information
1	Content Conformity	27	90	Very Valid
2	Material	22	88	Very Valid
3	Language	18	90	Very Valid
4	Appearance	21	83	Very Valid
Total		**88**	**88 %**	**Very Valid**

The results of the validation of the RPP by experts show that out of the 25 statements given a total of 119, the average overall rating of the validator is 4.76, the percentage of the validator's score is 95.20% and is included in the very valid category with an interval score of 80% -100 %. The results of the LKPD assessment are presented in Table 3, namely:

Table 3. LKPD Validity Results

No	Aspect	Total Score	Percentage	Information
1	Material	17	85	Very Valid
2	Appearance E-Modul	30	85,71	Very Valid
3	Language	18	90	Very Valid
Total		**65**	**87 %**	**Very Valid**

The results of LKPD validation by experts show that out of the 15 statements given a total of 65, the average overall rating of the validator is 4.33, the percentage of the validator's score is 87%, and is included in the very valid category with a score interval of 80% -100% . The results of the media assessment are presented in Table 4, namely:

Table 4. Media Validity Results

No	Aspect	Total Score	Percentage	Information
1	Appearance	18	90	Very Valid
2	Material Presentation	19	95	Very Valid
3	Benefit	9	90	Very Valid
Total		**46**	**92%**	**Sangat Valid**

Media validation results by media experts note that out of the 10 statements given a total of 46, the average overall rating of the validator is 4.6, the percentage score of the validator is 92%, and is included in the very valid category with an interval score of 80% -100 %.

After validating the RPP, LKPD, Media by material experts and media experts, it can be seen the feasibility of the teaching materials that have been developed, namely the E-Module material for building flat sides, the following is a recapitulation of RPP, LKPD, and Media presented in table 5.

Table 5. Results of RPP Validation Recapitulation, LKPD, Media

No	Validator Code	Total Score			xScore Max	Score	Value
		RPP	LKPD	Media			
1	V1	119	65	46	250	230	92%
2	V2	122	69	48		239	96%
Average						**234.5**	**93.80%**

Based on the table above, it can be seen that the total score obtained for the two validators is 234.5 with an ideal score of 250. Therefore, to get the percentage of validity of the teaching materials developed, use the formula:

$$V = \frac{234,5}{250} \times 100\% = 93,80\%$$

From the results of the validity percentage, 93.80% is included in the "Very Valid" criteria and can be used, but it needs revision according to the suggestions, comments, and input provided by the validator.

Not only that, teacher validation was also carried out to find out the feasibility of the material in teaching materials assisted by PowerPoint Geogebra. The aspects assessed include learning objectives, material assessment, benefits and completeness. Based on the assessment from field practitioners by the mathematics subject teacher, namely Mr. Teguh Wiryanto, S.Pd, it can be seen in table 6:

Table 6. Results of Field Practitioners Validation

No	Aspect	Total Score	Percentage	Information
1	Learning objectives	17	85	Very valid
2	Material Assessment	22	88	Very valid
3	Benefit	21	84	Very valid
4	Completeness	18	90	Very valid
Total		**78**	**86,67%**	**Very Valid**

Based on the table above, it is known that the 18 statements given received a total of 78, the average overall rating of the validator was 4.33, with a validator score percentage of 86.67%, and included in the very valid category with a score interval of 80% -100% .

Design Revision; In this process the researcher gets inputs for the E-Modules that are made. The things that need to be improved are as follows. 1) in the LKPD the questions are clearer so that students understand the questions, 2) change the appearance of the font on the LKPD to make it look more attractive, 3) in the LKPD in Steps to use the E-Module the images are magnified even more so that it is clear to read. Based on the things that need to be repaired, the researcher makes improvements to the parts that need to be repaired. After all the improvements have been made, the teaching materials are then ready to be taken to the field for trials.

Product Trials; The next step is to test the E-Module on the flat sided space build material. This trial goes through two stages, namely limited trials and extensive trials.

Limited trial; Limited trials aim to assess the feasibility of teaching materials developed based on the student's point of view. A limited trial was carried out at SMP Negeri 4 Cipeundeuy with a total of 10 students in class IX. The selection of research subjects was based on students who had studied flat sided geometric material. Students are given learning using teaching materials that have been developed, namely E-Modules for 1 meeting. Furthermore, to obtain the due diligence data by the students, the students were given a scale of students'

opinions on teaching materials on flat sided spatial construction materials. The results of student responses during the limited trials can be seen in table 7.

Table 7. Results of Student Responses in Limited Trials

No	Aspect	Total Score	Percentage	Information
1	Appearance	252	90	Very Practical
2	Material Presentation	284	89	Very Practical
3	Benefit	176	88	Very Practical
Total		**712**	**89%**	**Very Practical**

From the results of the validity percentage, 86.11% is included in the "Very Valid" criteria. Extensive Trials; Similar to the limited trial, the broad trial also aims to assess the feasibility of the teaching materials being developed, but the difference is that during the broad trial the number of students is greater than the limited trial. Extensive trials were carried out at SMP Negeri 4 Cipeundeuy with a total of 30 students in class VIII-A. The selection of research subjects was based on students who had not yet studied the material for flat side shapes. Students are given learning using E-Modules. Furthermore, to obtain due diligence data by students, students are given a scale of students' opinions on the E-Module based on a contextual approach to students' mathematical problem solving abilities. The results of student responses during the broad trial are presented in table 8.

