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Development of Interactive Learning Media Through the Problem Based Learning Model to Improve Students' Mathematical Communication and Self Regulated Learning Skills

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ABSTRACT

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This research aims to (1) produce interactive learning media based on the Problem Based Learning model that is valid, (2) practical, and (3) effective. Research, (4) analyze the increase in students' mathematical communication skills using interactive learning media with the Problem Based Learning model, (5) analyze the increase in students' self-regulated learning abilities, and (6) analyze the answer process used by students. students to complete a mathematical communication ability test. The Thiagarajan, Semmel, and Semmel 4D models (Define, Design, Develop, Disseminate) were used in this development research. This research involved class VIII students of SMP N 1 Bandar. Interactive learning media in the form of lesson plans, worksheets, mathematical communication assessments, and self-regulated learning questionnaires are the results of research. The research results showed that (1) the interactive learning media developed through the Problem Based Learning model was valid in trial II, (2) practice was obtained in trial II, and (3) it was effective in trial II. In trial II, interactive learning media through the Problem Based Learning model improved students' mathematical communication skills. Student self-improvement—media-controlled learning. In trial II, interactive learning using the Problem Based Learning model experienced an increase.

A. INTRODUCTION

Education is an essential resource for a country's growth and success. Education is crucial to a country's progress, especially in Indonesia. Pratama, Syahputra H (2017) states that "education is a pillar of the nation's livelihood." This country can maintain its dignity because of education." "The quality of a country's human resources determines whether it is developed or developing." Even if a country has an abundance of natural resources and technological expertise, it will be unable to expand rapidly unless it also has an abundance of human resources. As a result of the rapid rise of science in culture. People's thinking habits (mindset) determine culture to a considerable extent, but people's thinking develops and evolves as a result of their education. As a result , in order to advance scientifically, humanity must provide the best education possible, because mathematics is the queen of all sciences.

Mathematics is one of the disciplines taught in school that is critical to children's development. Suratno's (2016) observation that mathematics is essential for human life, particularly in the modern day, is consistent with this. Why? Because mathematics is superior to all other sciences. As a result, mathematics is one of the most significant disciplines that students must master in order to understand other courses. Septianawati (Wardono, Waluya, Kartono, Mulyono, & Scolastica, 2018) made a similar point: mathematics is one of the essential topics that humans, particularly students, must know in order to address real-world problems.I concur.There are five reasons why children should learn mathematics, according to Corkroft (Jayanti, Arifin, & Nur, 2020): (1) mathematics is always related to life; (2) mathematics is very important in all subjects; (3) mathematics is a very powerful, clear, and concise communication tool; (4) mathematics is very useful for presenting information; and (5) mathematics is thought to improve students' thinking abilities.

Mathematics, according to the professional remarks above, is a subject that requires special attention. In practice, however, the quality of mathematics instruction in Indonesia remains well below expectations. According to the Program for International Student Assessment (PISA) scores, educational achievement in mathematics fields remains subpar. Indonesia was ranked 64th out of 65 countries in 2012, 69th out of 76 countries in 2015, and 73rd out of 78 countries in 2018. This indicates Indonesia's lack of mathematical ability, as evidenced by the country's ranking in the bottom ten from 2012 to 2018 This is not because Indonesia has the fewest hours of mathematics teaching. Students in Indonesia receive an average of 169 hours of mathematics instruction per year, according to Frederick KS Leung's (2008) findings from the Trends International Mathematics and Science Study (TIMMS). This is much higher than in other countries. In Indonesia, however, the length of study has little influence on student achievement. In reality, Indonesian students averaged 411 points, whereas international students averaged 467 points. Other TIMMS research findings given by the Center for Educational Assessment (Puspendik, 2015) ranked Indonesia sixth from the bottom, or 45th out of 50 countries assessed. As a result, Indonesian students' knowledge quality score remains lower than the international average score. The solution to the aforementioned obstacle is for Indonesian students to have a varied range of skills, including: (1) problem solving; (2) reasoning and proof; (3) communication; (4) connections; and (5) representation) (NCTM (inHafriani, 2021)). According to the above remark, mathematics communication skills are one of the competencies that students must cultivate.

Students must have excellent mathematical communication abilities in order to master mathematics. The purpose of mathematics education, according to Ministry of National Education Regulation No. 22 of 2006, is for students to be able to articulate concepts using symbols, tables, diagrams, or other media to illustrate situations or concerns. This is congruent with the National Council of Teacher Mathematics (NCTM), which states that learning to mathematics communicate is one of the general goals of learning mathematics (Ariani, 2017). One of the mathematical abilities that students must have, according to Rahmi, Nadia, Hasibah, and Hidayat (2017), is mathematical communication skills.

