Mathematics problem solving on linear system of two variables

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Abstract. This study aims to describe the mathematical problem-solving ability of class X AKL 3 SMK Negeri 1 Purbalingga viewed from their learning styles. The research method used is descriptive qualitative. The data analysis technique used the Miles and Huberman model including data reduction, data presentation, and conclusions. Purposive sampling technique was used as the sampling technique. Questionnaires, tests, interviews, and documentation were used to collect the data. Based on the learning style questionnaire, students are grouped into 3 groups of learning styles, namely visual, auditory, and kinesthetic learning styles. 3 students from each group were taken to be the respondents. Based on the results of this study, it shows that students with visual learning styles and kinesthetic learning styles are able problem-solving indicators, namely understanding problems, planning solutions, and implementing plans. Students with an auditory learning style are able to meet 4 problem-solving indicators, namely understanding problems, planning solutions, implementing plans, and rechecking.

1. Introduction

In learning mathematics, it is never separated from problem-solving. Problem-solving needs to be instilled in students so that students do not lose meaning in learning mathematics because a concept that has been accepted can be applied in solving math problems from simple to complex story problems. States that problem-solving skills must be possessed by students to train them to be accustomed to facing various problems, both problems in mathematics and problems in other fields of study and problems faced in everyday life which are increasingly complex [6]. This indicates the importance of problem-solving in both mathematics learning and daily life.

In [10], states that problem-solving has an important role in mathematics and should have a major role in mathematics. This is evidenced in [9] that problem-solving ability is one of the five standard processes, including problem-solving, reasoning and proof, communication, connection, and representation (representation). In [11], ability to solve mathematical problems is an attempt or strategy to solve problems. Developing strategies appropriately gets how the student learns and each student has their way of learning to be able to understand the concepts given quickly. The individual’s self-evaluation of the ability to cope with problems effectively is extremely important in this respect [13]. In the problem-based approach, complex, real-world problems are used to motivate students to identify and research the con-
Learning is a conscious human interaction with the environment so that there is a change in behavior, knowledge, understanding, skills, and other aspects [1]. In this connection, each student also has his learning style to create habits to facilitate learning. Learning style is a way for a person to consistently absorb, understand, organize, and process the information received [12]. Learning styles are divided into three, namely visual learning styles, auditory learning styles, and kinesthetic learning styles [2]. Learning styles influence problem-solving abilities, this is because learning styles are a characteristic that a person has in solving a problem. Therefore, it is important for teachers to know and understand the mathematics problem-solving abilities and learning styles of each student. Thus the teacher can apply a variety of learning models and by the learning styles of the majority of students, thus creating effective learning and making it easier for students to understand, absorb, process the information provided. Learning by PBL model is one of student centered learning while teacher as facilitator [3]. Active students tended to use multiple activities to obtain the needed information were more adjusted to the group norms and regulation and more skillful in using reasoning and problem-solving skills and in participation in discussion [2].

SMK Negeri 1 Purbalingga is located in Kalimanah District, Purbalingga Regency. SMK Negeri 1 Purbalingga is a school-based on the Adiwiyata program, which is a program that aims to create good conditions for schools to become places of learning and make school members aware. This makes students comfortable and focused on their learning and makes it easier to find knowledge. SMK Negeri 1 Purbalingga also has adequate facilities and infrastructure as facilities to support learning, for example, projectors, speakers, and props. Also, based on interviews with teachers, students have different characteristics in solving math problems.

2. Method
The research used is descriptive-qualitative, namely research to obtain a description of the state of the object/subject based on visible facts. The subjects used in this study were students of class X AKL 3 SMK Negeri 1 Purbalingga. The technique used in taking the subject is purposive sampling, namely the technique of determining the sample based on certain considerations. The researcher took the subject as a data source with certain considerations based on the consideration of the teacher of mathematics, communication, being active in learning and non-academic activities. Researchers used purposive sampling technique to determine three students from each learning style to analyze their mathematical problem solving abilities. The data collection technique used in this study was a learning style questionnaire developed by [7], a test of mathematical problem solving abilities which was strengthened by interviews. In analyzing the data the researcher used the Miles and Huberman model technique, namely data reduction, data presentation, and conclusion.

3. Result dan Discussion
The following are the results of the mathematical problem solving ability of class X AKL 3 students according to their learning styles.

3.1 Students with visual learning styles

Based Figure 1, students with a visual learning style understand the problem by rewriting the
information contained in the questions in the form of what is known and asked completely, besides students with a visual learning style also understand the problem by directly using mathematical symbols. In the interview, students with a visual learning style explained the information contained in the questions.

Students with a visual learning style plan their solution by first considering the information contained in the problem with a variable, then making a mathematical model, and choosing the method they use. In interviews with students with a visual learning style explain how to make a mathematical model and explain the methods they use in detail. Students with a visual learning style also complete a plan well by using the method they choose so that they can find the desired result and conclude it. However, one student made a mistake, it was because he made a mistake in making plans.

In the step of looking back / checking again, there is one student with a visual learning style who checks again by linking the results he gets to an equation, the rest only checks the calculation part without linking the results he has obtained to an equation he knows.

3.2 Students with auditory learning styles

Students with an auditory learning style understand the problem by writing down the information contained in the questions completely, namely what is known and asked. In Figure 2, one student with an auditory learning style understands the problem by directly using mathematical symbols. At the time of the interview, students with an auditory learning style explained the information contained in the questions clearly and completely and explained why directly using mathematical symbols in writing down known information was to make it faster in solving.

Students with auditory learning styles plan solutions by first assuming the information contained in the problem to a variable to make it easier for them to make mathematical models and their equations. Also, students with auditory learning styles also mention the methods they will use. In the interview, students with an auditory learning style explained how the process of making a mathematical model was clear. At the stage of completing the plan, one student with an auditory learning style made a mistake at the planning stage resulting in an error in completing it. The rest students with an auditory learning style can finish it well. In the interview, students with an auditory learning style explained how the process of completing it was so that they found the desired results and could conclude it.

Students with auditory learning styles also check again by linking the results obtained to a known equation. In the interview process, students with an auditory learning style explain how to check it so that it finds the desired answer and makes it more confident.
3.3 Students with kinesthetic learning styles

Students with a kinesthetic learning style understand the problem by writing down information using mathematical symbols or in a more operational form. Based Figure 3, students with kinesthetic learning styles can also understand a problem that is being asked from the questions. In the interview, students with a kinesthetic learning style explained the mathematical symbols they used to solve an existing problem. As kinesthetic pupils sought the pattern, visual and auditory pupils had already recognized the patterns formed based on the representations they had already made [8].

At the stage of planning a solution, students with a kinesthetic learning style plan it by first assuming that the information contained in the problem is known to a certain variable to create a mathematical model, which is then used to solve with the method they choose. During the interview, students with a kinesthetic learning style explain the process of getting a mathematical model or equation to solve a problem and explain the method that will be used. Students with a kinesthetic learning style use the chosen method and the equations they have made to solve a problem appropriately and produce the desired answer, and conclude it. In the interview, students with a kinesthetic learning style explained the process of completing a plan with the method they chose well.

4. Conclusion

Based on the results of the research related to the description of students' mathematical problem-solving abilities in class X AKL 3 SMK Negeri 1 Purbalingga in terms of learning styles, it can be concluded: Students with visual learning styles and kinesthetic learning styles are able to meet 3 indicators of mathematical problem solving, namely understanding problems, planning solutions, and solving problems. Students with auditory learning styles are able to meet 4 indicators of problem-solving abilities, namely, understanding problems, planning solutions, completing plans, and looking back.

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