

STUDENT WORKSHEET DESIGN USING PROMPTING MODEL TO FACILITATE MATHEMATICS PROBLEM SOLVING ABILITY

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ABSTRACT

This study aims to determine the feasibility of LKPD teaching materials with the probing prompting learning model to facilitate the mathematical problem solving abilities of junior high school students on the flat-sided building material (cubes and blocks) and to determine student responses to the developed student worksheets (LKPD). This study uses research and development methods with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The results of the research data obtained, and it can be concluded that the student worksheet (LKPD) of the probing prompting model is suitable for use with the results of the material test ($\bar{x} = 33$), mathematics education test ($\bar{x} = 54$), and media expert test ($\bar{x} = 63$). Student responses when viewed based on the results of the overall aspect value of the limited scale test, the value ($\bar{x} = 45.71$) is in the very feasible category. Meanwhile, the students' responses to the wide-scale (field) test based on the overall aspect scored ($\bar{x} = 46.81$) with a very decent category.

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INTRODUCTION

Mathematical problem solving is a process of using the knowledge (knowledge) that has been obtained by previous students into new situations. Mathematical problem solving ability is an ability that must be possessed by students in learning mathematics so that every activity carried out in learning is very important because the learning objectives to be achieved in problem solving are related to everyday life. According to the results of the preliminary study when the researchers conducted the KKP in one of the schools in the city of Serang, namely SMPIT Azkia Wijaya in the 2021-2022 academic year, there were still many students who found it difficult to learn mathematics, not a few students who really understood the concept

of solving mathematical problems, students only working on the questions in accordance with what was exemplified by the teacher, students found it difficult to work on problems using mathematical problem solving concepts.

According to Sulasih.A (2019) stating that there are several symptoms of low mathematical problem solving abilities of these students including: 1) some students cannot directly work on problem solving problems in the form of stories so they have to ask the teacher the steps for working on the questions first, 2) most students cannot understand and identify what is known and asked from the questions given, 3) most students cannot plan solutions and do not re-examine the results that have been obtained, 4) students answer questions without using general steps. problem solving, and 5) students who cannot do the questions tend to leave or wait for answers from friends. This statement was reinforced by a researcher conducted by Rahmawati.A, (2022) that based on the results of the analysis and discussion of students' mathematical problem solving abilities, it can be concluded that with high abilities they can solve existing problems, but they are less thorough in solving problems. Read the question so the answers don't match. Students in the medium ability category cannot solve the problem because they can only understand the problem given. Students in the low category cannot solve the problem because they still have difficulty understanding the problem given. Therefore, the process of learning mathematics in problem solving needs to be improved, so that students' problem solving skills are honed

Therefore, to explore interesting mathematics learning that is in line with everyday life, various models appear in learning to facilitate the teaching and learning process of teachers, including the probing prompting learning model. The Probing Prompting learning model is very suitable for solving students' mathematical problems because in this Probing Prompting learning model students can be active in thinking in the learning process and also students must learn to solve the problems given by the teacher.

Suyatno (Susanti, 2017) states that probing prompting is learning carried out by the teacher guiding and exploring a series of questions so that there is a thought process related to the new knowledge being investigated. In addition, students build concepts into new knowledge, so that new knowledge is not contagious. Meanwhile, according to Huda (Helma Mustika, 2017), there are seven techniques that explore the learning steps which are described as follows: 2) Wait a while to give students the opportunity to formulate and discuss their answers 3) The teacher presents problems to students according to the index. learning 4) Wait for a while to help provide opportunities for students to solve the problem Phrase 5) The teacher assigns one student to answer a question 6) If the answer is correct, the teacher asks another student for an answer, the teacher asks another question. That answer is a guide to solving the answer. Then move on to problems that require students to think at a higher level. 7) The teacher asks the last question to other students to see if the indicators are really understood by all students.