Mathematical communication skills are significant because they aid in the development of other mathematical abilities. In other words, pupils must be able to communicate mathematically in order to answer questions. This means that if students are unable to effectively communicate in order to grasp mathematical problems or concepts, they will be unable to solve problems efficiently. Because mathematical symbols and formulas are used in mathematical communication. Ansari (2016) believes that developing mathematical communication skills in students is important for several reasons, including (1) the ability to model situations/circumstances in writing or verbally, graphically, visually, or algebraically; (2) mathematical communication can reflect and clarify thoughts about mathematical ideas in various situations; and (3) developing an understanding of mathematical ideas, such as the role of algebra.

According to Yusra and Saragih (2016), mathematical communication skills are the ability to depict mathematical ideas with symbols, tables, diagrams, or other media to explain and transmit mathematical problems using mathematical language in teaching and studying mathematics. It can help teachers understand students' abilities to interpret and communicate their grasp of mathematical topics and approaches.

Expectations, on the other hand, are inversely proportional to reality. Mathematical communication abilities are insufficient. Those with poor mathematical communication skills will struggle to understand the issues, but those with excellent communication skills will be able to solve them quickly. Sari's research (in Fitriyanti (2021) demonstrates that when most students are presented with problems that do not correspond to the examples provided, they struggle to solve the problems because they do not know where to start. Researchers showed this by asking 30 students in class VIII-2 at SMP Negeri 1 Bandar to answer questions using the resource Cubes and Blocks. The section that follows discusses mathematical communication abilities.

The following is about mathematical communication skills.

1) Kenzo is going to his friend's birthday party. He plans to give a shoe as a gift and wrap it in a block-shaped box measuring 25 cm long, 18 cm wide and 15 cm high. What is the minimum area of wrapping paper needed to wrap a box?
2) If the surface area of the cube is 225cm2, what is the volume of the cube?

