



## The Ability of Seventh-Grade Students in Mathematical Problem-Solving on Set Theory Using Animation Media

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### ABSTRAK

Tujuan penelitian ini adalah untuk mendeskripsikan keterampilan pemecahan masalah pada topik himpunan dengan menggunakan media animasi. Penelitian ini merupakan jenis penelitian deskriptif yang berfokus pada kemampuan pemecahan masalah matematis yang menjadi variabel penelitian ini. Subyek penelitian ini adalah siswa kelas VII SMP Muhammadiyah 4 Palembang. Pengumpulan data dilakukan melalui dua metode yaitu metode tertulis dan metode wawancara. Hasil penelitian menunjukkan bahwa kemampuan pemecahan masalah matematis siswa kelas VII SMP Muhammadiyah 4 Palembang masuk dalam kategori sedang. Dengan menggunakan video animasi dalam pembelajaran matematika pada topik himpunan dapat membantu siswa dalam memecahkan atau menemukan solusi permasalahan matematika

### ABSTRACT

The aim of this research is to describe problem-solving skills in the topic of sets using animation media. This research is a type of descriptive study focusing on mathematical problem-solving skills, which is the variable of this research. The subject of this research is seventh-grade students at Muhammadiyah 4 Middle School in Palembang. Data was collected through two methods: written methods and interview methods. The research results indicate that the mathematical problem-solving ability of seventh-grade students at Muhammadiyah 4 Middle School in Palembang falls into the moderate category. By utilizing animated videos in mathematics learning on the topic of sets, it can assist students in solving or finding solutions to mathematical problems.

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## INTRODUCTION

Education is the most influential direction in developing nationalism and the state, or it can also serve as a guide to make life clearer. Education is inseparable from the process of teaching and learning, one of which is mathematics education, which organizes thinking through a contextual problem-solving approach. One aspect of hope in applying mathematics learning is problem-solving, which facilitates reasoning, communication, and problem-solving skills (Depdiknas, 2016; Geonawan et al., 2017).

The ability to solve mathematical problems is a fundamental skill that must be mastered in mathematics because when students learn to solve a mathematical problem, they gain learning experiences in identifying issues, formulating solution strategies, and executing the given steps (Dewi & Saharuddin, 2024). Students can be said to possess this ability if they meet specific criteria interpreted as indicators. Students can develop problem-solving skills if they have indicators of problem-solving abilities; one example is understanding the problem, devising a plan to solve the problem, executing the plan, and reflecting. (Suryawan, 2020). However, problem-solving skills are still considered low. The PISA results provide data indicating that among the 80 countries participating in the PISA assessment, Indonesia ranks 73rd with a relatively low score. One of the reasons for Indonesia's low PISA score is that teachers still often use conventional teaching methods, causing students to solve problems primarily based on procedural formulas found in books or from educators, which diminishes their mathematical problem-solving abilities. Based on research findings, it can be concluded that the low problem-solving skills of students, particularly in the material of arithmetic sequences and series, are due to deficiencies in planning and evaluating solutions (Rahmat, 2022).

Similarly, from the results of the interview with the mathematics teacher at Muhammadiyah 4 Middle School in Palembang. The results of the interview indicate that many students still lack the ability to solve mathematical problems, especially regarding the topic of sets. This is due to the student's lack of motivation and the conventional nature of the learning process, which often leads to boredom during lessons. This issue arises because the teaching is still too teacher-centered. Students are not given enough opportunities to actively participate in learning activities, and furthermore, they want to learn mathematics in a more engaging and motivating way, which would help foster their interest in the subject.

Another factor to consider is the lack of innovation from teachers in selecting engaging teaching methods. This causes the learning process to become less enjoyable and makes students less active (Putri & Ariani, 2022). The development of technology has introduced many new elements in learning media, one of which is animation media. One of the advantages of animated video media is its ability to present messages clearly through simultaneous audio, as well as to display objects, places, and events in the form of engaging moving images. This can enhance students' motivation to learn, and furthermore, by utilizing animation media, the problems presented in learning can be based on everyday issues that are relevant to the learners. This aligns with the statement from Irsan (2023) that the presentation of material and images can be adjusted using customizable animations to support the correct presentation of concepts. This can help students in observing and focusing on the learning process, enabling them to better understand the concepts being studied.

