GENDER DIFFERENTS AND VISUAL-SPATIAL INTELLIGENCE IN SOLVING GEOMETRIC IN 9TH GRADE

Ria Wahyu Wijayanti[1], Imam Sujadi[2], Sri Subanti[3]

Magister of Mathematics Education, Sebelas Maret University[1,2,3]
riaa.ww@gmail.com [1]

Abstract

Visual-spatial intelligence is one of the multiple intelligences that is important to solve mathematics problem, especially in geometry. The aim of this research is to know about visual-spatial characteristic, such as students' imagination, pattern seeking, problem solving, and conceptualization in solving the geometric problem. The type of this research was a qualitative research on case study. Subject's selection procedure was by using *snowball* sampling. Data collection technique was task-based interviews. The validity was determined by time triangulation. The data analysis technique in this research was reduction, data display, and conclusion. The data was analyzed based on visual-spatial indicator. The results of this research showed that female students have better pattern seeking, problem solving, and conceptualization. Meanwhile male students have better in imagination.

Keywords: gender, geometric, intelligence, visual-spatial

Introduction

Indonesia is the most populous country in the world number four. According to the *Badan Pusat Statistik* (BPS), a government agency doing a thorough research on the structure of Indonesia's population every decade, it states that the number of men more than the total population of women. According to a recent study (released in 2010), Indonesia has a population of 237.6 million people which 119.6 million are males and 118 million people are females. The domination number of males also occurred in schools in Indonesia, both from the elementary level up to college. The phenomenon also occurs in the engineering faculty in Indonesia, the dominance of male students is very large compared to females. The number of engineering students in various universities in Indonesia is dominated by male students.

Different characteristics of the way men and women think according to Kartono (2006) that men tend to be more rational in dealing with problems than women. Men generally have the ability to think abstractly and thoroughly, while women tend to think real and practical. Results of research by Zhu (2007) concluded that there is a difference between the mathematical problem solving abilities of male and female students. Female students preferred the conventional problem solving using algorithms rather than strategy used by male students. Male students prefer unconventional problem solving and using estimation strategies.

In some other studies, it was found that not only their differences in math was based on the gender factor, but how to acquire knowledge of mathematics was also associated with gender differences. Keitel (Iswahyudi, 2012) states, "Gender, social, and cultural dimensions are very powerfully interacting in conceptualizations of

mathematics education, ...". This suggests that gender (in this case are the male students and female) have a close relationship with the learning of mathematics.

Research conducted by Shafiq (2011), states that "In Indonesia, the Kyrgyz Republic, and Tunisia, girls underachieve in mathematics and science but overachieve in reading", the study reveals that female students in Indonesia, Kyrgyz and Tunisia have poor performance (children who have high intelligence but low achievement) in mathematics and science but have high achievement in reading. The study shows that female students have lower achievement than the male students. Speaking of intelligence, every learner himself must have a level of ability or intelligence differently so Gardner (2007) divides intelligence into 8 types (Multiple Intelligence) or commonly abbreviated to MI, namely (1) verbal-linguistic intelligence, (2) logical-mathematical, (3) visual-spatial, (4) rhythmic-music, (5) bodily-kinesthetic, (6) interpersonal, (7) intrapersonal, and (8) natualistik. Visual-spatial intelligence is the ability to capture the world exactly the visual space (Gardner, 2007).

This intelligence have tremendous benefits in education, especially math. Research conducted by Ozlem (2015), states that "the students who have high mathematical success have more success in the spatial visualization success than others", the study reveals that students who have success in mathematics has the ability to visual-spatial more than other students.

Based on the previous description, the researchers would like to know more about the visual-spatial intelligence of female students in solving mathematical problems. By knowing the visual-spatial intelligence of female students in solving problems in the geometry class, a teacher is expected to have a reference for decision in choosing the model and the medium of learning for students. Identification of visual-spatial intelligence of female students in solving geometry problems need to be done, so it could be an alternative knowledge in mathematics teaching and learning process as well as in continuing further studies for female students.