From the question above,

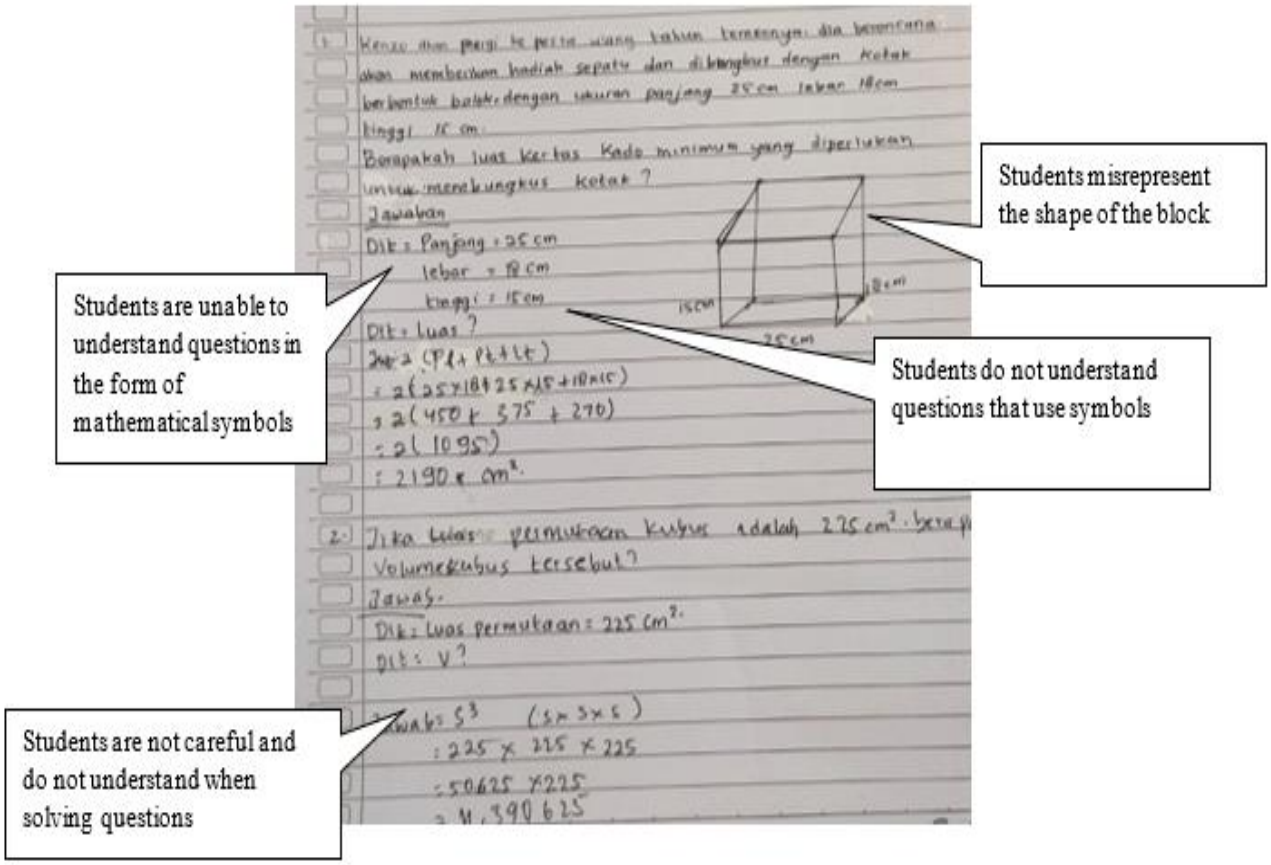

Figure 1 One Student's Answer Sheet

Explanations for the communication skills questions reveal that students do not understand the scenario. They can write down mathematical problem ideas but cannot think of how to solve them or develop a mathematical model. Less cautiously students make mistakes when answering questions. As a result, poor solution planning yields an incorrect answer. To begin, students should substitute a variable, letter, or symbol for each quantity to simplify the problem. The children's comments show a lack of mathematical communication skills. This supports a study by Lestari, Saragih, and Hasrat (2018), which discovered that students' mathematical communication abilities include their ability to convey concepts or situations using appropriate mathematical models and write conclusions.

The research presented above shows that math students' communication skills are lacking. Students' math communication skills are poor for a variety of reasons. Students rarely teach themselves problem-solving skills. Students are unable to create a mathematical model of the problem because they do not understand its significance. This can happen if you use the wrong math learning resources and models. We know that teachers use direct learning, which reduces learning activity by using the traditional paradigm (lecture). Teachers' questions that differ from their sample questions make it more difficult for students to work on.

Students must have cognitive, emotional, and psychomotor abilities. Affective skills are valued in school just as much as cognitive and psychomotor skills. Self-regulated learning is an important affective domain for students.

Yandari et al. (2018) discovered that self-regulated learning is required for learning. The ability to control one's thoughts and behaviors while remaining emotionally independent. According to Pratama, Minarni, and Saragih (2017), self-regulated learning is critical in today's education. Schunk and Zimmerman (in Zamnah, 2017) define self-regulated learning (SRL) as learning that is influenced by one's own goal-oriented thoughts, feelings, strategies, and behavior. Thus, self-regulated learning is a person's autonomous perspective on a subject that is uninfluenced by others.

Reality differs from expectations. The researcher interviewed a mathematics instructor at SMP Negeri 1 Bandar and discovered that the majority of students lacked mathematical independence. Most students still cheat on homework assignments (PR) and practice problems supplied by teachers, lack confidence, and do not drive themselves to learn. difficulties with math issues and kids' lack of self-study. There is evidence of low student self-regulated learning.

Students have poor self-regulation because they are unable to separate self-regulated learning from education. Inappropriate media and learning paradigms have an impact on one. According to the learning model, most teachers use traditional learning ways since they have not adopted student-action learning models and media.

Because they are independent and can make their own life decisions, strong self-regulated learners can handle any challenge. According to Mahmoodi, Kalantari, and Ghaslani (2014), "students who exhibit more adaptive self-regulatory strategies demonstrate better learning." As a result, engaged, self-regulated learners learn better. This implies that self-regulated learning can help students learn. Self-regulated learning must be improved.

According to Mr. Ki Hajar Dewantara's educational credo, the behavior of teachers influences the quality of the learning system. My research reveals that teacher-designed mathematics learning scenarios influence students' mathematical communication and self-regulation. If the scenario improves this state, it is a success. Effective learning makes use of interactive media and cutting-edge learning models to increase students' self-regulated learning and mathematical communication.

To facilitate learning, interactive learning media connects text, speech, moving images, and video. There are numerous advantages to using interactive learning media in the classroom. Interactive learning media is one of the learning approaches. It dramatically increases education. Surya's research (Kamarullah (2017) suggests that mathematics training should be enjoyable and engaging in order to achieve learning objectives.

The above comment emphasizes the importance of teachers having appropriate jobs and responsibilities in order to properly teach high-engagement lessons. High student involvement improves teaching and learning by facilitating successful learning exchanges. Students are just as invested in their education as teachers are. Active learning should improve students' mathematical communication skills.

