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Problem Solving Ability Viewed by Learning Style on *Whole Brain Teaching's* Learning Assisted Geogebra of 8th Grade Students

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Abstract

Problem solving ability is one of the goals in learning mathematics and it can be developed by paying attention to student's learning style. The aim of this study are to determine the quality of the Whole Brain Teaching learning assisted geogebra and found a pattern of problem solving ability of 8th grade students in problem solving viewed by learning style. The research uses mixed methods study with concurrent embeded design. The type of quantitative research is experimental research with nonrandomized control group. The subject of the research were 2 students of VIII-F, who chosen from each learning style. Quantitative data were tested by z-test and t-test, while the qualitative data were analyzed descriptively. Learning by Whole Brain Teaching assisted geogebra is qualified. Students of visual type can solve the problem well until the looking back stage. Students of auditorial type can solve the problem but have difficulty to looking back. Students of kinesthetic type can solve the problem but have difficulty in planning stage.

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INTRODUCTION

The main goal of education is to train individuals as problem solvers to overcome and deal with problems in real life (Yavuz, 2015) Problem-solving skills can develop and improve through practice problem-solving abilities, because problem-solving is the application of concepts and skills (Abdurrahman, 2012).

Skills in dealing with problems of daily life along with the satisfaction of math problem solving skills. It is therefore important to familiarize students in sharpening the problem-solving abilities, both routine and non-routine. Most of the problems in the world are non-routine problems, ill-structured problem and the solution allows us to use unfamiliar algorithms (Setiawan, 2012). However, most students are not yet familiar with how to solving problem. In accordance with the results of international research related to the performance of students in Indonesia to solving the problems (problem solving) is still not satisfactory (Junaedi, 2012).

The ability to solve problems is one of the most important things in learning mathematics that must be owned by students. Problem solving abilities are common goals and core processes in mathematics learning (Purnomo, 2015), (Susilo, 2012), (Ekawati, 2013). Quality of math learning will make the mathematical concept meaningful for students. Students who understand the concept will significantly be motivated in learning. Knowledge is meaningful if the knowledge is in accordance with previous knowledge in the minds of students, or students know the benefits in daily life (Mairing, 2013).

The dominant learning style defines the best way of receiving different stimuli and thinking to learn (Vendiagrys, 2015) for someone to learn new information by filtering out what will be learned (Alfatah, 2013). Knowing the different learning styles of students has helped teachers in conveying information (DePorter, 2010). Teachers need to pay attention, respect and accept the learning style of the students because the learning style is firmly embedded in the biological individual, so it is not easy to change (Jelínková, 2016). Students naturally have learning styles and it can improve learning achievement (Abidin, 2011). Likewise opinion (Nielsen, 2016) about teachers should take note of the signs of student's difficulty that can be explained by learning styles to hinder and reduce frustration and resistance associated with student's learning styles.

Preliminary study at SMP N 7 Semarang shows that more than 75% of students have difficulty to solving problems. Most students still think that mathematics is difficult, because they can not understand mathematics thoroughly, then adopt a negative attitude toward it that is closely related to the problem-solving skills (Arslan, 2014). The attitude toward mathematics is influenced by the method of learning used by teachers in the classroom so as to influence one's attitude in learning mathematics (Akinsola, 2008).

There are various kinds of learning models that are expected to improve students problem solving skills, include the Whole Brain Teaching model (WBT). In WBT learning, teachers are required to present a fun learning and students are required to be interactive. In order for the learning process to take place properly, teachers need to pay attention to student learning activities, because learning activities are all activities both physically and mentally conducted in the process of interaction (teachers and students) in order to achieve the learning's goals (Fauziah, 2017). This is in accordance with the dominant learning style that each individual possesses: visual learning style (remembering the seen), auditorial learning style (absorbing the heard) and kinestetis learning style (absorbing information through physical movement) (DePorter, 2010).

Technology in learning can be used to improve the process of mathematical thinking (Zevenbergen, 2011), so that students will experience a much more meaningful process. Students become more involved in the learning process and more attractive to higher achievements by using Geogebra, (Reis, 2010).

Based on the description, the researcher conducted the research with the aim of: (1) to know the quality of learning with the WBT model on the problem solving skills of 8th grade students SMP N 7 Semarang and (2) to find the pattern of problem solving ability of 8th grade students SMP N 7 Semarang viewed by learning style on WBT learning assisted geogebra.

METHODS

This research is a combination of qualitative and quantitative research method also known as mixed methods. In this research uses concurent embedded design method. This design can also be characterized as a mixed-method strategy that applies a single stage of quantitative and qualitative data collection at a time (Sugiyono, 2016).

In this study, qualitative research as a primary method and quantitative research as a secondary method. Quantitative research as supporting data to analyze problem solving ability viewed by learning style. This research begins with the collection and processing of qualitative data and ends with qualitative data collection as well. The population in this study are 8th grade students of SMP Negeri 7 Semarang. From 7 classes of 8th grade students selected 1 experimental class that was given learning with WBT assisted geogebra and 1 control class that was given learning with Problem Based Learning (PBL).

