

Analysis of Students' Mathematical Problem-Solving Ability Judging from their Interests

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ABSTRACT

Mathematical problem-solving ability is one of the most important mathematical abilities and must be possessed by every student. In solving mathematical problems, everyone has a different way and style of thinking. The existence of grouping of students based on the specialization of the special subjects of the department shows that the basic abilities, skills, or intelligence in schools also vary. This study aims to describe students' mathematical problem-solving abilities in terms of specialization in Science, Social Sciences, Language, and Religion with a focus on the Three Variable Linear Equation System (SPLTV). The type of this research is descriptive qualitative analysis research. The subjects in this study were students of class X MAN 2 Malang City. The results of this study indicate that 1) At the stage of understanding the problem, some students with specialization in Social Studies and Language Studies were not able to understand the problem correctly based on the information obtained from the problems given, 2) At the stage of implementing the plan students with specialization in Religion Studies, Social Studies, and Language Studies made several mistakes such as lacking careful in carrying out arithmetic operations so that the results obtained are less precise, 3) At the stage of re-examining students with specialization in Religion Studies and Language Studies, they do not write down the results of re-checking because they are not accustomed to re-checking whether the answers obtained are correct or not, 4) Students with specialization Science Studies has fulfilled every stage of problem-solving.

Keywords: interest, Math problem-solving skill, Judging

ABSTRACT

Kemampuan pemecahan masalah matematika merupakan salah satu dari kemampuan matematis yang sangat penting dan harus dimiliki oleh setiap siswa. Dalam memecahkan masalah matematika, setiap orang memiliki cara dan gaya berpikir yang berbeda-beda. Adanya pengelompokan siswa berdasarkan peminatan mata pelajaran khas jurusan menunjukkan bahwa kemampuan dasar, kecakapan atau kepandaian di sekolah juga berbeda-beda. Penelitian ini bertujuan untuk mendeskripsikan kemampuan pemecahan masalah matematika siswa ditinjau dari peminatan IPA, IPS, Bahasa dan Agama dengan fokus materi pada Sistem Persamaan Linier Tiga Variabel (SPLTV). Adapun jenis penelitian ini adalah penelitian analisis deskriptif kualitatif. Subjek dalam penelitian ini adalah siswa kelas X MAN 2 Kota Malang. Hasil penelitian ini menunjukkan bahwa 1) Pada tahapan memahami masalah beberapa siswa dengan peminatan IPS dan Bahasa ternyata belum bisa memahami masalah tersebut secara tepat berdasarkan informasi yang diperoleh dari permasalahan yang diberikan, 2) Pada tahapan melaksanakan rencana siswa dengan peminatan Agama, IPS, dan Bahasa melakukan beberapa kesalahan seperti kurang teliti dalam melakukan operasi hitung sehingga hasil yang diperoleh menjadi kurang tepat, 3) Pada tahapan memeriksa kembali siswa dengan peminatan Agama dan Bahasa tidak menuliskan hasil memeriksa kembali karena tidak terbiasa untuk memeriksa kembali apakah jawaban yang diperoleh sudah benar atau belum, 4) Siswa dengan peminatan IPA sudah memenuhi setiap tahapan pemecahan masalah.

Kata Kunci: Peminatan, Kemampuan pemecahan masalah matematika, Judging

Introduction

In the attachment to the Regulation of the Minister of National Education No. 22 of 2006 concerning content standards, it is stated that mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines, and advances the power of human thought. Mathematics subjects need to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically,



critically, and creatively, as well as the ability to work together. This shows the importance of learning mathematics to be taught at every grade level in schools in order to produce reliable students in the face of changing times through mastery of mathematics (Davita & Pujiastuti, 2020a; Suryani et al., 2020)

One of the most important mathematical abilities that must be possessed by every student is the ability to solve mathematical problems (Widodo & Ikhwanudin, 2018). Problem-solving ability is one of the goals of learning mathematics that must be achieved by students as stated in the Regulation of the Minister of National Education No. 22 of 2006. Problem-solving skills are mental abilities that require high-level thinking as a process to overcome the difficulties encountered to achieve the stated goals. expected (Iswara & Sundayana, 2021; Nurmeidina et al., 2021; Septian et al., 2021; Suparman et al., 2021). The problem-solving process provides opportunities for students to play an active role in studying, searching, and finding information/data for themselves to be processed into concepts, principles, theories, or conclusions (Susriyati & Yurida, 2019).