Therefore, the researchers tried to apply the probing prompting learning model in the form of student worksheets (LKPD) to encourage mathematical problem solving skills. These teaching materials are also very useful in the implementation of mathematics education and learning to support student learning success by finding terminology for subjects taught independently or in groups. One of the learning tools that can assist in incorporating mathematical problem solving skills into teaching materials is LKPD. According to (Muhammad Hisni, 2022) LKPD can make students to explain their knowledge, therefore students can develop the potential of his mind and contribute actively during the learning process in the classroom. In this regard, LKPD also aims to find concepts in during the learning process that is tailored to the needs of students so that make it easier to explore the thinking abilities of students.

In addition, LKPD can involve students in building knowledge, increase their thinking potential and enable them to actively participate in class during the learning process. In an effort to innovate on the above problems, the researchers in this study used the Probing Prompting Model to design Student Worksheets (LKPD). In addition to providing innovative new LKPD teaching methods that are designed as attractive as possible, this LKPD is in the form of a hardbook, so that the LKPD can be used directly by students as well as by students and teachers without requiring access to the internet. The LKPD design is intended to help students interact indirectly with teachers about the topics presented.

Based on this problem, the researcher is interested in conducting a development research entitled "Designing Student Worksheets (LKPD) Using the Probing Prompting Model to Facilitate Mathematical Problem Solving Ability".

Student Worksheet (LKPD)

According to Praswoto (Kholiullah, 2011) LKPD is a tool to give messages to students that are used by teachers in the learning process and completed by students. Meanwhile, according to (Rofiah, 2014) LKPD is a way for teachers to communicate with students actively. Therefore, LKPD that can support communication with MI/SD students must be simple. The LKPD is a printed material that contains materials, summaries, and instructions for the implementation of learning tasks carried out by students, related to the basic abilities to be achieved. In preparing LKPD, educators must meet several requirements. To make a good worksheet, educators must be diligent and have sufficient knowledge and skills. For LKPD at least students must meet the criteria relating to the achievement or failure of the basic abilities that must be mastered. According to Syarifah.S (Hidayah, 2019) explains the steps in the preparation of LKPD, including: 1) Analyzing the curriculum, SK, KD, indicators, time allocation and learning materials 2) Analyzing the syllabus and determining the learning flow in accordance with the results of the SK, KD analysis, and indicators. 3) Analyzing the lesson plans and selecting the steps for learning activities. 4) LKPDs are arranged according to the activities in the lesson plans.

According to (Miqro' Fajari Lathifah, 2021) suggested that LKPD has 4 functions including: 1) LKPD is used as teaching material to minimize the role of educators, and make students play an active role 2) LKPD as teaching material that makes it easier to understand the material provided, 3) LKPD as concise teaching material and attracts students to practice, 4) facilitate the implementation of students. And then, LKPD has several advantages and disadvantages. The following are the advantages of LKPD: 1) Students can learn and progress at their own pace 2) Students can repeat their own study of the material that has been delivered at the time of theory 3) The combination of text and images can add to the attraction so as to facilitate the delivery of information which are presented in verbal and visual formats 4) Students will be more active in participating because they have to respond to the exercises and questions that are compiled, and 5) Print media can be reprinted and distributed easily. While the disadvantages of LKPD include: 1) The cost of printing is expensive if it will display color images 2) The printing process often takes time 3) The preparation is designed in such a way that it is not too long 4) Requires better maintenance 5) Cannot display motion.

Probing Prompting Learning Model

According to Huda (2013) explaining that Probing-Prompting learning is learning by means of the teacher presenting a series of questions that are guiding and exploring so that there is a thinking process that links each student's knowledge and experience with the new knowledge being studied. Furthermore, students form concepts, principles and rules into new knowledge, thus new knowledge is not notified. This learning model requires students to be more active in the learning process because the teacher will appoint students at random to answer the

questions asked so that students inevitably have to participate and cannot avoid the learning process.

According to Sudarti (2008) there are seven steps of the probing prompting learning model including: 1) the teacher gives students problems such as questions in the form of pictures, tables and so on 2) the teacher provides opportunities for students to make answers to the questions given 3) the teacher asks questions to the students. students to explore knowledge about the expected material, 4) the teacher again gives the opportunity for students to make answers 5) the teacher appoints students to answer questions 6) if the answers given are correct, the teacher asks for other students' answers. however, if the answer given is wrong, the teacher will ask additional questions that will guide students to answer the first question 7) the teacher asks other questions to other students to ensure that the learning indicators for the day have been achieved.

