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Development of Math Modules Based on Active Learning Type the Power of Two using Ms. Word in the Junior High School Curriculum

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ABSTRACT

Modules in learning emphasize more on the activeness and activity of students. This study aims to develop a mathematics module based on an Active Learning (AL) strategy with the Active Learning (AL) type, namely The Power of Two (PT). This study uses an R&D research design with the ADDIE model, which consists of 5 stages: analysis, design, development, implementation, and evaluation. This study involved three validators in assessing the validity of the module and 12 small group students to test student responses to the module, which was used to determine the practicality of the module. Based on the research results, it is known that the module developed has very valid criteria, with a percentage of 91.48% by two expert lecturers and a mathematics teacher. The results of student response tests used to assess the practicality of the developed module have very practical criteria, with a percentage of 90.22% by students. This shows that the mathematics module developed based on an Active Learning (AL) strategy with The Power of Two (PT) type is very valid and very practical.

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1. INTRODUCTION

The curriculum is a core part of the implementation of education. Over time, the curriculum in Indonesia often changes. Currently, the curriculum that can be an option to be implemented at the junior high school level is the 2013 Curriculum. The 2013 curriculum demands student-centered learning, so it is expected to be active learners. The 2013 curriculum also emphasizes the active involvement of students in the learning process, which aims to gain direct experience and be trained to discover the knowledge they are learning for themselves. This is because the 2013 curriculum implements active learning for students (Gunawan, 2017). In addition, the 2013 Curriculum can be integrated with mathematics (Simanjuntak, Suseno, Setiadi, Lustyantie, & Barus, 2022). The 2013 curriculum requires students to be active and have new knowledge in learning, especially in learning mathematics (Febriyanti & Mandasari, 2020; Rohmah & Sumardi, 2020). So, it can be said that the 2013 Curriculum applies active learning so that students become active learners. Learning in the 2013 curriculum that requires student activity is learning mathematics.

Learning mathematics requires student activity. This statement is in line with the opinions of Betyka, Putra, & Erita (2019) and Rohmah (2021) that learning mathematics is a learning activity in which students are actively involved in building mathematical knowledge in their own way. However, the fact is that some students do not like learning mathematics because they consider mathematics a difficult subject (Febriyanti & Mandasari, 2020; Mashuri, 2019; Rosmala, 2021; Sitorus, 2021). As a result, students become too lazy to follow mathematics learning. Interest in learning mathematics is still lacking (Sumartini & Fitri, 2021). Thus, the activity and activeness of students become low. Meanwhile, student activity and activeness are indicators of the success of the learning process (Sihaloho, Sitompul, & Appulembang, 2020). Therefore, it is necessary to develop learning device that can direct students' activities to achieve success in the process of learning mathematics. This statement aligns with Aprianti et al. (2021) , who argue that learning device can influence learning success. So, we need learning device that can direct students' activities and activeness to obtain success in the learning process.

Learning devices are used as a reference in learning. This is because learning devices are indicators of good-quality learning (Effendi & Susanti, 2021). Learning devices in learning activities include syllabi, lesson plans, textbooks, modules, and others used as implementation plans in learning (Delfero & Handayani, 2020). Learning devices that can activate students are modules. This is in accordance with Ilahiyah, Yandari, & Pamungkas (2019) opinion that modules can help students learn actively to understand lessons. Because the learning device is a reference in learning and is an indicator of learning, a module is made. The module was chosen because it can activate students.

The module directs student activity because the module focuses on student activity. This statement is reinforced by Khoirudin (2019) that the module focuses on student activity and student creativity in the learning process. In addition, learning objectives can be achieved using modules (Rosyadi & Khusna, 2020). Modules can be used to measure student abilities (Ummah, 2021). In using the module, students must be able to build on the knowledge they have. So students must be more active than teachers. Thus, modules need to be designed based on learning strategies. This is because learning strategies can attract and activate students in learning (Nirwana & Rezeki, 2020). A learning strategy that can activate students is the *Active Learning* (Alfiani, 2021). *Active learning* is centered on student activity and activity in learning. An *Active learning* here is abbreviated as AL.