Djamarah (Batubara, 2017: 15) also claims that the availability of learning materials influences students' learning. Interactive learning materials assist tangible operational students in comprehending abstract topics. Interactive educational resources should also help with learning. Students who use learning media no longer learn in a teacher-centered manner. Students can study and enhance their math communication skills. Self-regulated learning is an indicator of student-centered learning. Self-regulated learning entails students taking charge of their own education as subjects, decision makers, controllers, or initiative takers. Thus, self-management of learning is vital.

According to Dina Indriyana (2011:116), students can become more involved in their studies, develop self-regulated learning, and employ multimedia. Multimedia adapts to students' diverse learning styles, and teachers must assess students' mastery.

Text, image, and voice can all be displayed simultaneously in interactive learning tools, which is a significant advantage. According to Sadiman (Hasan et al., 2021), interactive teaching media have four benefits: (1) making message presentation less verbalistic; (2) overcoming time, space, and sensory power; (3) overcoming students' passive nature; and (4) making it easier for teachers to deliver lesson information. Teachers are encouraged to employ interactive learning tools to make course material more clear and understandable. Instead of lecturing, they can assist students with their learning challenges. Adobe Flash CS6 can create interactive learning media.

According to Akbar in Supriyadi (2016), Adobe Flash CS6 is a professional authoring tool developed by Adobe to create eye-catching animations and bitmaps for dynamic and interactive websites. The features of Adobe Flash CS6 will make it easier for artists to create more compelling animations. Text and objects can be processed and generated with three-dimensional effects in Adobe Flash CS6 for better visuals. Nina (Unaisyah, 2018) confirmed this by stating that she chose Adobe Flash to create educational materials due to its many advantages. Adobe Flash can import and process image, video, and audio files to present content in a more engaging and dynamic manner, create and perform animations, and reduce the final flash file size. The final flash file may be an executable "*.exe" file, allowing PCs to open flash files without Adobe Flash. Adobe Flash CS6's flexibility and ease of use make it ideal for interactive instructional resources.

Interactive learning media created with Adobe Flash CS6 allows students to learn autonomously by allowing them to repeat material they don't understand until they do. The program guides students through the learning process, making the content engaging. Students can become more interested in their studies and improve their mathematical communication skills by using Adobe Flash CS6 media.

Interactive Adobe Flash CS6 instructional media may improve students' mathematical communication and self-regulation. As previously stated, teachers must employ interactive learning media. According to Sinurat, Syahputra, and Rajagukguk (2018), Adobe Flash-aided mathematics learning resources can increase students'

learning completion by 88.10%, improve their mathematical communication, and get a good response. Adobe Flash-enabled learning tools can help students become better math communicators, and they are reliable, practical, and efficient. This backs up research (Septiyani, Haji, & Susanta, 2022) that shows Macromedia Flash learning resources improve mathematical communication.

According to research (Purnamasari & Herman, 2018), interactive multimedia training improves mathematics communication skills more than traditional instruction. Interactive multimedia helps students improve their math communication skills more than traditional methods. Another study (Yuniar, Rohaeti, Aryan, 2018) discovered that students must understand and write quality summaries during independent study using learning videos to improve their mathematics communication skills.

An interview with a senior mathematics teacher at SMP Negeri 1 Bandar revealed that teachers rarely use learning materials. When teaching flat-sided space concepts, the teacher only uses the building frame model. Traditional learning methods are still used here. Other disciplines are taught without the use of learning media. There are no learning resources used; instructors lecture. Students are mostly information recipients and passive learners in these scenarios. Poor student learning outcomes are also impacted.

As previously stated, interesting learning resources help students accept arithmetic and enjoy studying. Interactive learning tools created in Adobe Flash CS6 can make learning more enjoyable. This is ideal for creating flat side spaces (cubes and beams).

Adobe Flash CS6 can create more engaging interactive learning resources if students study actively. Thus, teachers must select and implement the best learning model to ensure that students actively participate in class, use interactive learning materials, and improve their mathematical communication and self-regulated learning skills. This scenario corresponds to the scenario-based learning (PBL) paradigm.

Problem-based learning assists students in recognizing complex issues. This technique assists students in developing problem-solving skills through group work. Because it addresses real-world issues, the problem-based learning paradigm can be used to study mathematics.

