Advances in Social Science, Education and Humanities Research, volume 611
International Conference on Educational Studies in Mathematics (ICoESM 2021)

Problem Solving Ability of PGSD Unismuh Makassar Students on Flat Shapes in Terms of Van Hiele's Geometric Thinking Level

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ABSTRACT
The ability of students to understand geometric material is very low, so that students are less able to solve geometry story problems, especially about flat shapes. This study uses a qualitative approach that aims to reveal more carefully the problem-solving abilities of PGSD Unismuh Makassar students in solving plane problems in terms of Van Hiele's level of geometric thinking. To determine the subjects of this study, the researchers looked at the results of the mid-semester exams for the 2020/2021 academic year, which amounted to 32 students. Based on the mid scores that have been ranked, students are grouped into 3 groups based on the benchmark reference, namely high, medium and low groups. The results of the student MID test on the flat shape material showed that, out of 32 students, 28 students could answer questions at level 0 (visualization), 25 students could answer questions at level 1 (analysis), 13 students could answer questions at level 1 (analysis). 2 (informal deduction), and there are no students who can answer questions at level 3 (deduction) and level 4 (rigor). The results of student interviews showed that students' thinking abilities in solving flat-shaped questions were different. Some students only reach level 0 or visualization, and the highest level is at level 2, namely informal deduction. So it can be concluded that students who have a high level of Van Hielle geometric thinking will also have a high ability to solve geometric problems.

Keywords: *Problem Solving, flat Shapes, Van Hiele level.*

1. INTRODUCTION

The rapid development of Science and Technology (IPTEK) is thanks to the support of Mathematics. The basis of support is due to the strength of Mathematics in its structure and reasoning. Education plays an important role in life because education is a vehicle to improve and develop Human Resources (HR). Education is one of the basic needs that is very important for everyone. To do anything in everyday life, one needs to learn first. For example, when going to make a building, someone needs geometry.

Geometry is a branch of mathematics that is taught to understand the properties and relationships between geometric elements and become good problem solvers. Problem-solving ability is one part of mathematical ability. The teacher must continuously train problem-solving skills. This is because, through problem-solving, students are directed to develop their mathematical knowledge through a series of procedures that are passed in the process of solving these mathematical problems.

Mathematics has an important role in life. In practice, some students still consider mathematics a difficult subject. This is evidenced by the results of a survey conducted by the Trend in International Mathematics and Science Study (TIMSS) and the International Student Assessment (PISA) Program on students' mathematical abilities in the world. Much lower than other ASEAN countries such as Thailand, Malaysia, and Singapore. In addition, the geometry problem-solving ability of Indonesian students is still low. The results of the PISA study that assessed problem solving, reasoning, and mathematical communication skills showed that junior high school students in Indonesia still lacked problem-solving skills. 20% of Indonesian students could correctly

answer one of the geometry problem-solving questions regarding a square, rectangle, and parallelogram perimeter. For this reason, it recommends that the learning process in schools places more emphasis on increasing the portion of solving problems [1].

One of the branches of mathematics that demands this goal is geometry. The purpose of learning geometry is to show a logical, critical, analytical, thorough, responsible, responsive attitude and not give up easily in solving problems [2]. Geometry is closely related to a problem in everyday life. Geometry learning requires critical thinking and reasoning as well as logical abstraction skills. Basically, geometry material will be easily understood by students compared to other branches of mathematics. But in reality, students' ability to understand geometric material is very low, so that students are less able to solve geometry story problems, especially about flat shapes. When the teacher gives a flat shape question that only applies formulas, students easily work on it. However, students have difficulty when the teacher provides story questions about flat-shaped material related to everyday life.

Many factors cause the low geometry ability of students at various levels of education, including teaching factors or learning techniques used by teachers. The quality of learning is one factor that has the most significant influence on student achievement in mathematics [3]. Thus, teachers must be wiser in choosing models or approaches or conveying mathematical material, especially geometry.

Concerning students' difficulties in learning geometry, there is a theory related to learning geometry related to the problem, namely Van Hiele's Theory which states that students' geometric thinking levels are sequentially through 5 levels, namely; level 0 (visualization), level 1 (analysis), level 2 (informal deduction), level 3 (Deduction), level 4 (Rigor). Because the ability to think geometry aims to make students able to connect between one material and another. Students can understand the mathematical concepts they learn because they have mastered the prerequisite material related to other concepts. In addition, if students can relate the material they are learning to the previous subject or with other subjects, then learning mathematics becomes more meaningful [4]. Therefore, researchers are interested in describing how the level of problem-solving abilities of PGSD Unismuh Makassar students for the academic year 2020/2021.

2. METHODS

This study uses a qualitative approach that aims to reveal more carefully the problem-solving abilities of PGSD Unismuh Makassar students in solving plane problems in terms of Van Hiele's level of geometric thinking. In the sampling technique in qualitative research, there is no random sample but a purposive sample. According to Sugiyono [5], "A purposive sampling is a sampling technique for data sources with certain considerations." So that the selected subject is a subject who can provide as much information as possible in this study.

To determine the subjects of this study, the researchers looked at the results of the mid-semester exams for the 2020/2021 academic year, which amounted to 32 students to categorize students into van Hiele's level of thinking. Based on the mid scores that have been ranked, students are then grouped into 3 groups based on the benchmark reference, namely high, medium and low groups. From each group, 3 research subjects were taken to form a heterogeneous discussion group. Because according to Effendi [6], "The division of student groups in learning with heterogeneous initial abilities will encourage the establishment of mutually supportive relationships between group members." Data collection techniques are by giving tests and interviews.