Finding and Discussion

The results identifying the characteristics of visual-spatial intelligence of female students in solving problems related to the geometry of space are presented in the following descriptions:

Imagining

The second subject was female, she produced different data from other female. Differences in the data was the subject had the characteristics of good imagining, she could provide images or information relevant to the problems and provided a rational reason to the answers she gave, while two other subjects were not appropriate in providing pictures and information relevant to the issues, they tended to have difficulty to describe their imagination so that the other female students had poor imagining performance to solve geometry problems.

Seeking Patterns

Subjects could find a pattern of material presented and could explain the reasons in determining the pattern so that the female students had good performance in seeking pattern to solve geometry problems.

Problem Solving

Subjects could count a whole lot of cubes needed to make a cube or a gate array appropriately. Subjects could specify a variety of appropriate problem-solving strategies. In addition, the subject was also able to explain the reason for choosing

to use the ways to solve a problem so that the female students had good performance in problem solving to solve geometry problems.

Conceptualizing

Subjects could define the concept of a problem and associated it with the previous knowledge and could explain the reasons in determining the concept of the material that had been presented so that the female students had good performance in conseptualizing to solve geometry problems.

Based on the data analysis and the validity of research data, data was valid for the research subjects which were female and male. The following discussion will be presented regarding the results of the data analysis of the characteristics of visual-spatial intelligence of students in solving geometry problems.

Female Students

In the aspect of imagining, one of the three subjects had good imagining characteristics, while the other two subjects did not have good characteristics in imagining. Furthermore, in the aspect of the search for patterns, problem solving, and conceptualizing, the study gave the same result that all three have a good characteristic. Different characteristics of imagining of one subject to the other two subjects that caused the subject had high visual-spatial intelligence, to imagine a context well, could solve problems in a way that was not common, and could find concepts and associated problems with previous knowledge.

Female students had the characteristics of a good search pattern, problem solving, and conceptualizing. It is based on data analysis which showed that female students tended to have better understanding toward a problem and be able to associate insights earlier in resolving a problem. Base on the above results, the female students had a visual-spatial intelligence profiles including a good search patterns, problem solving, and conceptualizing to solve geometry problems.

Male Students

The following discussion of the results described valid data analysis and discussion of the characteristics of visual-spatial intelligence in male students on aspects of imagining, search patterns, problem solving, and conceptualizing when solving geometry problems.

In the aspect of the search for patterns, problem solving, and conceptualizing, one of the three subjects had good imagining characteristics, while the other two did not. Furthermore, the aspect of imagining gave the same result that all three had a good characteristic. Different characteristics of search patterns, problem solving, and conceptualizing of the subjects was because the subject had the high visual-spatial intelligence, besides being able to imagine a context well, he also could see a pattern formed in the material as well as he could search for a formula and then he could finish the problem well, it is because they understood the material or having previous knowledge and they could find the concept and associated it with their previous knowledge before.

Male students had have better imagining than females. It is based on data analysis showing that male students were more likely to have high imagination. Based on the above results, the male students had visual-spatial intelligence profiles that include characteristics of good imagining to solve geometry problems.

Conclusions

The profile of female students' visual-spatial intelligence of class IX in solving problems of the geometry of space, as follows: 1) In imagining, the students were not

able to provide information or images relevant to the issues, and were not able to provide adequate reasoning about the pictures or information he presents as his imagination unfavorable characteristics of its name, 2) in the search pattern, the students were able to find a pattern of a material presented and could provide an explanation of the reason for the search pattern so that the pattern search was good, 3) on completion of the issue, students were able to determine the solve problems, able to explain the reason in solving the problems, and were able to determine the different ways to solve the problem so that it had the characteristics of good problem resolution, and 4) in conseptualizing, students were able to mention the concepts of the problem and associate it with their previous knowledge and could provide explanation of the concepts and prior knowledge that he used in completing the problem so that he had the good characteristics of conseptualizing.

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