According to Muthmainnah (2019) Probing Prompting learns some of the advantages and disadvantages of learning strategies. The advantages obtained by observing the various studies above are: 1) probing prompting-based learning strategies allow all students to actively participate in learning by asking the teacher directly, 2) strategy-search-based learning strategies can familiarize students with independent learning through student worksheets (LKPD).). While the weaknesses of the probing learning strategy are: 1) the exploratory prompt learning strategy requires teachers to think critically when asking questions that guide and guide students towards the learning objectives to be achieved 2) it is difficult for teachers to ensure that many students understand the material depending on the learning objectives.

Mathematical Problem Solving Ability

Sulasih (2019) explains that problem solving ability is an ability where individuals use the knowledge, skills and understanding they already have to solve problems in new situations or problems. Problem solving ability is very important and needs to be mastered by students in learning mathematics because in the learning process and its completion, students are possible to gain experience using the knowledge and skills they already have to be applied to non-routine problem solving.

According to Polya (Sulasih, 2019) states that there are four indicators to solve mathematical problems including:

- 1) Understanding the problem, namely determining (identifying) what is known, what is being asked, what conditions are needed, what conditions can be met, checking whether the conditions are known, and restating the original problem in a more operational form. can be solved)
- 2) Planning a solution, checking whether you have seen before or seen the same problem in a different form, checking whether you already know other related problems, linking with theorems that may be useful, paying attention to what is not known from the problem and trying to think about familiar problems that have the same unknown element.
- 3) Implementing the settlement, namely carrying out the completion plan, checking the correctness of each step and proving that the steps are correct.
- 4) Re-checking, namely re-examining the results that have been achieved, checking the results, checking the arguments, looking for the results in other ways, and using the results or methods found to solve the problem. masalah lain.

METHOD

This research was conducted in the odd semester of the 2021-2022 academic year, this research was conducted at MTs Negeri 4 Serang for grade IX-2 students. This research uses the type of research and development method or Research and Development (R&D), which aims to develop products that will be tested for quality by experts. In this study, researchers used the ADDIE research model. The ADDIE model was developed and popularized by Robert M. Branch. The ADDIE model is intended as a guide in designing a learning product design. The ADDIE model was developed based on the theoretical foundation of learning design. This model is structured with systematic steps to solve learning problems. According to Branch (in Permana. 2022) the steps for developing learning with the ADDIE model are Analyze, Design, Development, Implementation, Evaluation.

RESULTS AND DISCUSSION

Results

The product produced in this research and development is in the form of student worksheets based on the probing prompting learning model with the material for building flat sides of cubes and blocks for eighth grade junior high school students. The following are the results of research and development that have been carried out during the research and in accordance with the steps of the ADDIE development model, including:

Stage of Analysis (Analysis)

This analysis stage is the initial stage of product development for the probing-prompting LKPD model of learning. The analysis carried out includes an analysis of needs, curriculum and student characteristics which are used as references and considerations for making learning media. Identification of the problem in this study was carried out by analyzing the needs at MTs Negeri 4 Serang through interviews with the mathematics education staff for class IX. Based on the results of interviews with educators, it was found that the learning media used were still textbooks and the learning methods used were still conventional or lectures. The learning curriculum that will be used in the development of this learning media is the 2013 curriculum and the material to be discussed is the material for building flat sides (cubes & blocks). The material for building a flat side space was chosen because it is quite difficult material so that learning media is needed to make it easier for students to learn the material. LKPD based on the probing prompting learning model was created using the Canva application which is expected to be developed to be more interesting and fun to use so that students can understand the concept of solving mathematical problems in the flat-sided building material and it is hoped that students will be more active in the learning process.