Based on identifying the issues above and considering the importance of students' mathematical problem-solving skills, which are still relatively low, there is a need to create innovations by utilizing animation media in learning to improve problem-solving abilities. The problem analysis shows that using learning media in the teaching and learning process has a significant impact. Referring to the issues, their root causes, and previous research findings, it can be concluded that an innovation in learning is needed that utilizes animation media to foster students' interest in learning as a tool used by students. This encourages the researcher to further investigate through the study titled "The Mathematical Problem-Solving Ability of Seventh-Grade Students on Set Material Using Animation Media" to describe the results of seventh-grade students' mathematical problem-solving abilities on set material through animation media.

## METHODS

This is descriptive research with a qualitative approach. It aims to describe the mathematical problem-solving abilities of seventh-grade students on the topic of sets through animation media.

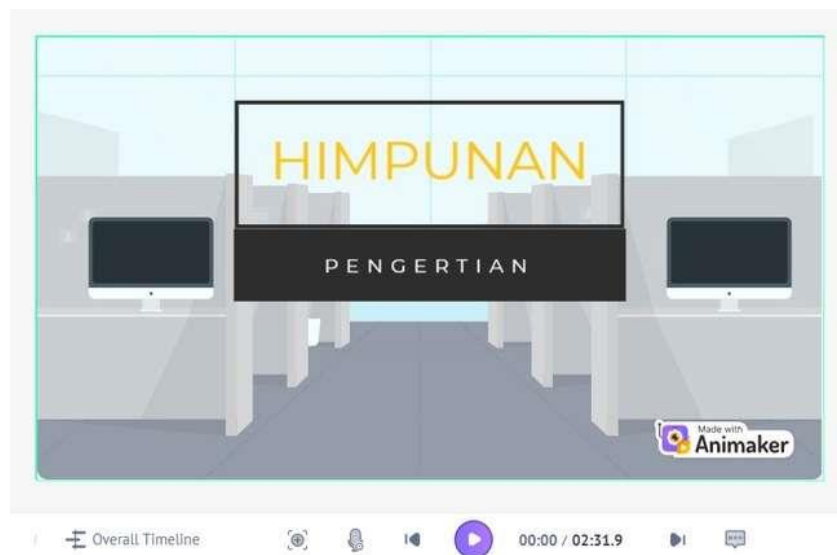


Figure 1. Display of Media Animation Set Theory Material

Problem-solving ability can be measured from students' test results, valid for their ability to solve mathematical problems. The following are indicators of mathematical problem-solving skills, as follows:

Table 1. Problem-Solving Indicators

No	Problem-Solving Ability Indicators
1	Identifying known elements, questions, and the sufficiency of elements (understanding the problem stage)
2	Selecting appropriate approaches and methods for problem-solving (determining the problem-solving plan stage)
3	Applying problem-solving strategies (implementing the problem-solving plan stage)
4	Interpreting results (work and interpreting solutions stage)

The researcher conducted a study at Muhammadiyah 4 Middle School in Palembang, specifically in the seventh grade. The researcher categorized by establishing criteria beforehand. This research focuses on students who demonstrate good academic performance in written tests, are highly motivated to participate, and receive support from the relevant subject teachers. Research data was obtained through written tests and interviews. The written tests were administered after the learning process, while the interviews were conducted to gain a deeper understanding of students' problem-solving abilities based on the test results. Data from the interviews were summarized and organized, then conclusions were drawn. For the exam scores, we check the students' answers individually using specific guidelines to assess their ability to solve set theory problems.

## RESULTS AND DISCUSSION

The research was carried out in four meetings, namely at the first, second and third meetings, learning material on sets was carried out with the help of live worksheets where students worked on live worksheets in groups using the laptops provided and at the fourth meeting students carried out a written test then continued with interviews regarding the results of their work.

This research was conducted over two meetings and will take a sample of 20 people to be used as the research sample. The researcher begins the lesson by greeting, praying, checking the students' attendance, stating the learning objectives, and providing a triggering question. After that, the researcher explained the basic concepts of Sets and introduced the students to the topic that would be studied, namely the definition of sets, how to express sets and their members. Then, the researcher presented problems related to the definition of sets, how to express sets, and their members to stimulate the students' interest and curiosity. The researchers divided the students into several groups.