Table 8. Results of Student Responses in Extensive Trials

No	Aspect	Total Score	Percentage	Information
1	Appearance	762	90	Very Practical
2	Material Presentation	852	88	Very Practical
3	Benefit	564	94	Very Practical
Total		**2187**	**91%**	**Very Practical**

Based on Table 10, it can be seen that the total score obtained in the broad test student responses is 2187 with an ideal score of 2400. Therefore to get the percentage of validity of the teaching materials developed use the formula:

$$V = \frac{2187}{2400} \times 100\% = 91\%$$

From the results of the validity percentage, 91% is included in the "Very Valid" criteria.

After conducting the student response questionnaire, you can see the practicality of the E-Module that has been developed. The following is a recapitulation of student response questionnaires for limited trials and broad trials, presented in Table 9.

Table 9. Results of Student Response Questionnaire Recapitulation

No	Trials	Total Score	Max Score	Score (%)
1	Restricted	712	800	89%
2	Extended	2187	2400	91%
	Average			**90 %**

Based on the results of the student response questionnaire recapitulation, it is known that the teaching materials made into the "Very Practical" category with a percentage of 90%.

Product Revision; In this process the researcher gets input and responses to the teaching materials being developed. The inputs that were received were quite good and received positive responses from teachers at the school and students at SMP Negeri 4 Cipeundeuy, so

the researchers did not make improvements to the E-Module on the flat sided geometric material that had been made.

Final Product; After the E-Module is based on a contextual approach to students' mathematical problem solving abilities there is no revision and based on the results of the student opinion scale in limited trials and wide trials it has been declared valid or suitable for use without revision, so it has become the final product.

Discussions

Based on the research results, the researcher can describe the discussion regarding the effectiveness of the E-Module on the mathematical problem solving abilities of junior high school students where the level of effectiveness can be seen from the level of student motivation in participating in learning activities which also has an impact on the achievement of positive learning outcomes (Waritsman, 2020). In the preliminary activity, when the teacher opens the lesson by praying and then saying hello, continuing to check the presence of students by saying their names one by one, it can be seen that students have given a positive response which is marked by raising their hands while answering attendance with a smile. And when the teacher provides learning motivation in this case explaining and explaining the objectives as well as the benefits of the material to be studied, it can be seen that students receive an explanation which is marked by conducive conditions in the class indicating that there is motivation to learn in students.

The core activity begins with the constructivism stage, in which the teacher gives the opportunity to students to observe an image related to a flat side shape, which then students are asked to write down what things or information they can get or find from the results of these observations. This is in accordance with Sariningsih (2014), which states that constructivism is one of the characteristics of the contextual approach, where the aim of constructivism is to build an understanding of a concept based on things that are known or have been learned (recall). After constructivism activities, the next stage is to create a social atmosphere in learning or a learning community that is still colored by constructivism where students are directed to form or create groups consisting of 3 to 5 people who later they will socialize, work together, exchange ideas and reach consensus in the form of conclusions. of a material object, in this case a flat sided shape where each group is asked to review the images displayed on constructivism as well as other images that are still related to flat sided shapes. Where the learning community or learning community is also part of the characteristics of the contextual approach (Sugandi & Bernard, 2018).

The results of the learning community are quite good, it can be seen from the group being able to write down some of the information they found from observations that have been made where this can also be called the inquiry stage, which then enters the questioning stage where the teacher gives the opportunity to students or each group to ask questions about what things they don't understand. The benefit of this questioning characteristic is that students dare to ask questions in order to overcome deadlocks in the thinking process and so that students dare to express their opinions, where one that will encourage the creation of this is also in the reflection stage, in which case students are given the opportunity to convey the results of his observations in the form of conclusions presented in front of the class.

Another thing that we must pay attention to in analyzing the level of effectiveness of an E-Module is to look at the test results data that has been carried out at the product test stage. Where in this case it can be seen from a sample of student answers to question number 1 which has an indicator of students' mathematical problem solving abilities, namely checking the correctness of answers or solutions (Suryani et al,., 2020). In the answer to question number one, it shows that students have been able to solve the problem well, even on average,

all students are also able to answer the question correctly, preceded by writing down what is known, asked, and the appropriate steps to work on.

The results of working on the questions show that students have been quite effective in solving these questions even though in writing the data it is known that it is relatively incomplete and does not write down the things asked and is also less systematic in writing the completion steps (Monica et al., 2018). Apart from the above, the results of the analysis of research test data show that the level of effectiveness of the e-module being developed obtained a score of 82% and this indicates that the e-module has an effectiveness value for constructing flat sided spaces (Sugandi et al., 2021).

CONCLUSION

Based on the results of the research that has been done, as well as looking at the existing problem formulation, conclusions can be drawn, namely: The process of developing E-Modules based on a contextual approach to the mathematical problem solving abilities of junior high school students on flat sided geometric material is already in valid and very practical criteria. Student responses to the E-Module using a contextual approach to the mathematical problem solving abilities of junior high school students on flat-sided geometrical material are already in very practical criteria, based on the student response questionnaire obtained, it means that the teaching materials developed are effective for class VIII junior high school students. Constraints faced during the process of developing teaching materials assisted by PowerPoint Geogebra include: 1) pandemic conditions so that school schedules are different from usual, 2) Determination of learning materials and approaches as well as problem solving abilities which are the main focus, 3) Assessment instruments that are still not appropriate with focused abilities; cover making along with the contents of the E-Module using Microsoft Word, 4) limited availability of projectors.

Suggestions for future researchers still require the development of E-Modules that utilize technology to make the learning process more effective. In addition, it is hoped that the E-Module that has been developed will later be able to see its effectiveness on students' mathematical problem solving abilities.

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