Design Phase (Design)

The second stage is design which is all preparation of the concept from beginning to end in designing the appearance of the LKPD based on the probing prompting learning model that you want to develop so that it takes the form of a desired LKPD design. the design of this LKPD, namely: 1) compiling LKPD storyboards 2) media selection 3) collecting design objects 4) initial LKPD design. The student worksheets (LKPD) using the probing-prompting learning model on the flat side space on cubes & blocks will be developed in the form of a book that can be used without accessing the internet and made using Canva with A4 paper size and using the font type Mali and Freckle Facede . Mali font with a font size of 15 and a spacing of 1.65 while the Freckle Facede font with a font size of 25.7 and a spacing of 0.99.



Figure 1. Draft of LKPD

The picture above is an example of the initial draft of the LKPD which consists of 94 pages including cover, introduction, instructions for use, teachers, student instructions for use, KI/KD, achievement indicators, learning objectives, indicators of mathematical problem solving abilities, learning models, concept maps, activities learning, learning narration, problem solving, steps for completion, summary of material, competency test, author's biography, and back cover.

Results of the Development Phase (Development)

At this development stage, what is being developed is in the form of a Probing prompting-based Mathematics LKPD to improve mathematical problem-solving skills on flat-sided (cube & block) materials. So this development aims to produce a new product in the form of the final LKPD after going through many revisions to the LKPD. From the previous steps, the LKPD that will be developed will then be compiled and made according to the concept that has been designed in compiling the LKPD so that it becomes a real LKPD. Then the resulting LKPD is validated by material experts, mathematics education experts, and media experts according to the assessment instrument based on the requirements that must be met in the preparation of the appropriate and good LKPD.

The material expert validator came from outside the FKIP UNSERA (University of Serang Raya) environment, namely Mrs. Frena Fardillah M.Pd, a lecturer in mathematics education from the Muhammadiyah University of Tangerang, while the validator for mathematics education was taken from one of the mathematics lecturers from Primagraha University who was tested directly by Mrs. Eva Fitria Ningsih M.Pd, and the validator of the media expert test was taken from one of the computer science lecturers from the University of Banten Jaya, Mr. Yul Hendra M.Kom. The results of the material expert validation, mathematics education expert test, and material expert test can be seen in table 1:

Table 1. LKPD Feasibility Test Results Based on Overall Aspect

Validation	Total score	Total score	Average	Average score	Criteria
Material Expert Test Mathematics	33	33		3	Worthy
Education Expert Test	54	54		3	Worthy
Media Expert Test	63	63		3	Worthy
Total	150	150		9	

The assessment of the material expert in assessing the feasibility of the LKPD in the overall aspect shows the Eligibility criteria for the three validators as shown in table 1. Based on the

assessments given by material experts, mathematics education experts, and media experts, the overall expert assessment of the developed LKPD can be seen in figure 2.



Figure 2. Diagram of expert test results

Results of the Implementation Phase (Implementation)

Limited Scale Test

This limited-scale test was carried out after the first expert test conducted by a validation expert. The implementation was carried out in a small number of students consisting of only 7 students of MTs Negeri 4 Serang class VIII and IX. The implementation of this limited test is carried out outside class hours and outside school. In the implementation of this limited-scale test, students who are respondents are given a questionnaire in the form of a LKPD feasibility test before using the teaching materials in the form of the LKPD. The type of measurement used is in the form of a Likert scale, this LKPD eligibility questionnaire aims to ask students for input regarding the language used, the type of font used, background color, writing, the use of language that is easy to understand or not, and the interest in the appearance of the LKPD.

Test Area (Field)

This wide-scale test is carried out after a limited scale. In the implementation carried out in large numbers of students consisting of 31 students of MTs Negeri 4 Serang class and IX. The implementation of this broad test is carried out during school hours. In the implementation of this wide-scale test, students who became respondents were given a questionnaire in the form of student responses to LKPD and evaluation questions based on mathematical problem solving abilities. The type of measurement used is in the form of a Likert scale, this questionnaire aims to ask students for input regarding the language used, the type of font used, background color, writing, the use of language that is easy to understand or not, and interest in the appearance of the worksheets and ability-based materials. students' mathematical problem solving.