In solving math problems, everyone has a different way and style of thinking (Mubarok & S.Pd., 2019). The existence of grouping of students based on the specialization of the special subjects of the department shows that the basic abilities, skills or intelligence in schools are also different. This is in line with the regulation of the Minister of Education and Culture of the Republic of Indonesia number 36 of 2018 which explains that the selection of specializations is carried out by students when registering in SMA/MA based on the grades of the Junior High School/Madrasah Tsanawiyah (SMP/MTs) report cards or the equivalent, national exam scores. SMP/MTs or the equivalent, recommendations for guidance and counseling teachers/counselors at SMP/MTs or the equivalent, and the results of a placement test when enrolled in a SMA/MA, or an aptitude and interest test by a psychologist. Given that everyone has a certain way of doing things, including problem solving, researchers are interested in knowing more about how students solve math problems with different specializations. From the results of an interview with one of the teachers at MAN 2 Malang City who teaches in the Science, Language and Religion specialization class, it is stated that in the learning process, the responses and ability of students to solve math problems in these classes are also different.

Research on problem solving analysis has been done a lot. As done by (Davita & Pujiastuti, 2020; Rizki et al., 2021), aims to determine the ability to solve mathematical problems in terms of gender while the research conducted by (Juliansa et al., 2019) aims to determine the ability to solve mathematical problems in terms of students' personality types, as well as research conducted by (Yuliati, 2021) aims to determine the ability of mathematical problem solving in terms of student interest in learning. Therefore, the analysis of students' mathematical problem-solving abilities in terms of specialization is the novelty of this research. The purpose of this study is to describe the mathematical problem-solving ability of students in terms of specialization in science, social studies, language and religion.

Research methods

The method used in this research is descriptive qualitative. Qualitative descriptive research is often called naturalistic research method because the research is carried out in natural conditions (natural setting); referred to as a qualitative method because the data collected and the analysis are more qualitative in nature (Sugiyono, 2018). The subjects in this study were 8th grade students of MAN 2 Malang City consisting of 2 students each from science, social studies, language and religion specialization, where for 2 religious students the researchers wrote as AG1 and AG2, for 2 students specializing in science will write researchers as PA1 and PA2, for 2 students specializing in social studies, researchers will write as PS1 and PS2, while for 2 students specializing in language researchers write as BA1 and BA2

Data on mathematical problem-solving abilities were obtained by giving problem-solving test questions in the form of essay questions on the subject of the Three Variable Linear Equation System (SPLTV) then the results were analyzed based on the Polya stages and confirmed by interviews to find

out more about the process or strategies students used in solving the problem. contained in the test questions given. In this study, the data analysis used was data collection, data reduction, data presentation and conclusion drawing. In data reduction, data from test and interview results will be collected in notes, then summarized and retrieved the necessary data. After the data is reduced, the researcher will present the data by clearly describing the research results. After the data is presented, the researcher will draw conclusions from the data that has been described to answer the problem formulation that has been described.

Results and Discussion

Results

This section describes the results of research and discussion that have been obtained from the implementation of the Three Variable Linear Equation System (SPLTV) material test on mathematical problem-solving abilities. To make it easier to analyze students' mathematical problem-solving abilities, a table of student results in solving problems is made based on the stages of Polya's problem solving as follows:

Table 1. Student problem solving results based on Polya. problem solving stages

No	Subject	Number 1			
		Understanding the Problem	Making Plans	Executing the Plan	Looking back
1	AG1	√	√	-	-
2	AG2	√	√	-	-
3	PA1	√	√	√	√
4	PA2	√	√	√	√
5	PS1	√	√	√	√
6	PS2	√	√	-	√
7	BA1	√	√	-	√
8	BA2	√	√	-	√

Based on Tables 1 and 2. It can be seen that at the stage of understanding the problem there are 4 students who have not fulfilled namely AG1, PS1, BA1, and BA2. At the stage of making plans all subjects have fulfilled. At the stage of implementing the plan, there were 5 students who did not meet, namely AG1, AG2, PS2, BA1 and BA2. At the stage of reviewing there are 3 students who have not met, namely AG1, AG2, and BA1.

Table 2. Student problem solving results based on Polya. problem solving stages

No	Subject	Number 2			
		Understanding the Problem	Making Plans	Executing the Plan	Looking back
1	AG1	-	√	√	-
2	AG2	√	√	√	-
3	PA1	√	√	√	√
4	PA2	√	√	√	√
5	PS1	-	√	√	√
6	PS2	√	√	√	√
7	BA1	-	√	√	-
8	BA2	-	√	√	√

Discussion

Based on the analysis that has been done on all subjects in solving the problem of linear equations of three variables at the stage of understanding the problem there are 4 students who still do not meet, namely AG1, PS1, BA1 and BA2. The results of understanding the four subjects were represented by one of the students because they had something in common, namely being constrained at the stage of understanding the problem, it can be seen in Figure 1

$$\begin{aligned} \textcircled{2} \quad & \text{Diketahui: } N + A + R = 51 \\ & A : R = 7 : 5 \\ & N - 5 = 2R + 2 \end{aligned}$$

Figure 1. the work of one student at the stage of understanding the problem

At the stage of understanding the problem, it can be seen if the student understands that five years ago it only applied to Nita's age, whereas in question number 2 it was not only Nita that applied to the age of five years ago, Ria also applies to the age of 5 years ago. The following is a snippet of an interview with one of the students who did not meet the stage of understanding the problem.

