Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.9, No.8, 2018

The Effect of Intelligence Quotient (IQ), Self-Regulated Learning, Mathematical Disposition, and Logical Thinking Ability Towards the Problem Solving Ability of Geometry in State Junior High School Students in Bandar Lampung City

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Abstract
This research is conducted because there is no research report related to the problem solving of geometry in junior high school students in Bandar Lampung City, while the ability to solve the problem of geometry needs to get attention. The purpose of the research is to analyze the effect of intelligence quetient (IQ), self-regulated learning, mathematical disposition, and logical thinking ability towards the problem solving ability of geometry in state junior high school students in Bandar Lampung City. The research used survey method with path analysis technique. Intelligence quetient (X_1), self-regulated learning (X_2), mathematical disposition (X_3), and logical thinking ability (X_4) as the exogenous variable. Problem solving ability of geometry (Y) as the endogenous variable. The results of the research indicate there is a positive direct effect of intelligence quotient, self-regulated learning, and logical thinking ability towards the problem solving ability of geometry. There is not a positive direct effect of mathematical disposition towards the problem solving ability of geometry.
Keywords: Intelligence Quotient, Self-Regulated Learning, Mathematical Disposition, Logical Thinking Ability, Problem Solving Ability of Geometry

1. Introduction

Geometry is one of the most important and useful branches of mathematics in life. Geometry is one of the areas of study in mathematics materials that earn a large portion to be studied by students at the school. The fact shows that the problem solving ability of the geometry of the student has not achieved the optimum result of the expected goal. One of the things to watch out for in school math is the problem-solving skills. Mathematical problem solving is very important, because one of the goals of learning mathematics is to develop student thinking and problem-solving skills. In addition, problem solving is part of a very important mathematics curriculum because, in the learning process and completion, students are enabled to gain experience using the knowledge and skills they already have to apply to problem solving in their lives. This is because mathematics can be considered as a process and problem-solving tool (Soedjadi, 2000; Suherman, 2003; Aydogdu and Impression, 2014; Suyitno, 2014). It is said by Freudenthal (1973), how to be able to use mathematics to solve problems if people have never experienced mathematics as a problem solving activity.

Polya as quoted by Chamberlin (2008), defines problem solving as an attempt to find a way out of a difficulty, achieving a goal that is not immediately achievable. Problem Solving Ability is the ability shown by students in solving problems or problems encountered by using methods and stock of knowledge they already have, with attention to the process of finding answers based on certain stages. In mathematics, the problem can be questions or tasks to be completed which in its completion requires knowledge regarding mathematical concepts, principles, and operations (Hudojo, 2001; Hamalik, 2005; Fadlelmula, 2010; Mayer, 2013; Pehkonen, Naveri, and Laine, 2013).

Problem solving ability is the result or learning achievement. As a learning achievement has a close relationship with the level of intelligence or intelligence quotient owned by students. Expressions of thought, speech, the way of asking questions, problem solving skills and so on reflect one's intelligence. The essence of intelligence is the general ability or ability of man to do his life's work. Intelligence includes many mental abilities, such as the ability to plan, solve problems, think abstractly, understand ideas, and learn. intellectual ability is a strong predictor of academic achievement. Keep in mind that intelligence is not the only determinant of academic achievement. (Munandar, 1999; Fudyartanta, 2004; Legg and Hutter, 2007; Veas, Gilar, and Pablo Minano, 2016).

Another factor that influences the learning outcomes is self-regulated learning. Sumarmo (2014), said that self-regulated learning is one of the mathematical soft skills as a component of the mathematical thinking process in the affective domain. Self-regulated learning emphasizes the importance of personal responsibility and controls the knowledge and skills acquired. Setting yourself up in learning also brings the student into an expert or master what he or she learns. Self-regulated learning is an active constructive process undertaken by students, where students set goals for learning and then seek to monitor, organize, and control cognition, motivation, and attitudes (Zimmerman, 1990; Schunk, 2005; Tirtarahadja and Sulo, 2005; Valle et al, 2008;

Yildizli and Saban, 2016).

The mathematical disposition needs attention in mathematics learning. Math disposition means a tendency to think and act in a positive way. This tendency is reflected in student interest and belief in math, the willingness to explore and persevere when solving mathematical problems, and a willingness to reflect on their own thoughts as they study math. Disposition of nature or character that leads one to make choices and experiences. Disposition is guided by self-esteem and attitudes related to values. Students will find it hard to get good achievement in learning mathematics if their attitude or disposition to math is not good. (Katz, 1993; Anku, 1996; Damon, 2005; Atallah, Bryant and Dada, 2010; Moenikia and Babelan, 2010; Feldhaus, 2012).

The internal factor of students who play a role in solving mathematical problems is the ability to think logically. Said by Suriasumantri (2017) and Maksum (2016), that thinking is an activity to find the right knowledge. Logical thinking demands systematic thinking. Systematic thinking is a series of thoughts that relate to each other and are logically related. It is said by Zenzen and Bulbui (2011), without the ability to think logically, can not be achieved the truth that can be accounted for. The ability to think logically is a very important cognitive ability that affects student learning outcomes.

