Student Analogy Reasons when Solving Area Concepts in Pyramids and Prisms

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Abstract. The purpose of this study is to describe the reasoning of students' analogies in solving the broad concept problem in pyramids and prisms. This research method using descriptive qualitative. Data collection uses analogous reasoning tests and interviews. After that tested to 32 students of Junior High School. Based on the results of the analysis can be concluded that (1) 16% of students solve the problem of source and target problem correctly. (2) 29% of students correctly solve source problems and target problems incorrectly. (3) 55% solve source problems and target problems wrong. This is because students tend to memorize formulas not using analogy reasoning to solve new problems. Finally, the students have difficulties in solving new problems, because students are not accustomed to using the experience they have gained to solve new problems.

1. Introduction

Analogy reasoning is an important part of mathematics learning. Because if analogical reasoning is not developed from the beginning, then mathematics for students will be the only course that follows rules and examples without understanding its meaning [1]. Troubleshooting is important to learn, but it should not only memorize how to solve it, but how to find a solution to the problem. Analogy reasoning helps students to solve new problems using previously acquired experiences, so students will explore and engage in searching for mathematical information that can lead students to a deeper level of understanding [2,3].

Some scholars argue that analogical reasoning is a very great student thought. The analytical reasoning relationship analogy with problem-solving ability will improve one's mathematical ability [4, 5, 6]. Based on the results of research shows that the most important attribute in mathematical thinking is analogical reasoning [7]. Basically this research is similar to earlier research, the research also analyze the students' analogical reasoning [7,8]. But in this study analyzed the students' analogy of reasoning when solving the problem of broad concept in pyramid and prism. Students required to work on the analogy reasoning problem, ie source and target problem.

This study focuses on the concept of a wide pyramid and prism. The broad concept can be easy, but in certain cases students are asked to look for what is not yet known in this issue. One such reason that makes students find it difficult to work out a problem [9]. This study used descriptive qualitative. Data collection uses analogous reasoning tests and interviews. Furthermore, the test was tested in 32 students of Junior High School. Validation in research using time triangulation. Based on the above
explanation, this study aims to answer: how the reasoning of student analogy when solving broad concept in pyramid and prism?

2. Experimental Method
This research uses a qualitative method. Data collection uses analogy reasoning tests and interviews. Analogy reasoning test consists of source and target problem, the given form of problem is as follows:

**Source Problems**

![Diagram of irregular pyramid with base and sides labeled A, B, C, D, T, and dimensions given.]

Base an irregular pyramid with a square shape with 10cm sides. If the volume of pyramid is 400 cm$^3$ then the area of the pyramid is ….

**Target Problems**

A prism base with a right triangular shape with a long side slanted 17 cm and long one side of the elbow 15 cm. If the prism volume is 540 cm$^3$ then the surface area of the prism is ….

Validation of data using time triangulation with data collection with two tests and interviews. There are four indicators used to measure analogical reasoning, ie encoding, inferring, mapping and aplaying [10]. Interviews are used to strengthen arguments and clarify student answers. This research was conducted on 32 students of Grade VIII of Junior High School 4 Karanganyar.

3. Results
An overview of the students’ analogy reasoning test (table 1)

**Table 1. The percentage rate of the students’ analogy reasoning test answers**

| Student answers                                      | Percentage % |
|-----------------------------------------------------|--------------|
| The source issue and the target issue are correct   | 16%          |
| The source problem is correct and the target problem is incorrect | 29%          |
| The source issue and the target issue are incorrect | 55%          |

Based on (Table 1) it is concluded that 16% of students answer the source problem and the target problem is correct. The first assumption that students can be said to understand the concept. However, based on interviews, students show the analogous reasoning stages in solving logical reasoning. Furthermore, in the interview also found that students feel confused at the mapping and aplaying stage. The confusion is because students are not used to analogy reasoning to solve problems. But the confusion is able to overcome the students.

Based on the given problem I found many answers to true source problem but the target problem is wrong, even I also find the source problem and the target problem is wrong. Based on (table 1) 29% of students answered true source problem and wrong target problem. Based on students’ test answers on targeted problems students actually understand the concept. It appears that students understand the broad formula of prism. Yet students can not find what is not yet known in the matter, ie the length of one side of the triangle and the height of the prism. (Figure 1).
Based on the interview students do not show the stages of the analogy clearly. Students show confusion in explaining the answer. Students actually know the source problem can help work on the target problem, can be said stages of mapping students seem but can not do the target problem or aplaying stage can not seem.  

Based on (table 1) 55% of students answer the problem of source and target problem is wrong. Based on the analogy reasoning test (source problem and target problem) the students do not seem to understand the broad concept. Students simply write the formula they memorized, ie the triangle area formula. In solving the problem students are expected to find what is not yet known in the first problem, than students can work on the extent (figure 2).

4. Discussion

From the results of the above research, it is found that students are able to answer the source problem but also difficulty in solving the target problem. This is because students are not aware that source issues can help solve target problems, even though the target issue has more ideas. In addition the students do not seem to understand the broad concept correctly. In accordance with earlier research if students are not accustomed to applying analogical reasoning, it can not be said that the student failed to complete the task [11].  

Student analogy reasoning skills will improve in adolescence, of course, assisted by providing exercises to make students analogy reasoning. Generally children focus more on the element of analogies and attributes than on the relationship in reasoning. The process of development called
relational shift allows adults to consider the relational element and relational relationships of reasoning [3].

5. Conclusion
From the results of the analysis, discussion and discussion, it can be concluded that only 16% of students who answered the reasoning test analogy correctly. Based on student interviews it is found that the reasoning stage of student analogy is not visible, so the students in the process of working more memorize the formula not using analogy reasoning in solving the problem. Subsequently obtained 29% and 55% of students answered the analogy reasoning test was wrong. Based on student interviews, students do not understand the broad concept (figure 1, and figure 2). Besides the students do not understand the broad concept, the students can not capture what information has been known on the problem that resulted in the students difficult to solve the problem.

To overcome these problems, the use of regular training of students, the return of student work after being corrected is very important. Because with a reversal of student work, students are expected to know what is wrong with their work, so with the feedback students have experience to solve problems that will be faced in the future. But what should be noted by the teacher is on making analogy reasoning test, because students in identifying a problem vary. For further research can be developed on other materials. Not only in mathematics course, but analogical reasoning can be applied to other subjects even in everyday life.

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