The *Active Learning* (AL) learning strategy focuses on student activity and activity so students' attention will be focused on learning. This statement aligns with the opinion of Ellisa Fitri Tanjung, Tobroni, dan Samsul Hady that *Active Learning* (AL) keeps students' attention focused on learning (Tanjung, Tobroni, Hady, 2019). *Active Learning* (AL) can optimize learning (Uno & Mohamad, 2022). In *Active Learning*, students must actively express ideas (Asmani, 2016). The *Active Learning* (AL) strategy focuses on the involvement and activeness of students in the learning process. This statement is reinforced by the opinion of Neti & Amini (2020); Rahayu, SD, & Vidya (2022); Sunarsih & Yulianti (2021) that the *Active Learning* (AL) strategy directs students to be active and motivated in learning. When students are actively learning, students will dominate the lesson (Hartono & Yetyastuti, 2019). Therefore, learning modules are designed based on *Active Learning* (AL) learning strategies to direct student activity and activeness. *Active Learning* strategies have several types. The type of *Active Learning* (AL) chosen is *The Power of Two* or PT. *The Power of Two* (PT) type was chosen because this type can activate students (Ardi, Latuconsina, Angriani, & Kusumayanti, 2020). So, it is hoped that by using *The Power of Two* (PT) type, students will become active in learning.

The Power of Two (PT) involves two people. *The Power of Two* (PT) type requires students to work in pairs so that students are active (Nirwana & Rezeki, 2020). This is done so that there is synergy, namely two heads are better than one (Razi, 2019). The type of *The Power of Two* (PT) has several steps. First, there must be a question or problem. Second, answer or seek solutions to questions or problems individually. Third, form a group of two people. Fourth, group discussion to find new answers from each answer made individually. Fifth, make conclusions from the new answers that have been discussed. So, with this type of *The Power of Two* (PT), students will become active in learning. Especially, students are active in finding answers to a problem.

Previous research discusses the development of mathematics modules based on learning strategies. An example is the development of the *Active Learning* (AL) module carried out by Andriadi, Fitraini, & Suhandri (2018). However, there has been no research in developing an *Active Learning* (AL) based mathematics module with the type of *The Power of Two* (PT). So what distinguishes the development of the mathematics module in this study from previous research is that previous research did not use the type contained in *Active Learning* (AL). In contrast, this study used the type contained in *Active Learning* (AL), namely *The Power of Two* (PT) type.

Based on the description above, a mathematics module based on *Active Learning* (AL) type *The Power of Two* (PT) will be developed in the junior high school curriculum. The formulation of the problem in this research is how to develop an *Active Learning* (AL) based mathematics module with the type of *The Power of Two* (PT) using Ms. Word in the curriculum in junior high school and how the validity and practicality of the *Active Learning* (AL) based mathematics module with the type of The *Power of Two* (PT) uses Ms. Word in the curriculum in junior high school. Then the results of this study will contain the steps for developing the module as well as the validity and practicality of the module. This mathematics module is expected to be used by students in the learning process. In addition, this mathematics module can make students active in the learning process.

2. METHODS

The research design used in this research is Research and Development (RnD). The development model used is the ADDIE model; the stages consist of analysis, design, development, implementation, and evaluation (Nababan, 2020; Purwaningsih, Anggoro, & Fadila, 2019). The analysis phase aims to conduct a preliminary study. The preliminary study of this research was carried out by observation and interviews. Observations and interviews were conducted to determine material requirements, lesson plans, and learning device related to mathematics. At the design stage, the aim is to design learning device that are in accordance with the characteristics of mathematics lessons and material needs, student conditions, and student needs in general. At the development stage, it aims to develop the module into a complete form that has been revised and validated by expert lecturers and mathematics teachers. Modules that have been revised according to the suggestions of expert lecturers and math teachers will then be validated. At the implementation stage aims to conduct trials. Module trials were carried out in junior high schools. Each student uses the module. Students are given the opportunity to study the material in the module. Then students are given a student response questionnaire for module assessment. At the evaluation stage an analysis of the practicality criteria of the module is carried out. The practicality criteria of the module can be known based on student response questionnaire data.

The research was conducted at SMP Muhammadiyah 1 Malang. Subjects or respondents who participated in this study were class VIII students of SMP Muhammadiyah 1 Malang, with details of a small group of 12 students. The research was conducted in December 2022.

Data collection techniques in this study were interviews, observations, and questionnaires. The questionnaire was prepared based on the Likert scale used by expert lecturers and mathematics teachers to test the validity of the module and the practicality test questionnaire by students. The following is a table of assessment questionnaire scales.