PBL necessitates active learning. According to Saragih et al. (2018), the Problem-Based Learning approach (PBM) is a revolutionary student-centered learning strategy that stimulates creativity and activity. The PBM model is a student-centered learning approach that promotes creativity and activity. According to Sungur and Tekkaya (2018), students who use the problem learning model perform better in terms of learning goal orientation, task value, strategy elaboration, critical thinking, and metacognition regulation. The problem-based learning model is combined with interactive media to bring learning to life. Ningrum's (2016) problem-based learning study proposes a teaching paradigm that can help students communicate mathematical ideas.

In addition to enhancing math communication,

Problem-based learning (PBL) with interactive materials helps students in developing self-regulated learning attitudes. Edmodo media, according to Aulia et al. (2018), can improve students' self-regulated learning in a problem-based learning environment. According to research (Handayani & Wahyuni, 2021), students' self-regulated learning with Edmodo and the problem-based learning model surpassed traditional ways.

Interactive learning materials based on the Problem Based Learning (PBL) paradigm support students in the classroom, shift the focus from being told to being informed, and shift the assessment method from output-based to input-based. technique such that the final product meets learning goals, particularly those related to self-regulated learning and mathematical communication.

Interactive mathematics learning media that uses a problem-based learning approach may improve students' mathematical knowledge and self-regulation. According to the problems described above, the learning media is poor, and students' mathematical communication and self-regulated learning skills are low. In order to address this issue, the writer researched "Development of Interactive Learning Media Through Problem Based Learning Models to Improve Students' Mathematical Communication and Self Regulated Learning Abilities"

B. RESEARCH METHODS

This study will be of the developmental study variety. Thiagarajan's 4-Dimensional Development Model will be used in this study. This research will be carried out at SMP N 1 Bandar in class VIII odd semester of the 2022/2023 academic year on the material of Building Flat Side Spaces (Cubes and Blocks), while the study's objects included a set of Teacher's Books (BG) , Shiva Books (BS), Student Activities Sheets (LKPD), and a metacognitive ability test based on the think–pair–share learning model.

This research was conducted in two phases, the first of which involved the creation of learning tools based on the think-pair-share learning model. The development of learning tools, including the validity of the

learning implementation plan (RPP), the validity of the Student Activity Sheet (LKPD), the validity of the Student Book (BS), the validity of the metacognition ability test, and the validity of the mathematical communication ability test, is accomplished via: (a) Planning and review by experts; (b) Simulation. This is done to assess the viability of the developing learning instruments. The second phase is the implementation of learning aids deemed suitable based on the results of class VIII trials at SMP N 1 Bandar in class.

This study employs Thiagarajan's (4-D) model for learning tool development (Trianto, 2011:190) to examine the evolution of educational resources. The 4-D model was chosen because it is systematic and well-suited to the creation of educational resources. The 4D model consists of four stages: definition (Define), design, development, and dissemination (Disseminate). This study's development model is depicted in a nutshell in the next image:

This research consists of the preparation stage, implementation stage, analysis stage and report writing. Completely, research procedures can be seen in figure 1 below.

