

MATHEMATICAL PROBLEM SOLVING ABILITY IN VIEW OF LEARNING STYLES

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Abstract

Problem solving ability is very important in mathematics education, because problem solving ability is one of the goals in learning mathematics. The ability to solve mathematical problems is influenced by various factors, including the various student learning styles. This study aims to describe students' mathematical problem solving abilities in terms of learning styles. This research uses a qualitative descriptive approach. The subjects used were 8 semester 1 students, 6 students were taken with the following details, namely 2 students with a visual learning style, 2 students with an audiotorial learning style, and 2 students with a kinesthetic learning style. Data collection techniques used learning style questionnaires, problem solving ability tests, and interviews. Data analysis techniques include data reduction, data presentation, and drawing conclusions. The results of this study show a description of students' mathematical problem-solving abilities in terms of learning styles as follows: (1) visual students can understand the problem well, devise an appropriate solution plan, carry out the plan correctly, and re-check the answers that have been made. (2) auditory students can understand the problem well, develop appropriate resolution plans, carry out plans correctly, but do not carry out the stage of re-checking answers. (3) auditory students can understand the problem well, have not been able to write a settlement plan correctly, are less able to carry out the steps of the settlement plan, and re-check the answers that have been done.

Keywords: Problem Solving Ability, Learning Style

Abstrak

Kemampuan pemecahan masalah sangat penting dalam pendidikan matematika, dikarenakan kemampuan pemecahan masalah merupakan salah satu tujuan dalam pembelajaran matematika. Kemampuan pemecahan masalah matematika dipengaruhi oleh berbagai macam faktor, di antaranya yaitu gaya belajar mahasiswa yang bervariasi. Penelitian ini bertujuan untuk mendeskripsikan kemampuan pemecahan masalah matematis mahasiswa ditinjau dari gaya belajar. Penelitian ini menggunakan metode pendekatan kualitatif bersifat deskriptif. Subjek yang digunakan adalah mahasiswa semester 1 berjumlah 8 mahasiswa, yang diambil 6 mahasiswa dengan rincian sebagai berikut yaitu 2 mahasiswa dengan gaya belajar visual, 2 mahasiswa dengan gaya belajar audiotorial, dan 2 mahasiswa dengan gaya belajar kinestetik. Teknik pengambilan data menggunakan angket gaya belajar, tes kemampuan pemecahan masalah, dan wawancara. Teknik analisis data meliputi reduksi data, penyajian data, dan penarikan kesimpulan. Hasil dari penelitian ini menunjukkan deskripsi kemampuan pemecahan masalah matematis mahasiswa ditinjau dari gaya belajar sebagai berikut: (1) mahasiswa visual dapat memahami masalah dengan baik, menyusun rencana penyelesaian dengan tepat, melaksanakan rencana dengan benar, dan memeriksa kembali jawaban yang telah dilakukan. (2) mahasiswa auditori dapat memahami masalah dengan baik, menyusun rencana penyelesaian dengan tepat, melaksanakan rencana dengan benar, namun tidak melakukan tahap memeriksa kembali jawaban. (3) mahasiswa auditori dapat memahami masalah dengan baik, belum bisa menuliskan rencana penyelesaian dengan tepat, kurang mampu melaksanakan langkah-langkah rencana penyelesaian, dan memeriksa kembali jawaban yang telah dilakukan.

Kata kunci : Kemampuan Pemecahan Masalah, Gaya Belajar

INTRODUCTION

Problem solving ability is a skill that requires a higher level thinking phase, in this process students must be able to solve complex problems. The ability to solve mathematical problems is an important part that must be possessed by students, so that this skill is always developed in learning mathematics. In the process of learning mathematics, the ability to solve mathematical problems is an important ability that must be possessed by students to help them improve other mathematical abilities, such as developing analytical thinking skills, being critical and creative (nurmutia, 2019). Learning style is one of the factors that can influence students' mathematical problem solving abilities. In this study, students with a visual learning style were able to solve problems according to the four polya stages well. Students with an auditory learning style are able to solve problems in three stages, namely being able to understand problems, make plans, and implement plans that will be used to solve problems. Students with a kinesthetic learning style can only carry out the stage of re-examining the problem (olaniyan, 2015). Students with kinesthetic learning styles require more concentration in carrying out the stages of problem solving, so that they are only able to carry out one stage of the other 4 stages of problem solving.