One of the weaknesses of students in solving problems in geometry, they tend to use the formula found in solving problems, so they do not have the ability to see the relationship between concepts they build. Learning experiences that have been owned as if apart from one another, so that the development of logical thinking ability and problem solving is not optimal (Saragih, 2013).

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2. Research Method

The research method used is survey method with path analysis technique. Intelligence quotient or IQ (X1), self-regulated learning (X2), mathematical disposition (X3), and logical thinking ability (X4) as the exogenous variables. Problem solving ability of geometry (Y) as the endogenous variable.

Data collection techniques used are test techniques for IQ, logical thinking ability, and problem solving ability of geometry. While the self-regulated learning and mathematical disposition using a questionnaire. Samples were taken by 355 students from 11 schools. Prior to testing the hypothesis first tested the requirements of analysis consisting of test normality of estimation error, linearity test and simple regression significance between two variables. Hypothesis testing is done by using Lisrel program.

3. Result and Discussion

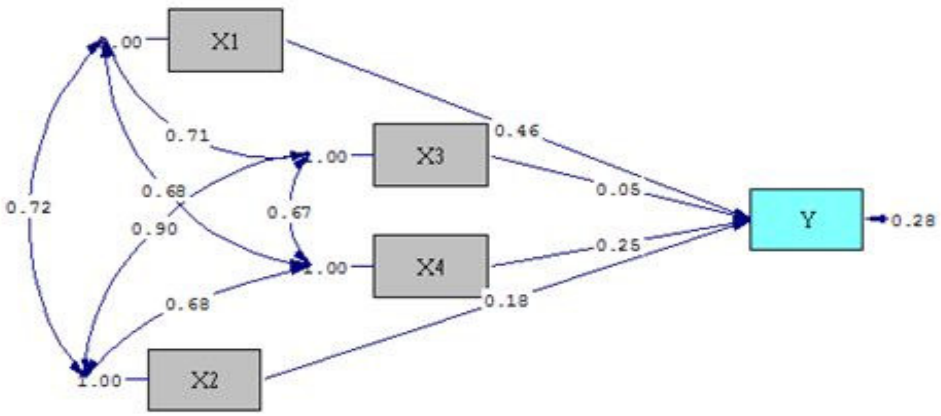

Figure 1. Coefficient of Line Model Structure

The path coefficient analysis model of the above structure model is expressed in the equation$Y = p_{y1}X_1 + p_{y2}X_2 + p_{y3}X_3 + p_{y4}X_4 + \varepsilon_3$. From the calculation result obtained equation $Y = 0{,}46X_1 + 0{,}18X_2 + 0{,}05X_3 + 0{,}25X_4 + 0{,}28$. The results of the complete test are explained through the path of influence X_1, X_2, X_3, and X_4 to Y as follows.

1) Based on the calculation of path coefficient obtained $p_{y1} = 0.46$ with $t_{value} = 10{,}36$ and t_{table} ($\alpha = 0.05$) = 1.96. Known $t_{value} > t_{table}$ then H_0 rejected and accept H_1, which means there is a positive direct effect of IQ (X_1) towards the problem solving ability of geometry (Y).
2) Based on the calculation of path coefficient obtained $p_{y2} = 0.18$ with $t_{value} = 2.68$ and t_{table} ($\alpha = 0.05$) = 1.96. Known $t_{value} > t_{table}$ then H_0 rejected and accept H_1, which means there is a positive direct effect of self-regulated learning (X_2) towards the problem solving ability of geometry (Y).
3) Based on the calculation of path coefficient obtained $p_{y3} = 0.05$ with $t_{value} = 0.81$ and t_{table} ($\alpha = 0.05$) = 1.96. Known $t_{value} < t_{table}$ then H_0 is accepted and reject H_1, which means there is no positive direct effect of mathematical disposition (X_3) towards the problem solving ability of geometry (Y).
4) Based on the calculation of path coefficient obtained $p_{y4} = 0.25$ with $t_{value} = 6.01$ and t_{table} ($\alpha = 0.05$) =

1.96. Known $t_{value} > t_{table}$ then H_0 rejected and accept H_1, which means there is a positive direct effect of logical thinking ability (X_4) towards the problem solving ability of geometry (Y).

3.1 The Effect of Intelligence Quotient (IQ) towards Problem Solving Ability of Geometry

The results showed that IQ had a positive direct effect towards problem solving ability of geometry. This means that the high ability of geometry problem-solving can be explained by IQ. The contribution IQ directly to problem solving ability of geometry by 21.16%.

The influence of IQ on problem-solving abilities is proposed by Breckenridge and Vincent, which states that intelligence is a person's ability to learn, adapt and solve new problems (Prabu, 1993).

Problem solving ability is one of the goals to be achieved in learning mathematics. The results of learning or achievement of mathematics learning are very visible from the students' ability to solve math problems. This is because in the learning of mathematics, children are faced with problem solving tasks. For that IQ plays a role in learning mathematics. Mentioned Veas, Gilar, and Minano (2016), that intellectual ability is a strong predictor of academic achievement.

