Case Study Spatial Reasoning in Student Junior High School Solve Problems Geometri

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Abstract: *One branch of science in mathematics were taught junior high school students is Geometry. Students are required to be able to visualize and manipulate an object in their minds in solving geometry problems. For example, if students are asked to find a shaded area of a flat object, the students should be able to imagine how the shape of the object and determine how to proceed. Some studies show that students still have difficulty in finding a way to solve the problem of geometry, even the students who were in junior high school are still experiencing difficulties. One of the reasoning which plays an important role in supporting the students' reasoning in solving geometry problems are spatial reasoning. The purpose of this case study is to describe the spatial reasoning of students in solving geometry problems. In learning geometry teachers are expected to provide a way to represent the concept of geometry that can help students in solving problems.*
Keywords: *spatial reasoning, problem geometry*

I. Introduction

Spatial reasoning is a thought process the extent of one's ability to visualize objects and make sense in the abstract through objects or symbols. According to (National Research Council, 2006), states that spatial thinking or reasoning, involving the location and movement of objects and ourselves, either mentally or physically, in space. It is not a single capability or process but it actually refers to a large number of concepts, tools and processes.

Spatial reasoning is important in informing our ability to investigate and solve problems, particularly in mathematics. (National Council of Teachers Of Mathematics, 2006), states that spatial reasoning is important not only in mathematics but also in the whole field of study. In Ontario curriculum combines spatial sense and geometry into a single unit as both inherently linked. In line with the curriculum (Ontario Ministry Of Education, 2007) states the research on spatial reasoning is substantially the importance of spatial reasoning abilities in geometry, measurement and problem solving both in early math experiences and then in high school and beyond, especially in the area STEAM.

Geometry is one of the materials in mathematics has been taught to students in Junior High School. Geometry is the study of form and space. Without spatial ability, students can not fully appreciate the nature (Guven, B; Kosa, T, 2008). (National Council of Teachers of Mathematics, 2000), recommends that the geometry must include the study of three-dimensional geometry and provides the opportunity for students to use spatial reasoning to solve problems. Problem solving geometry students are required to be able to visualize and manipulate an object in their minds. For example, if students are asked to find a shaded area of a flat object, the students should be able to imagine how the shape of the object and determine how to proceed.

In the process of solving a problem someone will do the mental processes by using all the knowledge and determine appropriate strategies to resolve the problem. Polya (2004) revealed two kinds of problems, namely (a) the problem of finding, can be theoretical or practical, abstract or concrete, including tekateki, and (b) issue to prove, to show that a statement is true or false (not both). In mathematics, the problem is usually a math problem, but not all math problem. Hudojo (2003) explains that the question or matter referred to the problem depends on the knowledge of a person. So a question or problem is a problem for someone but it may also not be a problem for others.

Based on the background of the above problems, the formulation of the problem in this paper is "How spatial reasoning junior high school students in solving geometry problems?" Knowing spatial reasoning is expected to provide ideas for teachers to improve the teaching of geometry by taking into account students' spatial reasoning.

IV. Research Methodology

This research is a case study in some of the junior secondary students of class VIII who have difficulty in using spatial reasoning. A case study describing the reasoning used fatherly students in solving geometry problems.
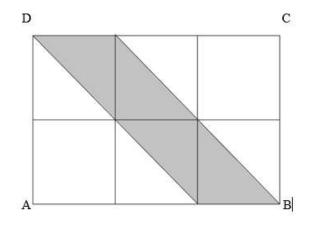
V.   Results and Discussion

A. Research

Preliminary studies conducted in Mts Surya Buana Malang. Classes are used is in class VIII B and VII D. Why researchers used two such classes due at the school between boys and girls are separated, and upon the recommendation of the principal and the teacher concerned and then was used in class VIII B and VIII D In the classroom researchers only menjelesakan essence of the given problem, what is focused students in solving the problem.

The first study was conducted in male students class VIII D and the second study in class VIII female students B. Students who follow many as 20 male students and 20 female students. The execution was conducted over about 90 minutes. From the results of corrections to the male student who can answer that question only 2 people and the female students there are 8 people who could answer, the rest could not answer.

Sample questions given to these students as follows:

(Students are required to determine the extent of the shaded region).

Unknown rectangle ABCD with sides AB = CD = x units and length of BC = AD = y unit. Determine the areas in the shading below!

Write down the reasons on the answers you give.

From the question given above, more than half of all boys and girls can not solve the problem. In fact, if the student has a good spatial reasoning, then easily solve these students.

The character of the male students were 18 people and women students were about 10 people who could not answer the question because of confusion with the rendered image, when asked confused where, the students explained bring to the overall image of the rectangular later therein why there is a square image , As well as the shaded part also form a parallelogram, is where students feel confused in completing extensive searching shaded part. Formula for the area which is to be used in the count.