The results of the LKPD feasibility assessment based on the overall aspects of the limited scale test and wide scale test can be seen in table 2:

Table 2. Results of Student Responses to LKPD Based on Overall Aspects

Shiva Response	Total score	Total Average score	Average score	Criteria
Limited Scale Test	320	45,71	3,52	Very Worthy
Wide Scale Test (Field)	1.451	46,81	3,60	Very Worthy
Total	1.771	92,52	7,12	

At the time of the limited-scale test and the broad-scale test, the overall aspects obtained very feasible criteria so that this LKPD could facilitate mathematical problem solving abilities. Based on the assessments given by material experts, mathematics education experts, and media experts, the overall expert assessment of the developed LKPD can be seen in figure 3.



Figure 3. Diagram of Student Response Results Based on Overall Aspect

Furthermore, during the broad-scale test, a mathematical problem-solving ability test was conducted which aims to determine student responses regarding the facilitation of the LKPD probing prompting learning model on mathematical problem-solving abilities. Next, the respondent will be asked to solve the story questions on the flat side (cubes and blocks). The data was taken from the answers of 31 students in class IX-2 at MTs Negeri 4 Serang, the questions consisted of 3 description items which were assessed according to the assessment rubik that had been determined as a score. So that the results of the mathematical problem solving ability tests that have been carried out by students during the field test can be seen in figure 4 below:

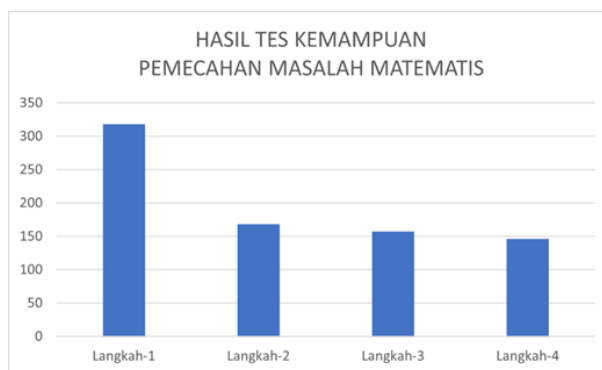


Figure 4. Solving Ability Test Results Math Problems

Results of the Evaluation Phase (Evaluation)

At the final stage of the development of this LKPD, namely the evaluation stage. After the expert test, limited scale trial and wide trial, it was found that the developed LKPD was in the very feasible criteria and it was said that the LKPD could be used. So that there is no input and revision regarding the LKPD products developed, both from experts and from student responses.

Discussion

The following are the results of the analysis of mathematical problem solving abilities that have been carried out by previous research, including:

1. Research conducted by Hardinurdiana and Anisah Kurniati (2018) with the title "Development of Problem Solving-Based Student Worksheets (LKS) to Facilitate

Mathematical Problem Solving Ability of Madrasah Tsanawiyah Students" From the results of posttest data analysis, the level of students' mathematical problem solving ability is 80 ,20% with high criteria. Based on this indicator of mathematical problem solving ability, it shows that the developed worksheets have been able to facilitate students' mathematical problem solving abilities. From the results of the posttest analysis, it can also be seen that there are 4 students who are included in the incomplete category because the scores they get are below the KKM (<75) and 21 other students are included in the complete category because their scores are (≥ 75).

2. Research conducted by Paramartha, Suharta, Parwati (2020) with the title "Application of Ethnomatics-Based Mathematics Student Worksheets (LKS) to Improve Problem Solving Ability and Build Positive Character of Students" explains that the mathematical problem solving ability of seventh grade students of SMP Saraswati Singaraja in the 2018/2019 academic year through the application of ethnomathematical-based LKS-assisted learning, it has increased from cycle to cycle. This can be seen from the results of classroom observations where students with low problem solving abilities are able to identify what is known, asked, and use mathematical concepts according to the problem. From the results of the problem-solving ability test, the percentage of students who were in the complete category from cycle I to cycle II increased by 40%, then from cycle II to cycle III the percentage of students who were in the complete category increased by 15,00% .

Based on the results of research conducted directly by researchers obtained the following results:

1. Planning Problems

Student activities on the LKPD that facilitate this indicator are on page 16 on learning activity 1, page 35 on learning activity 2, page 52 on learning activity 3, and page 66 on learning activity 4. Some students during the broad-scale test showed students understood the material by filling in the questions given at the time of the broad-scale test well, the questions given are in the form of 3 questions on the shape of the flat side (cubes and blocks) based on mathematical problem solving abilities. Then at the time of the broad-scale test, the researcher gave a test that facilitated mathematical problem solving skills, along with the results of respondents' answers that met the criteria for understanding the problem.