In the learning process, the researcher implemented the problem-based learning (PBL) model with the aid of an electronic student worksheet (E-LKPD) focused on set theory. Students expressed that working in groups using the PBL model with E-LKPD made them excited and enthusiastic about learning. This was because, in addition to reading material, they also received explanations and solved problems with the support of animated videos from the E-LKPD. E-LKPD that utilize visual elements such as images, graphics, or diagrams help students visualize real-life problems. This greatly aids in understanding the context of word problems, which are often abstract (Eraiana et al, 2023). The researcher distributed the Student Worksheets (e-LKPD) to the students and allowed each group time to observe the learning video. The researcher provided a brief demonstration of the features and navigation of the digital LKPD to the students before they began their independent tasks. In the first meeting, the students started their learning activities by working on the problems outlined in the digital LKPD, which focused on how to express sets and their members. The use of the e-LKPD is expected to facilitate students in solving problems related to the topic of sets. Considering that there

are several students who have not yet completed problems 1 and 2 from the previous meeting, then.

In the second meeting, all students were given the opportunity to revisit the solution to the problem related to the topic of sets. Students address the problem starting with the first step, which is the ability to identify the known elements, the questions being asked, and the sufficiency of the elements (understanding the problem stage). The second step is to choose the appropriate approach and methods for problem-solving (the stage of determining the problem-solving plan). The third step is to implement the problem-solving strategy (the stage of executing the problem-solving plan). The fourth step is to interpret the results (work and interpreting solutions stage). After completing two stages of learning that used student worksheets, a written test was conducted to assess the students' understanding.

2. Pondok pesantren Qodratullah Palembang akan mengadakan Masa Pengenalan Lingkungan Sekolah (MPLS) untuk santri baru. Ridho selaku ketua asrama laki-laki menginformasikan peserta didik baru untuk mengisi biodata diri yang meliputi nama, asal sekolah, dan hobi. Dari 100 orang peserta didik baru yang ada di asrama laki-laki, terdapat 60 peserta didik yang hobi bermain sepak bola, 30 peserta didik yang hobi bermain basket, dan 25 peserta didik yang tidak hobi bermain keduanya. Tentukan banyaknya siswa yang memiliki hobi keduanya.

a. Informasi apa yang kamu ketahui dari soal?

8 Peserta didik baru ada : 100 Siswa  
60 peserta didik yg hobi bermain sepak bola  
30 peserta didik yg hobi bermain basket  
25 peserta didik yg tidak hobi keduanya 4

b. Strategi apa untuk menyelesaikan soal tersebut?

8 \* buat diagram venn  
\* konsentrasi 3

c. Tuliskan Solusi/Langkah-langkah penyelesaian

30 Rumus :  $n(A \cup B) = n(A) + n(B) - n(A \cap B)$   
 $100 = (60 - x) + (30 - x) + x + 25$   
 $100 = 115 - 100 = 15$   $x = 15$  4

d. Tuliskan kesimpulan

7 Jadi, banyaknya siswa yang memiliki hobi keduanya adalah  $x = 15$  4

SELAMAT MENGERJAKAN

Able to identify most of the information given and desired in the problem

Able to find key information and make precise estimates to solve problems

Complete all steps of the plan correctly and without deficiencies.

Draw logical and relevant conclusions based on the analysis carried out

Figure 2. DA's answer

Based on the analysis results, the subject DA successfully provided accurate and comprehensive answers to the aforementioned issues. The steps taken followed the procedure, starting with the first step, where the subject was able to identify the known and questioned elements. The second step involved DA selecting the most appropriate strategies and techniques to address the problem. The third step saw DA execute the plan that had been created to achieve the desired outcome. In the fourth step, DA successfully produced an accurate interpretation and drew logical and relevant conclusions based on the analysis conducted on the results of the work.

Based on the results of the DA answer, DA belongs to the group of students with high problem-solving abilities. His answer is that these students can correctly write down

what they know and what is asked in all numbers of questions. The student could also explain the steps in solving the problems correctly in all the questions given. In the final stage, the student has not yet completed the re-examination stage but can already conclude from the results of the answers obtained, so students still get scores. Based on the results of interviews with students, students can explain their understanding of solving the problems given.