Then the female students there are 2 people in solving the problem algebraically by calculating each section are known. Here note that students are not using spatial reasoning desired by researchers.
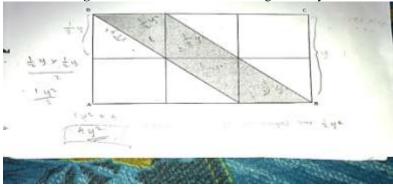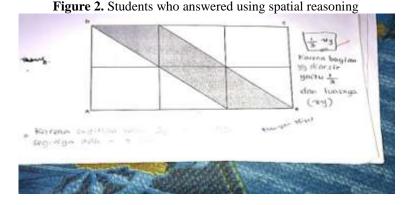
Figure 1. Students who answered algebraically

Students who have good spatial reasoning, then by looking at the area in the shading just the problem on questions given above can already be answered by the student. The students who have good spatial reasoning, students will answer the results of the shaded area at the top are 1/3 xy. The results obtained by viewing the shaded part. The shaded part of the triangle formed two separate parts, then the same parts together to form a complete square in the part, it didapatlah two sections of 6 square section contained within the rectangle.

Figure 2. Students who answered using spatial reasoning

However, for students who have difficulty in spatial reasoning, then the given problem it is very difficult to resolve. Of the students who have difficulties, do interviews to ascertain the difficulties experienced by the student. Some questions are awarded as follows:

1. Why you can not solve the given problem earlier.
Students answered that he did not understand the intent of the rendered image.
2. Why you do not understand, is not it obvious that the orders given, which is focused and simply asked the shaded part only. Students answered that yes ma'am, I've been focusing on his orders to see a section in shading, but still do not understand how the show to answer, what should be done with the shaded part.
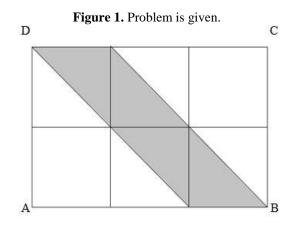 Student of the answers given above, it appears that the student does not have a good spatial reasoning. The student has not been able to visualize and manipulate an object in order to resolve the problem geometry.
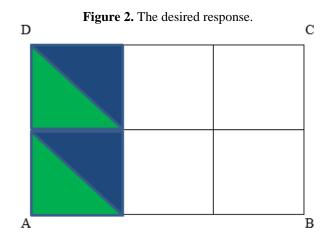
B. Discussion of research

Related to the above results, the student will have difficulty in solving geometry problems when young people have low spatial reasoning. Based on the questions given to the poor students, students' difficulty in imagining and manipulate an object. For students who have a good spatial reasoning, so well are they in solving the problem.

For students who can solve the problems, the first step is to see the students' overall shape of the object. Then look at the shape of the object that are shaded. When students have spatial reasoning with components that include being able to visualize and manipulate an object, then bagia that the shading in view as a unified way to form a new shape of the object.

Most students find it difficult to visualize and manipulate objects. What should they do in advance in solving geometry problems on the matter. And if they have a good spatial reasoning, then the first step they do is figure out a basic image on the matter to determine the actual area before finding a wide area in the shading.

Figure 1. Problem is given.

Figure 2. The desired response.

From the above matter, the first thing that should be known to the students in solving the problem is to know the basic image in advance so that students know what will wake widely used in answering the question, in this case the students see is a flat wake rectangle ABCD. It secondly to the side length of the known length of the image ie AB = CD = 3x and length BC = AD = 2x. All three students to focus on areas in shading, if students have spatial reasoning is good, then these students will see flat wake others that there are 4 flat wake of a right triangle, if the students have no difficulty in imagining it and manipulate it any right-angled triangle united that will form two square pieces in each box in the wake of the flat rectangle (figure 1).

In children who have good spatial reasoning then he will calculate how many squares in the rectangle are and how many squares shaded rectangle in it. On the basis of the formula area of a rectangle that students know the length multiplied by width, then the student can mejawab there are two shaded part per 6 parts overall. However, for students who have low spatial reasoning in terms of imagining objects and manipulate objects, then he will have difficulty in solving these problems (Figure 2).

Based on the above discussion, it can be seen that the students will have difficulty spatial reasoning in solving geometry problems when students have not been able to visualize and manipulate objects to be resolved. Both components are two important things that should be owned by the students in spatial reasoning when solving geometry problems.

VI. Conclusion

Based on the above it can be argued that spatial reasoning plays an important role in solving geometry problems. Spatial Reasoning component is seen in this case study is the student's ability to visualize and manipulate objects in order to solve the problem geometry. Spatial reasoning was positively related to student achievement. The better spatial reasoning, the mathematics achievement of students will also be getting better.

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