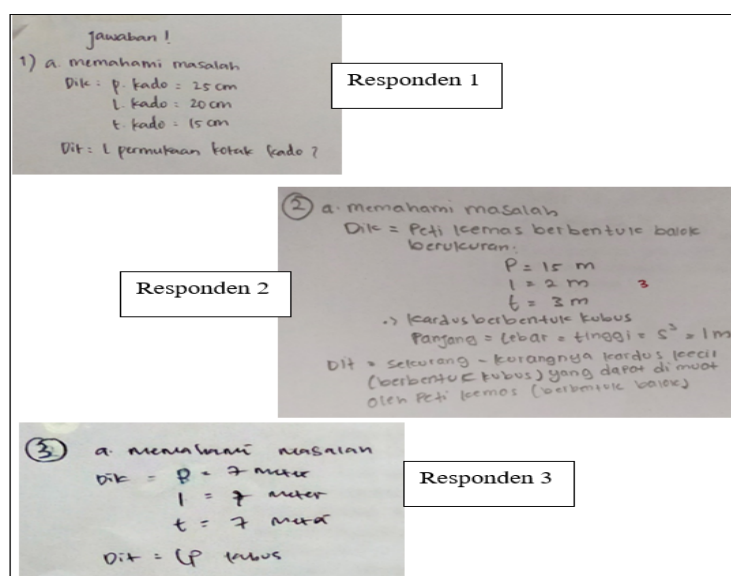


Figure 5. Display of student answers on indicator 1

From these questions in figure 5, respondents were asked to understand the problem from the questions given. The results of the answers of respondent 1 on question number 1, respondent 2 on question number 2, and respondent 3 on question number 3 have been facilitated in understanding the problem in the question by determining (identifying) what is known and what is asked correctly. so that the scoring results from the data obtained on the problem planning indicators, obtained the results of the answers as many as 31 respondents, namely 318 points.

2. Planning Completion

Student activities on LKPD that facilitate this indicator are on page 16 on learning activity 1, page 36 on learning activity 2, page 52 on learning activity 3, and page 66 on learning activity 4. The following are the results of respondents' answers that meet the criteria for planning problem solving:

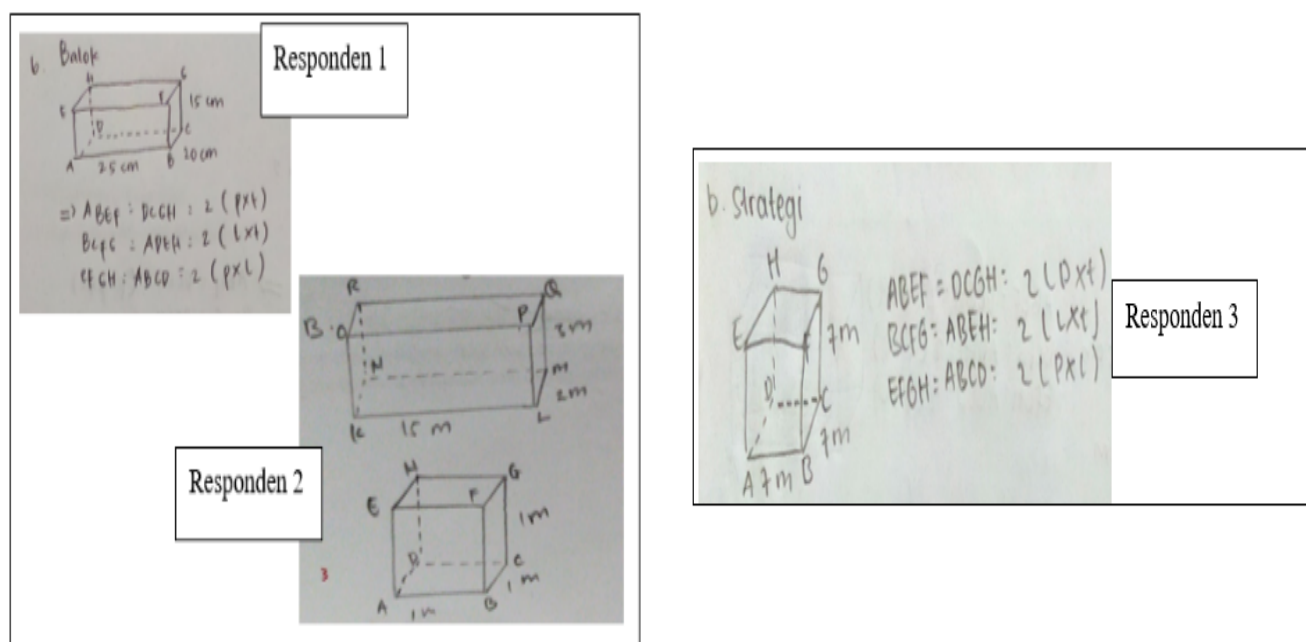


Figure 6. Display of student answers on indicator 2

From these questions in figure 6, respondents are asked to plan solutions, check whether they have seen before or seen the same problem in a different form, check whether they already know other related questions, relate to theorems that may be useful, pay attention to what is not known from the problem and try to think about it. known questions that have the same unknown elements. The results of the answers of respondent 1 on question number 1, respondent 2 on question number 2, and respondent 3 on question number 3 have been facilitated in planning the solution correctly. so that the scoring results from the data obtained on the indicators of planning for completion obtained the answers as many as 31 respondents, namely 168 points.

3. Carry out the solution

Student activities on LKPD that facilitate this indicator are on page 17 of learning activity 1, page 37 of learning activity 2, page 53 of learning activity 3, and page 67 of learning activity 4.

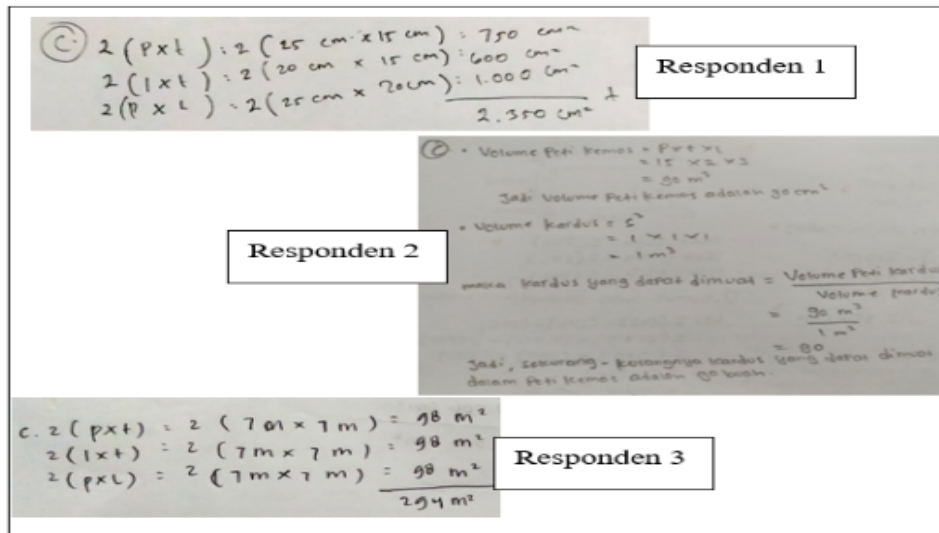


Figure 7. Display of Student Answers on Indicator 3

From these questions in figure 7, respondents were asked to carry out the settlement, namely carrying out the completion plan, checking the correctness of each step and proving that the steps were correct. The results of the answers of respondent 1 on question number 1, respondent 2 on question number 2, and respondent 3 on question number 3 have been facilitated in carrying out the settlement according to the plan correctly. so that the scoring results from the data obtained on the indicators of carrying out the settlement obtained the results of the answers as many as 31 respondents, namely 157 points.