With regard to the impact of IQ on problem-solving abilities as a result of learning reinforced by the results of Deary and Johnson (2015), which concluded a high IQ has a strong influence on learning outcomes rather than vice versa. In addition, the results of research Karsim, Suyitno and Isnarto (2017), that there is a positive influence significantly IQ on the ability problem-solving learners. This means that for every increase in IQ there will be an increase in problem solving ability of learners.

3.2 The Effect of Self-Regulated Learning towards Problem Solving Ability of Geometry

The results showed that the Self-regulated Learning had a positive direct effect towards the problem solving ability of geometry. This means that the high ability of problem solving geometry can be explained by the Self-regulated Learning. The contribution of self-regulated Learning directly to problem solving ability of geometry by 3.24%.

The existence of the influence of the Self-regulated Learning on the problem solving abilities of the above geometry is reinforced by the results of Zamnah's research (2017), which concludes that there is a relationship between self-regulated learning with students' mathematical problem solving abilities.

The ability to solve mathematical problems is not seen only as an objective but also a process in the learning of mathematics. As a result of learning, success depends on how students learn. It is this factor that shows that the self-regulated learning directly affects the problem solving ability. Found by Tirtarahadja and Sulo (2015), that self-regulated learning means learning activities that take place are driven more by their own volition, self-choice, and self-responsibility as learners. Students with good Self-regulated Learning, he will control the knowledge and skills that have been owned and how to apply it. It is said by Zimmerman (1990), that the self-regulated learning emphasizes the importance of personal responsibility and controls the knowledge and skills acquired. Setting yourself up in learning also brings the student into an expert or master what he or she learns.

3.3 The Effect of Mathematical Disposition towards Problem Solving Ability of Geometry

The results showed that mathematical disposition had no a positive direct effect towards the problem solving ability of geometry. This is because hypothesis testing is not supported by data empirically. The contribution of mathematical disposition directly to problem solving ability of geometry is only 0.25%.

Conceptually there is an influence of mathematical disposition on the ability of problem solving geometry, because the disposition of mathematics is a mental attitude that is appreciation of mathematics. Children who have good mathematical dispositions have a positive assessment of mathematics. But the influence is not direct, in the sense that there are other factors as intervening variables between the disposition of mathematics with the ability to solve the problem of geometry. It can also be interpreted as a mathematical disposition not significantly as an exogenous factor that directly affects the problem solving ability of geometry. This statement is supported from the results of the analysis is the effect of mathematical disposition logical thinking ability with a contribution of 4%. The ability to think logically affect the ability of problem solving geometry with a contribution of 6.25%. It can be said that the logical thinking ability as one intervening variable.

The above description explains that the disposition of mathematics as a positive attitude and appreciation of mathematics, not enough to guarantee the success of learning mathematics. But mathematical disposition is crucial to achieving a child's learning success. Without having the attitude, perception, appreciation or good judgment of the mathematics of children will be reluctant to learn or difficult to expect children to succeed in learning mathematics. If the child's perception of math is not good then it will be difficult for us to invite children to be active in learning mathematics. As Moenikia and Babelan (2010) found, that in learning mathematics, students' attitudes toward mathematics need attention. Students will find it difficult to get good achievement in learning mathematics if their attitude or disposition to math is not good. Because there is a

relationship between attitudes or dispositions to mathematics with the results of learning mathematics.

3.4 The Effect of Logical Thinking Ability towards Problem Solving Ability of Geometry

One of the results of this research is that the logical thinking ability had a positive direct effect towards the problem solving ability of geometry. Thus the high ability of problem solving geometry can be explained by the ability of logical thinking. The contribution of logical thinking ability directly to problem solving ability of geometry by 6.25%.

The results above are reinforced by the opinion of Suriasumantri (2017), which says that one of the capabilities closely related to problem solving is the ability to think logically, that is, the ability to find truth based on certain rules, patterns or logic.

In learning mathematics, the problems often faced are in the form of questions or tasks that must be completed students. A child with good logical thinking will be able to think coherently and be able to solve math problems step by step. The existence of the relationship between logical thinking ability with problem solving ability of mathematics, in line with result of research of Andriawan and Budiarto (2014), which shows that in solving mathematical problems, subjects capable of solving high mathematical problems have the characteristics of the ability to think logically that is capable of thinking coherently, can give his argument in every step problem solving, able to give conclusions appropriately.

4. Conclusion

Based on the results of the above research and discussion, it can be concluded that: 1) there is a positive direct effect of IQ towards the problem solving ability of geometry, 2) there is a positive direct effect of self-regulated leaning towards problem solving ability of geometry; 3) there is no a positive direct effect of mathematical disposition towards problem solving ability of geometry, and 4) there is a positive direct effect of logical thinking ability towards problem solving ability of geometry.

The results of this study bring implications if teachers want students 'skills in solving mathematical problems well, in learning mathematics teachers should pay attention to the characteristics of students, such as intelligence, and seeks to develop self-regulated learning, attitudes or positive disposition to mathematics, and students' reasoning abilities.

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