- Researcher : In the part that is known why the age of 5 years ago for Nita is written $N-5$
 PS1 : Because five years ago
 Researcher : Then why 5 years ago for Ria, which was $2R+2$, the R remained the same?
 PS1 : 5 years ago it was only for Nita

Based on the results of the interview, we can see if the student is still not right in interpreting the problems that have been read so that the student is less precise in writing the information that is known. This is in line with the research conducted by (Fauziah & Astutik, 2022) that the students' inaccuracy in reading the questions resulted in the students not understanding the meaning of the sentence of the problem.

At the stage of implementing the plan, there were 5 students who still did not meet, namely AG1, AG2, PS2, BA1 and BA2. The results of the stages of implementing the plan can be seen in Figure 2

$$\begin{array}{l} \text{Eliminasi (i) \& (ii)} \\ x + 2y : 16.000 \quad | \times 1 | x + 2y : 16.000 \\ 2x + y : 8.500 \quad | \times 2 | 4x + 2y : 17.000 \\ \hline -4x - 4y = 7.500 \end{array}$$

Figure 2. Stages of implementing the plan

At the stage of implementing this plan, it can be seen that students are less careful in multiplication operations, this can be seen in the linear equation $2x + y = 8,500$ after being multiplied by 2 to $4x + 2y = 8,500$. Here it can be seen that students have not multiplied the constant $2x + y = 8,500$ by 2, resulting in a constant constant. The following is a snippet of an interview with one of the students who did not meet the stage of implementing the plan.

- Researcher : In the elimination stages (i) & (ii) the second equation after being multiplied by 2 why is the constant constant?
 AG1 : Oh yes ma'am, I'm not very careful

In addition to being less thorough, students who have not met this stage also make errors in arithmetic operations. This can be seen in Figure 3

$$\begin{array}{r} \textcircled{2} \text{ dan } \textcircled{3} \\ 2y + x = 8500 \\ \underline{2y + 2y = 3000} - \\ x + 2y = 5500 \textcircled{4} \end{array} \qquad \begin{array}{r} \textcircled{1} \text{ dan } \textcircled{4} \\ 2y + 4x = 32000 \\ \underline{2y + x = 5500} - \\ 3x = 21000 \end{array}$$

Figure 3. Stages of implementing the plan

It can be seen because students are less careful in working on problem solving problems, students become wrong in performing arithmetic operations. In Figure 3. The linear equation $2y + x = 8,500$ minus $2x + 2y = 3,000$ gives $x + 2y = 5,500$, where $2y$ minus $2y$ should be 0, but written $2y$. Then in the operation part of the linear equation $2y + 4x = 32,000$ minus $2y + x = 5,500$ produces $3x = 21,000$, where $32,000$ minus $5,500$ should be $26,500$. This happens because students are less careful in working. This is in line with the research of (Fatmala et al., 2020) that one of the students' mistakes in answering questions is because students are not careful in working on questions and are in a hurry to finish quickly.

At the stage of reviewing there are 3 students who have not met, namely AG1, AG2, and BA1. One of the results of student work can be seen in Figure 4

jadi, umur mereka masing-masing adalah ...

Nita = 20 tahun
Alma = 18 tahun
Ria = 12 tahun

Figure 4. Stages of looking back

At this stage of reviewing, it can be seen that the student does not check whether the answers that have been obtained from the problems that have been solved are correct or not. Here students after obtaining answers to these problems immediately write the conclusion of the answer without re-checking whether the answers given are correct or not. The following is a snippet of an interview with one of the students who on the answer sheet for solving the problem still does not meet the stage of looking back.

- Researcher : did you double-check after getting the answer?
AG2 : No, ma'am, I immediately wrote down the age of each one, ma'am
Researcher : Why don't you re-check the results of the answers you have obtained?
AG2 : Because I'm sure that the answer I get is correct, ma'am

Conclusion

The conclusion provides brief information about what is obtained from the research that has been done. Just like with the research objectives, if there is more than one conclusion written, then the numbering is using numbers instead of using bullets. In the conclusion, it can also be added prospects for the development of research results and further applications that become prospects for the next study.

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