Unlike DA, in the question with the subject initialed AT, only two indicators can be met: determining and executing the problem-solving plan. The indicator for identifying the problem, which involves writing down what is known and what is being asked, and the indicator for interpreting the results, which involves writing down the conclusions from the problem-solving work, are absent in AT's answer. As a result, two indicators are not fulfilled in AT's work.

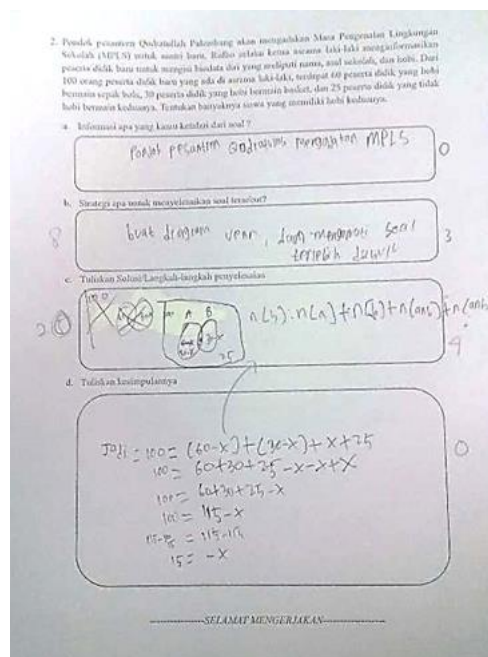


Figure 3. AT's answer

AT encountered difficulties answering the questions, as clarified during the interview with the relevant subject. Here are the results of the interview between AT and the researcher.

- P : "Permasalahan apa yang kamu ketahui dari soal tersebut?"  
AT : "Tidak ada ilustrasi gambar yang saya buat."  
P : "Apa kendalanya?"  
AT : "Karena saat itu, saya kurang fokus dan kurang memahami pertanyaan yang ada di soal tersebut"  
P : "Lalu kesimpulan apa yang diperoleh dari pertanyaan sesuai masalah?"  
AT : "Tidak ada kesimpulan yang saya peroleh."  
P : "Apa kendalanya?"  
AT : "Karena saya masih bingung kesimpulan seperti apa yang dimaksud."

AT said he had not illustrated the points he made from the question. That obstacle was because I was not focused enough and did not understand the questions. He



has not concluded either because he is still confused about what kind of conclusion is meant.

Based on the answers of students with low abilities, it can be seen that these students can write down what is known in question number 2c but do not write down what is asked in question 2b. Furthermore, these students only answer part of the problem in question number 2b, and 2c. In the final stage, these students have not yet completed the re-examination stage but can already write conclusions based on the results of the answers obtained. You still get a score. For question number 2d, the student did not answer because he did not understand the question's meaning. They cannot understand the information and problems in the questions.

This is in line with the results of Waliana's (2022) research that when solving problem-solving questions, students make mistakes at the stage of understanding the problem, preparing a resolution plan, implementing its plans, and checking again. Students' mistakes in completing set questions, namely not writing down what is known and asked in the question, for example, before making a mathematical model, incorrectly determining the formula, not writing conclusions, and not checking again. Form errors made by students based on the object of mathematics study are conceptual, principle, and skills errors.

Musta'inatun (2022) further stated that factors causing errors include not understanding the material related to the question, not being careful in reading and understanding the information on questions, not being thorough in answering questions and drawing conclusions, and being unable to apply concepts that have been learned and understood.

## CONCLUSIONS

Animation media in the mathematics learning process with the topic of sets has an impact that influences mathematical problem-solving skills. Through animated media, students can solve contextual problems related to the topic of sets. Moreover, animated media can help learners become more skilled at identifying problems, selecting appropriate solutions, and drawing accurate conclusions. This research proves that animation makes students more enthusiastic about learning and helps them understand the material better, allowing them to hone their 21st-century skills, especially in problem-solving. Thus, the use of animation media in learning needs to be further developed in various learning contexts to maximize its benefits in mathematics. If the results of this research can be applied more broadly, it is necessary to replicate the study on a larger sample and in different educational contexts.

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