Table 1. Assessment Questionnaire Scales

Score	Description
5	Very good
4	Good
3	Enough
2	Not enough
1	Very less

The following is a grid of expert lecturer and mathematics teacher module assessment questionnaires. This grid is a reference in making module validation assessment sheets. The module validation assessment sheet grid table is presented as follows.

Table 2. Module Validation Sheet Grid

Number	Aspect	Indicators	Number of Item	Item Number
1	Module Design	The illustration of the module cover describes the contents/teaching materials and reveals the object's character.	1	1
		The module title color contrasts with the background color.	1	2
		Do not use too many font combinations.	1	3
2	Didactic Requirements (according to the principles of effective learning)	Modules can be used for all levels of student ability.	1	4
		The module emphasizes the process of discovering concepts.	1	5
		Have a variety of stimuli through various media and student activities to provide opportunities for students to write, draw, and dialogue with friends.	1	6
3	Content Feasibility Aspects	Conformity of material with core competencies, basic competencies, and indicators.	1	7
		The concept of presenting material in the module is easy for students to understand.	1	8
4	Aspects of Language Feasibility	The language used is easy for students to understand.	1	9
		Conformity with good and correct Indonesian rules	1	10
5	Based on Active Learning	The module can encourage student learning activities.	1	11
		The module can encourage students to be actively involved in learning.	1	12
		The module attracts students' interest.	1	13
6	Based on the Power of Two type	Modules can encourage students to work in groups or collaborate.	1	14

The following is a student response questionnaire grid on the module. This grid becomes a reference for making student response questionnaires to determine the practicality of the module. The student response questionnaire grid table is presented as follows.

Table 3. Student Response Questionnaire Grid

Number	Aspect	Statement	Item Number
1	Graphic	The module has an attractive appearance.	1
		Pictures on interesting modules.	2
2	Language	The language in the module is easy to understand.	3
		The text on the module is clear and easy to read.	4
3	Utilization feasibility	Learning using modules becomes practical.	5
		Modules make learning effective.	6
		The use of modules makes learning easier.	7
4	Content	The questions in the module make it easier for students to understand the material.	8
5	Student engagement	The use of modules makes students become active in learning.	9
		The use of modules encourages students to collaborate with other students.	10

The data analysis technique used to manage the data obtained in this study is descriptive statistical analysis. The validity level of the module is obtained by calculating the percentage using the following formula :
(Karina, Yulita, & Ramdhani, 2019)

$$\text{Validity Percentage (\%)} = \frac{\text{total score of research result}}{\text{expected score}} \text{ x } 100\%$$

After obtaining the percentage of module validity, then this value will be matched with the validity table to determine the module validity criteria. The following is the validity table (Alimin & Effendi, 2020).

Table 4. Validity Criteria

Number	Achievement Level (100%)	Score
1	81 – 100	Very Valid
2	60 – 80	Valid
3	40 – 60	Quite Valid
4	20 – 40	Less Valid
5	0 – 20	Invalid

The practicality criteria of the module based on the student response questionnaire data are obtained by calculating the percentage using the following formula:
(Alimin & Effendi, 2020)

$$\text{Practical Value} = \frac{\text{the total score obtained}}{maximum\ score} \text{ x } 100\%$$

After obtaining the practicality value of the module, this value will be matched with the practicality table to determine the practicality criteria for the module. Here is a practicality table (Alimin & Effendi, 2020).

Table 5. Practicality Criteria

Number	Achievement Level (100%)	Score
1	81 – 100	Very Practical
2	60 – 80	Practical
3	40 – 60	Quite Practical
4	20 – 40	Less Practical
5	0 – 20	Impractical

3. FINDINGS AND DISCUSSION

3.1 Analysis

This development begins with the analysis stage, which is carried out by interviews and observations to determine the material needs of students and innovative products according to student characteristics. The results obtained from interviews and observations in class VIII SMP Muhammadiyah 1 Malang, namely, the subject matter of mathematics that demands student activity is a system of two-variable linear equations. In addition, learning device are also needed for direct student activity because schools do not yet have *Active Learning*-based modules. For core competencies, basic competencies, and learning device indicators, adjustments will be made to those listed in the learning implementation plan.

A mathematics module based on the *Active Learning* (AL) type *The Power of Two* (PT), will be developed based on the problems above. Software is used to create this module. The software required is Microsoft Word. This software is used for word processing.