4. Check again

Student activities on LKPD that facilitate this indicator are on page 20 on learning activity 1, page 38 on learning activity 2, page 53 on learning activity 3, and page 67 on learning activity 4 following the results of respondents' answers that meet the criteria in re-examining the results obtained. achieved:

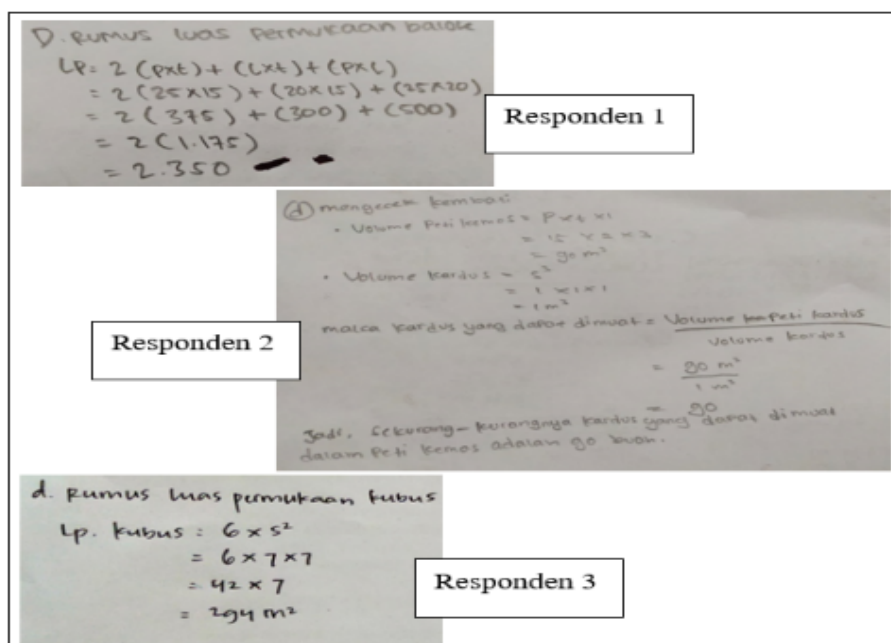


Figure 8. Display of Student Answers on Indicator 4

From these questions in figure 8, respondents were asked to re-examine, namely re-examining the results that have been achieved, checking the results, checking the arguments, looking for the results in other ways, and using the results or methods found to solve other problems. The results of the answers of respondent 1 on question number 1, respondent 2 on question number 2, and respondent 3 on question number 3 have been facilitated in re-examining correctly. so that the scoring results from the data obtained on the indicator do a re-check to obtain the results of the answers as many as 31 respondents, namely 146 points

CONCLUSION

The student worksheets (LKPD) of the probing prompting learning model to facilitate students' mathematical problem solving skills are made through the research and development stage when viewed based on the results of the overall aspect value of the material expert test, the \bar{x} value of 33 is at $27.5 < \bar{x} < 35.75$, so it is included in the Eligible category with an average score of 3, the score is based on the overall aspect of the mathematics education expert test, obtaining a value of \bar{x} of 54 is at $45 < \bar{x} < 58.5$ so it is included in the Eligible category with an average score 3, and if viewed based on the results of the overall aspect value of the media expert test, the \bar{x} value of 63 is at $52.5 < \bar{x} < 68.25$ so that it is included in the Eligible category with an average score of 3.

Student responses to teaching materials for student worksheets (LKPD) using the probing prompting learning model to facilitate students' mathematical problem solving abilities when viewed based on the results of the overall aspect value of the limited scale test, the value of \bar{x} is 45.71 with a mean score of 3.52 being at $\bar{x} > 42.25$. While the students' responses to the wide-scale (field) test based on the overall aspect obtained a value, the \bar{x} value was 46.81 with a mean score of 3.60 at $\bar{x} > 42.25$. Meanwhile, based on the results of the mathematical problem-solving ability test, the scoring results from the data obtained on the indicator re-checked the results obtained as many as 31 respondents, namely 318 points on the indicator of understanding the problem, 168 points on the indicator of planning for completion, 157 points on the indicator of carrying out problem solving, and 146 points on the recheck indicator.

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