3. RESULTS AND DISCUSSION

In this study, subjects were selected based on predetermined criteria, namely by giving Van Hiele geometric thinking level test questions as many as 5 questions, namely story questions with details of 1 item at level 0 (visualization), 1 item at level 1 (analysis).), 1 item at level 2 (informal deduction), 1 item at level 3 (deduction), and 1 item at level 4 (Rigor). The test questions were given to 32 PGSD Unismuh Makassar students for 90 minutes. The test results were corrected by the researcher and then described based on Van Hiele's level of geometric thinking.

Based on the results of the MID test of students for the 2020/2021 academic year on the flat shape material, categorization was obtained based on the level of van Hielle's geometric thinking, from 32 students as many as 28 students who could answer questions at level 0 (visualization), 25 students who could answer questions at level 1 (analysis), 13 students who can answer questions at level 2 (informal deduction). No students can answer questions at level 3 (deduction) and level 4 (rigor). Based on the mid scores that have been ranked, students are then

grouped into 3 groups based on the benchmark reference, namely high, medium and low groups. From each group, 3 research subjects were taken to form a heterogeneous discussion.

The following is the categorization based on the level of achievement and difficulty indicators of the problem-solving ability of PGSD Unismuh Makassar students with a total of 5 questions, where question no 1 is at level 0, question no 2 is at level 1, question no 3 is at level 2, question no 4 is at level 3 and question no 5 is at level 4.

Several factors cause students to have difficulty solving MID questions in the 2020/2021 academic year on flat-shaped material based on the results of interviews conducted via zoom because PGSD students do not focus on only one field of study. Still, several other areas of research and also student interest in studying Mathematics is also low.

Student (R2) said that "In solving problems, sometimes it is difficult to distinguish the formula that will be used in answering questions during MID." This tends to be because most students only memorize formulas without knowing the actual concept.

Table 1. Indicator of student difficulty based on van Hielle's geometric thinking level

Group	Subject	Number question	Achievement level	Difficulty indicator
High	T1	1,2,3	0,1,2	Students still have difficulty in proving the formula for flat shapes.
	T2	1,3	0,2	Students have not been able to solve geometrical problems by using the properties of already known shapes or using other approaches in solving interconnected plane problems.
	T3	1,2	0,1	Students have not been able to use strategies or approaches in solving problems in a flat shape.
Medium	S1	1,2	0,1	Students are familiar with geometric shapes and understand their properties but have not been able to sort flat shapes interconnected with each other. For example, a square is also a rectangle.
	S2	1,2	0,1	Students already know the shapes of flat shapes and understand their properties but have not been able to sort the shapes of flat shapes with each other that are interconnected. For example, a square is also a rectangle.
	S3	1,3	0,2	The student has not been able to mention the regularity contained in the flat object. For example, when the student observes a rectangle, they already know that there are two pairs of opposite sides, and the two pairs of sides parallel each other.
Low	R1	1	0	Students have not been able to know the related relationship between a flat shape and other flat shapes.
	R2	1	0	Students have not been able to solve the problem if given certain properties on the flat shape problem.
	R3	1,2	0,1	Students at this stage have not been able to complete the question of several flat shapes combined to find the shaded area.

Based on Table 1, it can be seen that students can only get to level 2, namely informal deduction, where students already know the shapes of flat shapes and understand their properties. Students can also sort the shapes of flat shapes that are interconnected, for example. Square is also a rectangle. So at this stage, students can understand the ordering of geometric shapes, but from 9 students, only 1 student can answer questions up to level 2, namely students in the high category. While other students, on average, still have difficulty at level 1 analysis and level 2 informal deduction. 4 students have not been able to answer questions at level 1, and 6 students have not been able to answer questions at level 2.

From some of the results of student interviews, it can be concluded that students' thinking abilities in solving flat-shaped questions are different. Some students only reach level 0 or visualization, and the highest level is at level 2, namely informal deduction. One of the contributing factors is that students' skills in solving problems of flat shapes are still lacking. For example, if given a combined flat shape consisting of several flat shapes, students are still confused in solving the problem because it is difficult to identify any shapes obtained from the image as the combined flat. In addition, understanding the concept of flat shapes is still lacking, and does not understand the properties of the flat shapes, so that in working on the questions given cannot be solved correctly and adequately.

4. CONCLUSION

Based on the results of this study, it can be concluded that the problem-solving abilities of PGSD Unismuh Makassar students on the flat shape material in terms of the Van Hielle Geometry thinking level showed that the student's ability level was different from 32 students as many as 28 students who could answer questions at level 0 (visualization), 25 students who can answer questions at level 1 (analysis), 13 students who can answer questions at level 2 (informal deduction), and there are no students who can answer questions at level 3 (deduction) and level 4 (rigor). Then students are grouped into 3 groups based on the benchmark reference, namely the high, medium, and low groups. From some of the results of student interviews, it can be concluded that students' thinking abilities in solving flat-shaped questions are different. Some students only reach level 0 or visualization, and the highest level is at level 2, namely informal deduction. So it is necessary to plan or develop a learning model based on Van Hielle's theory which is adjusted to the level of thinking possessed by students.

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