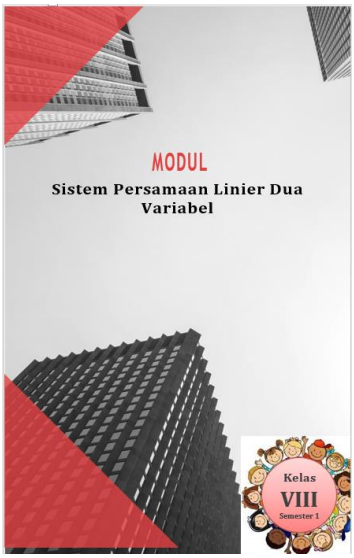
3.2 Design

The second stage in this development is design. Design activities are carried out by compiling schedules to prepare math modules, design component modules, and arrange module component layouts. The designed module components include (1) Cover; (2) prefaces; (3) table of contents; (4) glossaries; (5) intermediates; (6) learning activities; (7) summary; (8) exercises; (9) reflections; and (10) bibliography. The arrangement of module components also includes the arrangement of text and images. The results of this activity are component module designs, component layout modules, and flowchart preparation modules.

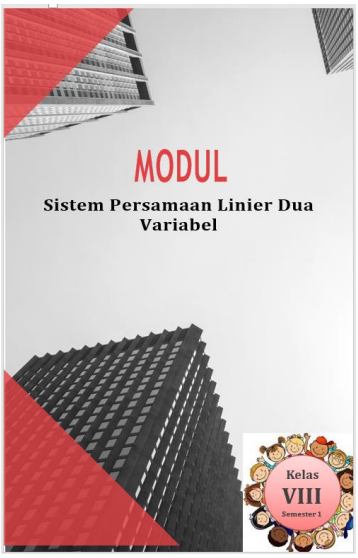
3.3 Development

The development stage aims to create a complete module that has been validated and revised based on suggestions and input from the validator. The validity test aims to determine the validity criteria of the developed module. The module was validated by two expert lecturers from the University of Muhammadiyah Malang and a math teacher from SMP Muhammadiyah 1 Malang. The aspects assessed include module design, didactic requirements, content feasibility, language feasibility, Active Learning (AL), and The Power of Two (PT). The validator provides suggestions for modules. The suggestions are as follows:

3.3.1 Enlarge the title on the module cover



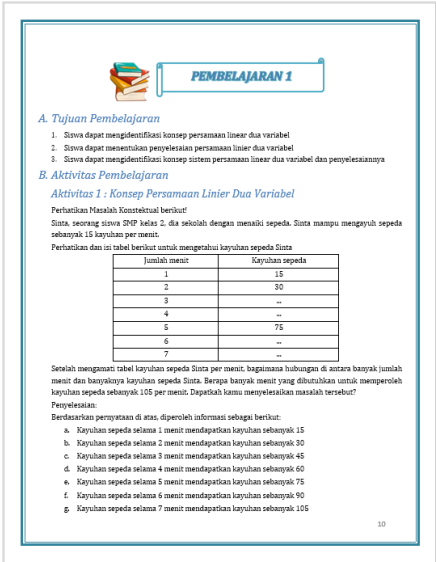
(a) Title on the cover module before revision



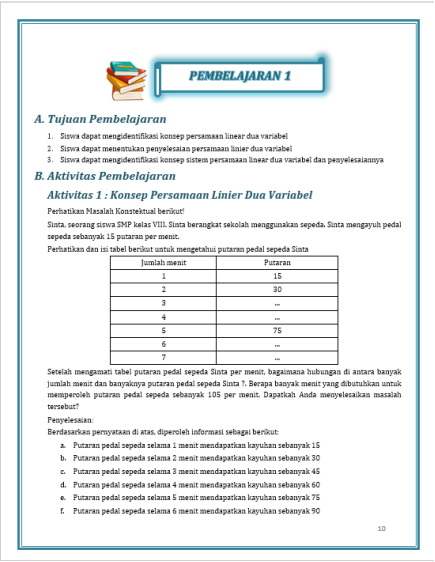
(b) Title on the cover of the module after revision

Figure 1. Module cover before and after revision

3.3.2 Sharpen the color of the sub-chapter text in the module



(a) The color of the module sub-chapter text before revision



(b) The color of the module sub-chapter text after revision

Figure 2. The color of the sub-chapter text before and after revision

After the module is revised, the validator gives an assessment of the module validation sheet. Data processing is calculated based on each aspect. The following results from the data processing validation sheet math module based on the *Active Learning* (AL) type *The Power of Two* (PT) using Ms. Word in the junior high school curriculum.