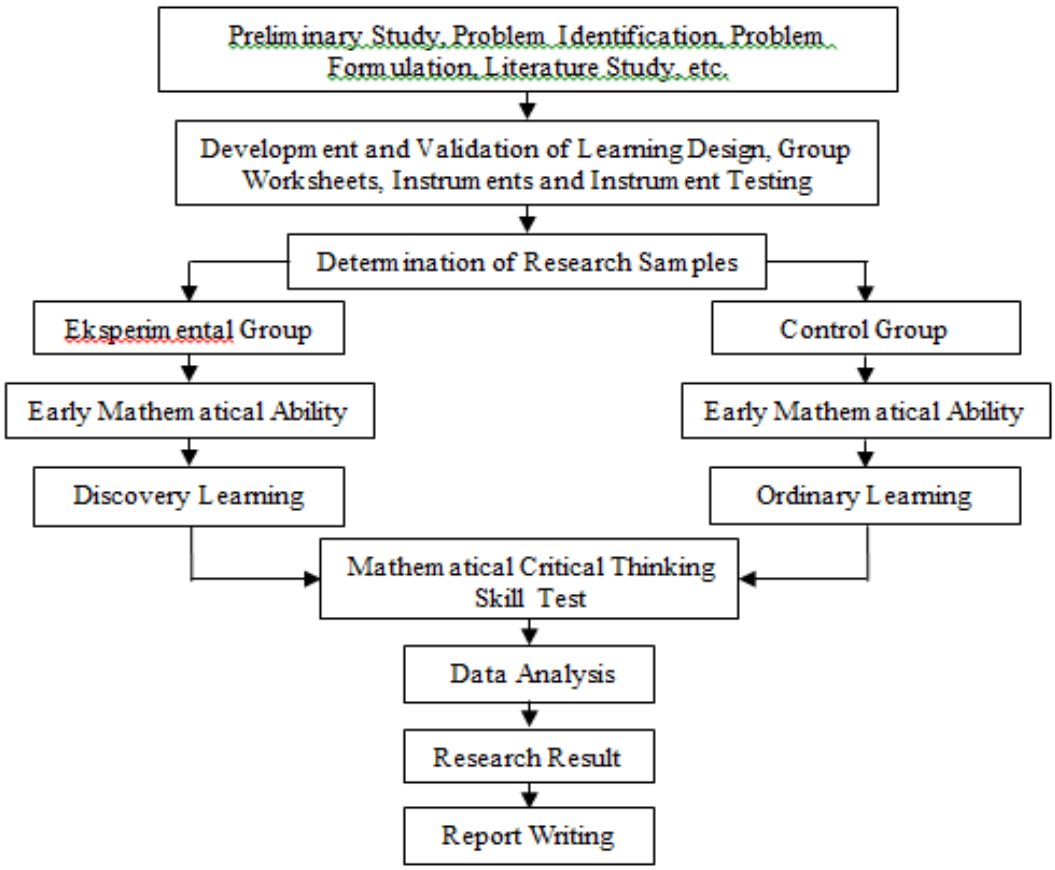

Figure 1.4-D Model Teaching Material Development Chart (Thiagarajan. 1974)

This research employs the following instruments to evaluate the developed learning tools: (1) The learning tool validation document is used to collect information about the quality of the learning tools based on expert evaluations. Validation sheets for Learning Implementation Plans (RPP), Student Books (BS), and Student Activity Sheets (LKPD); (2) the given ability test instrument is a structured description test; and (3) the Mathematical Communication Ability Test Instrument. A description test is used to acquire data to determine the mathematical communication ability of students. The purpose of the mathematical communication ability test is to determine whether or not students have mastered the topic of flat-sided geometric shapes after receiving instructional materials based on the think-pair-share learning model. This research is deemed successful if the instruments and materials developed meet the criteria of instructional validity, usability, and efficacy for encounter-based research. Validity is met when the content and construct validity of the developed teaching materials are satisfactory. (Siagian, 2017) Practicality is met if the instructional materials created are straightforward. Effectiveness is achieved when the outcomes of students' lectures after receiving learning materials are based on a problem-solving learning strategy. Developed problem-based learning instructional materials are considered effective if they ≥ 80% Positively consume 65% of the material presented and satisfy individual learning completion of all test-takers.

This development research makes use of the following instruments: (1) a validation sheet; (2) a sheet for experts and practitioners to assess the usefulness and efficiency of the tool; (3) an observation sheet; (4) a questionnaire for students and teachers; and (5) tests of learning outcomes.

C. RESULTS AND DISCUSSION

Based on the data obtained from the research results, it will be known whether the problem formulation or research question posed in the previous section has been answered or not. The results of the analysis of the data obtained show:

(1) The interactive learning media developed is valid; The validity test was carried out to see the shortcomings of the initial draft of interactive learning media which was designed by taking into account problems in Class VIII SMP N 1 Bandar related to basic competencies, material, sample questions and practice questions. The expert team (validators) involved in developing this tool consists of five experts. The validation results from the five validators stated that interactive learning media including: Student Books and Student Worksheets (LKPD) were valid and could be used with minor revisions. The five validators also stated that the students' mathematical communication ability test and mathematical communication ability test were valid with an average total validity of lesson plans of 4.36, LKPD of 4.32 and Interactive Learning Media (MPI) of 4.65. Then the results of the trial of the mathematical communication ability test instrument on the pretest and posttest questions which were tested on classes outside the sample showed that the mathematical communication ability test was valid. The same thing was also found in the instrument reliability test. The reliability of the mathematical communication ability test was 0.672 (high category) and the mathematical communication ability post-test was 0.572 (fair category). From the results of the analysis above, it can be concluded that the interactive learning media based on the Problem Based Learning model developed has met the validity criteria based on expert/practitioner assessment.