Learning style is a student's brain work system to acquire skills, memory, or knowledge in a learning process (subini, 2013). Each student has a unique way of being able to remember and understand lessons through learning styles. According to evy ramadina (2015) there are three types of learning styles in students, namely visual learning styles (visual learning), audio learning styles (auditory learning), and kinesthetic learning styles (kinesthetic learning). Visual learning style is a learning style based on the sense of sight through concentration of observation, auditory learning style is a learning style based on the sense of hearing through concentration of sound, while kinesthetic learning style is a learning style based on experience, sense of movement and touch, through concentration of action. Polya defines problem solving as an effort to find a way out of complex difficulties to achieve goals that cannot be achieved immediately through unusual means (firmansyah, 2017)

Then in solving the problem polya provides four systematic steps (asfar & nur, 2018), namely: 1) understanding the problem, 2) developing a plan, 3) implementing the plan, 4) re-

checking. Learning is the process of seeking and acquiring skills, abilities, information or knowledge. Everyone has their own method or way of understanding or acquiring knowledge in a learning process. This method is called learning style. Someone will find it difficult to get and process information in a way that is not according to their comfort, because everyone has a unique way and different learning needs. Therefore, everyone has different learning needs and ways of learning in acquiring skills and processing the information he is working on.

A clearer definition was put forward by ghufron and risnawita (2014) that learning style is the way a person learns or the way a person concentrates on processes and masters skills and processes information. Each person's ability to absorb and build information is different, so this condition can affect their learning style. For example, some students may find it easier to learn at night than during the day because it is quieter and there are also students who can concentrate more on learning through sight, concentrate more through hearing or are more able to master information and skills through gestures and touch.

Learning style according to bobby de potter has two important aspects. The first is a person's modality or habit of absorbing information. The second is the way a person processes or uses information. Based on modality, learning styles are divided into three groups, namely visual, auditory, and kinesthetic learning styles (subini, 2013).

METHODS

A qualitative approach is the approach used in this study, because this study aims to find out how mathematical problem solving abilities are viewed from students' learning styles. This research is descriptive in nature with more use of analysis because researchers must express the views of students' mathematical problem-solving abilities in terms of learning styles.

The source of the data in this study were 2nd semester students of mathematics education at the university of muhammadiyah tangerang who were also the research subjects. The selection of research subjects was carried out by giving a learning style questionnaire to students and then taking 6 students from one class, 2 of them had a visual

learning style, 2 had an auditory learning style, and 2 had a kinesthetic learning style. After getting 6 subjects, then 6 subjects were given the same test questions to determine their mathematical problem solving abilities. The data collected in this study are:

1. Primary data

Primary data sources in this study are learning style questionnaires, material tests derived from mathematical problem solving abilities, and interviews.

2. Secondary data

Secondary data sources in this study are written data such as the results of student final exam scores and documentation.

This research is a qualitative research conducted on even semester mathematics education students for the 2021/2022 academic year. This study used student subjects totaling 6 students. In this study, researchers used three instruments, namely a learning style questionnaire, a problem-solving ability test and an interview guide. In this study the material used in the test is derived material. Researchers use polya's steps as a reference in solving mathematical problems, starting from understanding the problem, making plans, implementing plans, and checking answers. The description of research data is carried out coherently on the results of tests of mathematical problem solving abilities in terms of learning styles.

The research began by administering a learning style questionnaire to students in march 2022. From the data collected through the learning style questionnaire, the researchers grouped learning styles according to the learning styles used in this study, namely visual, auditory, and kinesthetic learning styles. Kinesthetic, and 3 students have more than one learning style.

After obtaining the results of the learning style questionnaire, then 2 students from each learning style were selected to become research subjects. The research subjects chosen were those who most dominantly represented each learning style based on the results of the learning style questionnaire and based on considerations. After obtaining 6 subjects each

representing their respective learning styles, then the subjects were given test questions to work on tests of mathematical problem solving abilities and at a later stage they would be interviewed regarding the answers written.

Mathematical problem-solving ability tests and interviews were conducted in march 2022. The results of the tests and interviews were analyzed based on polya's problem-solving steps, namely understanding the problem, making plans, carrying out plans, and re-checking answers. During the research process, students were always observed and accompanied during the process of working on the questions. To simplify the data collection process, researchers prepared notes, recording devices, and also cameras to document activities. Interviews were conducted using interview guidelines so that the interview questions did not deviate from the indicators to be discussed.

In the following, data on the results of tests of mathematical problem solving abilities and interviews will be presented according to student learning styles, namely students who have a kinesthetic learning style, students who have an auditory learning style and students who have a visual learning style.

RESULTS AND DISCUSSION

In this study, researchers used three instruments, namely a learning style questionnaire, a problem-solving ability test and an interview guide. In this research, the material used in the test is the derivative theorem material. Researchers use Polya's steps as a reference in solving mathematical problems, starting from understanding the problem, making plans, implementing plans, and checking answers. The description of the research data was carried out coherently on the results of tests of students' mathematical problem solving abilities in terms of learning styles.