Table 6. Results of Validation of Each Aspect

Aspect	Score
Module Design	82,22 %
Didactic Requirements	93,33 %
Content Feasibility Aspects	93,33 %
Aspects of Language Feasibility	93,33 %
Active Learning	93,33 %
Type The Power of Two	93,33 %
Average	91,48 % (**Very Valid**)

Aspects of the module design in the table above obtained a percentage of 82.22% which is classified as a very valid criterion. The module cover design already describes the content or teaching materials and displays the object's character. The developed module has a title color that contrasts with the background color. The developed module does not use too many font combinations. Adjustment of images, fonts, font sizes, and colors in the modules aims to attract students to study the modules (Ilahiyah et al., 2019). The didactic aspect of the module obtained a percentage of 93.33% which was classified as a very valid criterion. This means the module can be used for all levels of student abilities. In addition, this module emphasizes the concept discovery process. Then the module has various stimuli through various media and student activities, thus providing opportunities for students to write, draw, and dialogue with their friends. These indicators are by the purpose of using modules in learning to activate students (Mardhia, Marneli, Haviz, & Fajar, 2022). The feasibility aspect of the module content obtained a percentage of 93.33% which is included in the very valid criteria. This means that the material is by core competencies, basic competencies, and indicators. In addition, the presentation of the material in the module is easy for students to understand. This means that the components of a textbook in terms of material or content have been fulfilled (Misrayani, 2021).

The feasibility aspect language of the module obtained a percentage of 93.33% which is included in the very valid criteria. This means that students can easily understand the language used in the module. In addition, the language in the module is according to the rules of good and correct Indonesian. This means that the components of a textbook on language aspects have been fulfilled (Misrayani, 2021). The *Active Learning* aspect of the module obtains a percentage of 93.33% which is included in the very valid criteria. This means that the module directs to encourage student learning activities. Modules can encourage students to be actively involved in learning. In addition, the module attracts students' interest. These indicators focus on *Active Learning* (AL) which directs students to be active and motivated in learning (Neti & Amini, 2020; Rahayu et al., 2022; Sunarsih & Yulianti, 2021). *The power of two* (PT) type aspects obtains a percentage of 93.33% which is included in the very valid criteria. The module can encourage students to work in groups or collaborate.

Based on table 6, the module validity value is 91.48%. This value is included in the very valid criteria. This means that the module that has been developed can be declared very valid. Furthermore, the module is ready to be tested on students.

3.4 Implementation

The fourth stage is implementation. Modules that have been declared valid are then printed in as many as 12 modules. Then the module is tested in learning at school. The trial was carried out in small groups consisting of 12 students, namely class VIII students of SMP Muhammadiyah 1 Malang. The tryout was carried out on December 23, 2022. The tryout was carried out by means of students studying the modules. Then students are given a response questionnaire for module assessment. Students were asked to fill out a response questionnaire. After obtaining the student response questionnaire data, the data will be processed in the form of a percentage. The data that has been processed will be used to determine the practicality criteria of the module.

3.5 Evaluation

The final stage is evaluation. Evaluation is carried out to determine the practicality criteria of the modules that have been developed. The practicality of this module can be seen from the student response questionnaire that has been filled in. The following table presents the average practicality percentage of the module based on the calculation of the student response questionnaire.

Table 7. The Average Percentage of Practicality of the Module

Aspect	Score
Graphic	90,83 %
Language	91,67 %
Utilization feasibility	89,44 %
Content	88,33 %
Student engagement	90,83 %
Average	90,22 % (**Very Practical**)

The practicality of the module can be seen from several aspects. Aspects of the practicality of the module include graphics, language, the feasibility of use, content, and student involvement. Graphical and linguistic aspects are taken from Lumbantoruan's (2022) opinion. The feasibility aspect of utilization and content is taken from Putri, Sueb, & Saptasari (2021) opinion. While student involvement is included in the practical aspect of the module because this module is based on Active Learning (AL) type The Power of Two (PT). So, it takes student involvement to see the activeness and activity of students.