(2) interactive learning media developed practically; The implementation of learning using the interactive learning media developed is reviewed from 2 aspects of observation, namely: (a) Expert/Practitioner Assessment of Learning Tools, namely the results of expert and practitioner assessments of the practicality of interactive learning media based on the Problem Based Learning learning model which can be used with slight revisions and without revision. In the second aspect, namely (b) Implementation of Interactive Learning Media, the average observation score for implementation of learning using interactive learning media developed in trial I is in the poor category. Learning in this class was carried out in 2 meetings with an average implementation average of 75.00 in the sufficient category ($70 \leq k < 80$). Thus, it can be concluded that the implementation of learning from the first meeting to the second meeting was at sufficient criteria, which means that it did not meet the criteria for success in the practicality of interactive learning media in terms of learning implementation. The interactive learning media developed in trial I did not meet the practicality criteria previously set. The next activity is to carry out a repeat trial, namely trial II, paying attention to indicators of practical aspects that have not been met. Observations of learning implementation in trial II obtained an average score of 89.37 in the good category ($80 \leq k < 90$), which means it has met the success criteria for the practicality of interactive learning media in terms of learning implementation.

Based on the results of this research, it can be concluded that interactive learning media has fulfilled the practicality of interactive learning media as expected. In this way, the interactive learning media developed is practical for use by teachers and students.

(3) the interactive learning media developed is effective; The effectiveness of the interactive learning media developed was reviewed based on two aspects, namely: (i) Analysis of the Achievement of Classical Mathematical Communication Skills, based on the results of the posttest analysis of trial I and trial II, it was found that the mathematical communication abilities in trial I did not meet the criteria for classical completion. Students' learning completeness is seen from their mathematical communication skills which are tested using tests that have been developed in the form of essays. The results of trial I showed that the average problem solving ability of students in the post-test results of trial I was 73.33%, while in the post-test results of trial II it was 90% and in accordance with the criteria for completeness of classical student learning outcomes.

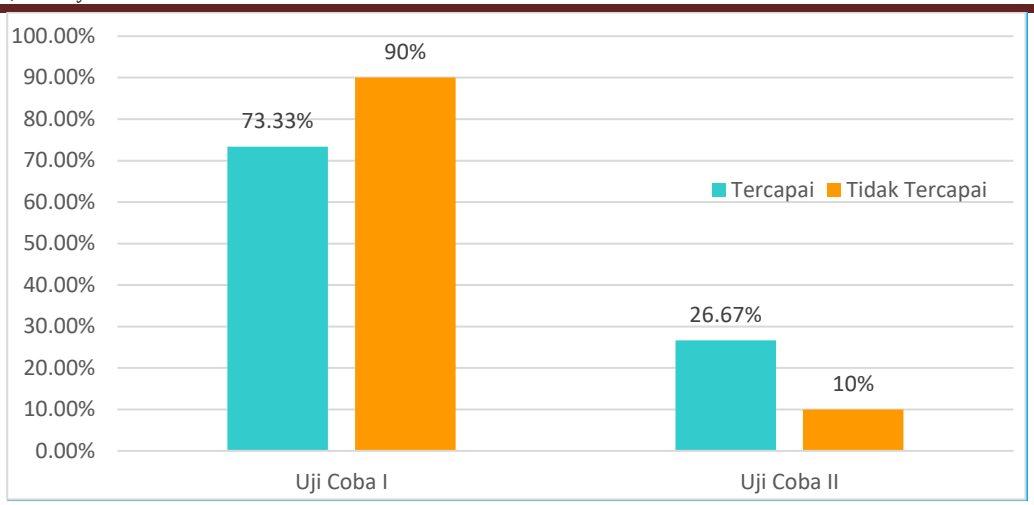

Figure 3.Classical student learning completeness

In accordance with the classical criteria for completeness of learning outcomes presented by Trianto (2011), namely a minimum of 80% of students who take the problem solving ability test are able to achieve a score ≥75. Thus, the post-test results of students' problem solving abilities meet classical completeness;

(ii) Achievement of Learning Objectives Based on the results of posttest analysis of trial I and trial II, it was found that mathematical communication skills in trial I achieved learning objectives, namely in the posttest results mathematical communication abilities had been achieved for all question items. Students' learning completeness is seen from their mathematical communication skills which are tested using tests that have been developed in the form of essays. The results of trial I, the results of students' mathematical communication skills in trial I, showed that the achievement of learning objectives on the average of all questions was 80.42%, while in the post-test results of trial II the average of all questions was 83.39%. and in accordance with the criteria for achieving the learning objectives that the learning objectives are achieved with the criteria ≥ 75% of the maximum score for each question item, thus achieving the learning objectives in trial I and trial II, namely in the posttest results, mathematical communication skills have been achieved for all question items.