The research began by giving a learning style questionnaire to students. From the data collected through a learning style questionnaire, the researchers grouped learning styles according to the learning styles used in this study, namely visual, auditory, and kinesthetic learning styles. The learning style data obtained can be seen in the following table:

Table 1 Learning Style Questionnaire Results Data

Learning Styles used	Number of Student Data
Visual (V)	7
Auditory (A)	9
Kinesthetic (K)	7

Based on the results of the learning style questionnaire that was distributed to these students, it shows that of the total research subjects totaling 25 students, 7 students have a visual learning style, 9 students have an auditory learning style, 7 students have a kinesthetic learning style, and 2 students have more than one learning style. After the results of the learning style questionnaire were obtained, 2 students from each learning style were then selected to be the research subjects.

1. Mathematical Problem Solving Ability of Students with Visual Learning Style

Based on the problem-solving ability test and the interviews that have been conducted, at the stage of understanding the problem, in general, the visual learning style subject is able to understand the problem well. Because the subject of the visual learning style tends to be able to determine what is known and what is asked according to the problems presented in the questions. This is consistent with the characteristics of the visual learning style according to De Potter & Hernacki (2007), namely thoroughness and detail. Visual learning style subjects can identify problems from questions and demonstrate relevant understanding by gathering the information contained in the questions. In working on the problem-solving ability test, the visual learning style subject works in neat and orderly writing, this is in accordance with the characteristics of the visual learning style, namely neat and orderly.

2. Mathematical Problem Solving Ability of Students with Auditory Learning Style

Based on tests of problem solving skills and interviews that have been conducted, at the stage of understanding the problem in general the subject of the auditory learning style is able to understand the problem well. Because the subject of the auditory learning style tends to be able to determine what is known and what is asked according to the problems presented in the questions. When given the opportunity to explain in interviews, the subject of the auditory learning style can explain in detail what is known and asked about the questions

compared to writing on the answer sheet, people with an auditory learning style feel difficulty in writing but great in speaking, likes to talk, likes to discuss, and explain things at length.

At the stage of preparing the subject plan, the auditory learning style is generally able to develop a problem-solving plan well. Because it can select relevant information from the problem and can develop a strategic plan to achieve the goals to be achieved in a problem.

At the stage of carrying out the problem-solving plan, the subject of the auditory learning style is generally able to carry out the problem-solving plan very well. Because the subject can carry out planning and is able to organize and connect problems with relevant prior knowledge according to the problem-solving steps he uses with the right results. At the re-examining stage, the subject of the auditory learning style does not carefully re-examine each of the problem-solving steps taken and the answers that have been obtained.

3. Mathematical Problem Solving Ability of Students with Kinesthetic Learning Style

Based on the problem-solving ability test and the interviews that have been conducted, at the stage of understanding the problem in general the subject of the kinesthetic learning style is able to understand the problem well. Because subjects with kinesthetic learning styles tend to be able to determine what is known and what is asked according to the problems presented in the questions.

At the stage of planning the subject, the kinesthetic learning style is generally quite good at drawing up problem-solving plans. Subjects can select relevant information from problems, but are not good at planning and developing plans or strategies to achieve the goals to be achieved in a problem. At the stage of carrying out the plan, the subject of the kinesthetic learning style can carry out the plan even though the process is still wrong, this is due to the lack of thoroughness in the subject of the kinesthetic learning style. At the stage of re-examining the subject, the kinesthetic learning style is less able to re-examine the answers to the results of problem solving that has been done, but is able to conclude answers from solving problems.

CONCLUSION

Based on the results of the research and discussion regarding the ability to solve mathematical problems in terms of learning style, it can be concluded that students with a visual learning style can carry out all stages of problem solving. Students' mathematical

problem solving abilities with a visual learning style, namely at the stage of understanding the problem can understand the problem well. At the planning stage, you can plan problem solving quite well. Meanwhile, in the stage of implementing the problem-solving plan, students can carry out the problem-solving plan properly. And at the stage of re-examining student answers the visual learning style can do well.

Students with an auditory learning style can carry out the problem solving stage up to the third stage. The problem-solving ability of students with an auditory learning style is able to understand problems by having good speaking skills. In the stage of preparing a problem-solving plan, auditory learning style students can carry out quite well. Whereas in the stage of carrying out the problem-solving plan, students can carry out the problem-solving plan properly, but auditory students do not carry out the fourth stage, namely re-examining the process and the results of the answers obtained.

Students with a kinesthetic learning style can carry out the first and fourth stages, namely understanding the problem and re-examining, but are unable to carry out the second and third stages, namely making plans and carrying out plans. Mathematical problem solving abilities of students with kinesthetic learning styles, namely at the stage of understanding the problem can understand the problem well. At the planning stage, kinesthetic learning style students have a way to solve problems but have not been able to write a solution plan correctly. Whereas in the stage of carrying out the problem solving plan, kinesthetic learning style students are less able to carry out the steps of the settlement plan, due to the lack of thoroughness in the subject of kinesthetic learning styles. And at the stage of re-examining kinesthetic learning style students are able to re-examine the answers that have been obtained by writing conclusions.

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