The graphical aspect of the module obtained a percentage of 90.83% which is a very practical criterion. This shows that the module has an attractive appearance and that the images on the module are attractive. The linguistic aspect of the module obtained a percentage of 91.67% which is included in the very practical criteria. This shows that the language in the module is easy to understand, and the text in the module is clear and easy to read. The feasibility aspect of using the module obtained a percentage of 89.44% which is included in the very practical criteria. This shows that learning using modules is practical, modules make learning effective, and using modules makes learning easier. Aspects of module content obtained a percentage of 88.33% which includes very practical criteria. This shows that the questions in the module make it easier for students to understand the material. Aspects of module content obtained a percentage of 90.22% which includes very practical criteria. This shows that the use of modules makes students active in learning, and the use of modules encourages students to collaborate with other students.

Based on table 7 above, the average practicality of the module based on the student response questionnaire data obtained a percentage of 90,22%. Thus, the practicality of the modules that have been developed is included in the very practical criteria.

Discussion

Based on the assessment of expert lecturers and mathematics teachers, the module is included in the very valid criteria with a score of 91,48%. The practicality of the *Active Learning*-based module type *The Power of Two* (PT) using Ms. Word in the junior high school curriculum is included in the very practical criteria with a percentage of 90,22%. On the results of the assessment of the *Active Learning* (AL) aspect, a score of 93,33% was obtained, included in the very valid criteria. Meanwhile, the type aspect of *The Power of Two* (PT) is also said to be very valid, with a percentage of 93,33%. So, it can be said that the module focuses on student activity and activeness and directs students to collaborate with other students. Student activity is influenced by several factors, including the learning process, the media used, and student motivation (Danver, 2016; Nawas, 2018; Sugiarti, Taufik, Rosyadi, Khusna, & Azmi, 2018). This study states that the module used can be used as a reference for student activities. Student activity itself is an important aspect of learning (Alfiani Athma Putri; Rosyadi & Sa'dijah,

Cholis; Susiswo; Rahardjo, 2022). This is also in line with the results of research by Yazar Soyadı (2015) which states that student activity is related to students' critical thinking.

Research on the application of learning modules has been carried out by Mirkouei, Bhinge, McCoy, Haapala, & Dornfeld (2016) and Rosyadi (2018). The results of the two studies state that using modules can facilitate students in using conceptual and procedural abilities. Research by Yasa, Chrisyarani, Akbar, & Mudiono (2018) states that modules can activate students during the learning process. This shows that it is important to prepare modules to support the instrument (Effendi & Irene, 2021).

Neti & Amini (2020) Explain that *Active Learning* directs students to be active and motivated in the learning process. So the Active Learning (AL) strategy here places more emphasis on student activity. Active Learning (AL) is able to generate student motivation to understand the material. The motivation itself appears after students are given a problem or initial action (Kurniawati, 2020). In this study, modules were developed according to the Junior High School curriculum based on the *Active Learning* (AL) type *The Power of Two* (PT).

Andriadi, Fitraini, & Suhandri (2018) Describe valid and practical *Active Learning*-based modules that have an impact on students' creative thinking. *Active Learning*-based modules are effectively used to facilitate students' creative thinking. This is in line with the research results of Ningrum (2016) , dan Wahyudi (2017) , and Kertayasa (2019) which state that modules can support students to be more active and creative in solving the problems given. Apart from that, the skill aspect also increases after using the module (Effendi & Susanti, 2021). *Active Learning*-based modules are effectively used to facilitate students' creative thinking (Pratiwi, Effendi, & Ummah, 2020). So here, students are more active in thinking, which will improve their creative thinking skills.

4. CONCLUSION

Based on the results of the research and data processing, it can be concluded that the *Active Learning* (AL)-based mathematics module type *The Power of Two* (PT) using Ms. Word in the junior high school curriculum has been developed using the ADDIE development model. the developed module has very valid module validity criteria with a percentage of 91.48% by two expert lecturers and a mathematics teacher. The results of the student response questionnaire using the module have very practical criteria, with a percentage of 90.22% of the 12 small group students. This study is only limited to the development of a module. In addition, the module is still in printed form. It is hoped that in further research, module development will be carried out to improve students' mathematical abilities and develop modules in the form of e-modules. The material selection in the module can be adjusted to the conditions of the students.

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