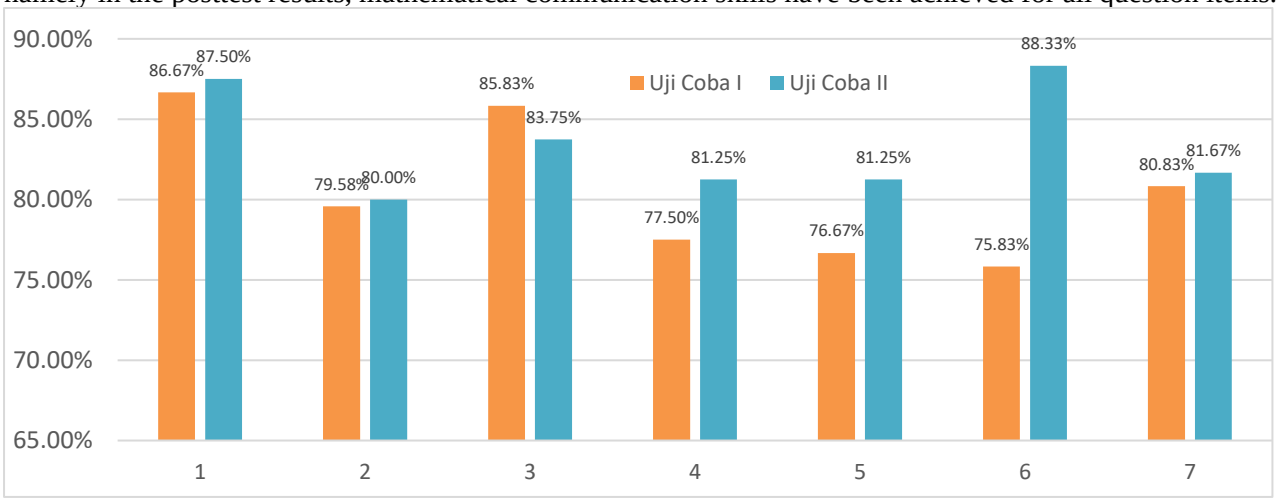

Figure 3.Achievement of Learning Goals

(iii) Analysis of Student Responses. This student response data aims to see the extent of interest, feelings of enjoyment, up-to-dateness, and ease of students in understanding the interactive learning media of the Problem Based Learning learning model being developed. After carrying out the post-test, students fill out a student response questionnaire regarding the use of interactive learning media and the implementation of learning. Student response data was obtained from a questionnaire which was analyzed based on percentages. Based on the results of data analysis from trial I and trial II, it was found that the average percentage of student responses in each trial was positive. This means that students give a positive response to the use of interactive learning media in learning. The actions/responses carried out by students to the stimulus in the form of teaching as an activity can be categorized into two things, namely positive responses to learning (listening, reading, writing,

discussing/asking) and negative responses (other irrelevant actions). A positive response indicates that students are willing to take part in the learning process. The positive response given by students was generated because the teacher had provided stimulus in the form of feedback and reinforcement that was in accordance with the characteristics of students after learning lessons in class.

(4) there was an increase in students' mathematical communication skills after using the interactive learning media that was developed. Based on the pre-test and post-test results, it can be concluded that students' mathematical communication skills using interactive learning media have increased. Based on the calculation of ngain/normalized gains in trial I and trial II, the increase in students' mathematical communication skills can be seen from trial I and trial II showing that the average mathematical communication ability of students in the post-test results of trial I is 0, 49 in the "medium" category and 0.51 in the "medium" category in trial II. Thus, it can be seen in trial I and trial II that students' mathematical communication has increased.

D. CONCLUSION AND SUGGESTIONS

Based on the results of the analysis and discussion in this research, several conclusions are put forward as follows: (1) The interactive learning media developed based on the Problem Based Learning learning model in improving students' mathematical communication skills has met the valid criteria with an average score of 4.65. (2) The interactive learning media developed based on the Problem Based Learning learning model has met practical criteria. This is based on: (a) Expert/practitioner assessment states that the tools based on the Problem Based Learning learning model developed can be used with slight revisions; (b) The implementation of interactive learning media developed based on the Problem Based Learning learning model is within good criteria, namely 89.37% in trial II. (3) The interactive learning media developed based on the Problem Based Learning learning model has met the effective criteria. This is based on: (a) Classical student learning completeness has been achieved in trial II at 90%; (b) Achievement of learning objectives has been achieved in trial II, namely 83.39%; (c) 93.31% of students' responses to learning components and activities have shown a positive response to the interactive learning media components and learning activities developed; (d) The learning time used does not exceed normal learning; (4) Increasing students' mathematical communication skills by using interactive learning media developed based on the Problem Based Learning learning model on flat-sided geometric material (cubes and blocks) increased from an average of 75.90 in trial I to an average of 87. 63 in trial II and the N-gain value was 0.49 in trial I to 0.51 in the medium category in trial II.

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