Data collection techniques in this study include document techniques (test results), questionnaires, observations, and interviews. Data analysis is done at the planning, implementation and assessment stage. In the planning stage, learning tools and research instruments validation are performed by expert validators and analyze items. At the implementation stage, researcher compile qualitative and quantitative data systematically obtained from the results of questionnaires, observations, test results, and interviews. In the assessment stage, researcher gave a questionnaire of student's responses to the learning with the WBT assisted geogebra. The quality of learning with the WBT assisted geogebra was analyzed qualitatively and quantitatively. The quality of WBT learning assisted geogebra is qualitatively viewed from the validation results of the learning tools and research instruments, the results of observation of the implementation of learning, and the student's responses to learning. The quality of WBT learning assisted geogebra quantitatively includes z-test and t-test. While the pattern of problem solving abilities of students viewed by learning style are analyzed descriptively based on document of test result and interview on student representatives so that it can be concluded patterns of problem solving abilities based on student's learning styles.

RESULT AND DISCUSSION

Based on the results of learning style's questionnaires on students who were taught using Whole Brain Teaching-assisted geogebra obtained the results as in Table 1.

Table 1. Student's Category On 8th Grade Students Based On Learning Style

No	Student's Category	Quantity
1	Visual	8
2	Auditorial	4
3	Kinesthetic	2
4	Combination	20
	Total	34

Based on table 1, 34 students who completed the questionnaire of learning style were 8 visual category students, 4 auditorial category students, 2 kinesthetic category students and 20 other students had combination learning style. Two students from each learning style category were selected to be analyzed in depth problem-solving skills. Selected students as interview subjects from visual, auditorial and kinesthetic categories was derived from the acquisition of learning style outcomes at the beginning and end of the same category. This is done in order to see a significant difference between the students from the three categories of learning styles in solving the problem.

The quality of learning is qualitatively assessed from 3 stages. The first stage is planning stage where the researcher prepares learning tools, research instruments that are then validated by expert validators and analyze items. At the implementation stage observation of the learning implementation by the observer, and at the assessment stage using student response questionnaire. The validation results indicate that the learning tools and instrument research in the valid criteria, and can be used. The results of the validation of the learning tools and instrumen research can be seen in Table 2.

Table 2. Results of Learning Tools and Validation Instrument Research

No	Tool & Instrument	Validator			Average	Validity
		I	II	III		
1	Syllabus	4.00	3.56	3.78	3.78	Valid
2	Lesson Plan	4.00	3.73	3.89	3.87	Valid
3	Teaching Materials	4.00	3.67	4.00	3.80	Valid
4	Student Activity Sheets	4.06	3.59	3.77	3.89	Valid
5	Problem-solving ability test	4.00	4.00	3.83	3.94	Valid
6	Learning Activity Sheet	3.80	3.20	4.00	3.67	Valid
7	Interview Guidelines Sheet	4.20	3.80	4.00	4.00	Valid
8	Student Response Sheet	4.00	4.00	3.83	3.94	Valid

For the implementation stage, it is obtained by learning activity sheet. The observation results indicate that the learning of mathematics with Whole Brain Teaching-assisted geogebra that have been implemented already categorized well. Data from the observation of learning implementation shows in Table 3.

Table 3. Observation's Results of Learning Implementation

No	Learning Activities	Average	Category
1	1st meeting	4,00	Good
2	2nd meeting	3,90	Good
3	3rd meeting	4,30	Good
4	4th meeting	4,10	Good
5	5th meeting	4,30	Good

For the assessment stage, it is obtained by student's response questionnaire. The results indicate that students' responses to the mathematics learning with Whole Brain Teaching-assisted geogebra received a positive response from students. Data from student's response shows in Table 4.

Table 4. Student's Response to The Mathematics Learning

Response	Percentage
Positive Response	79.41
Negative Response	20.59

Based on the result of assessment of instructional device by expert validator, obtained the average of expert validator rating entered in the minimum category either. This means learning tools are worthy of use in research. In the results of the items about problem solving, the questions used for the assessment of problem solving abilities is a matter of numbers 3, 4, 7 and 8. The average result of observation of the implementation of learning for 5 meetings into the good category. This means that the researcher has done the learning well. The number of students who responded positively to learning reached more than 79%.

The quality of learning is quantitatively determined based on the classical completeness test and the average difference test. The data used for the completeness test and the average difference is the final student's ability test result. The final student's test results shows in Table 5.

Table 5. The Final Student's Test Result

	Average
Experimental Class	68.18181
Control Class	58.28125

Based on the results of the first test of completeness using the test of the proportion of one sample-right side obtained $z_{count} = 2.88$, while $z_{table} = 1.65$. The test criterion is reject H_0 if $z_{count} \geq z_{table}$ (Wardono, 2017). Since $z_{count} = 2.88 > 1.65 = z_{table}$ then H_0 is rejected. This means that the proportion of students in learning Whole Brain Teaching-assisted geogebra reaching completeness 60 has exceeded 75%. Based on the results of the calculation of the second test using the test average of one sample-right side obtained $t_{count} = 4.74$, while $t_{table} = 1.69$. The test criterion is reject H_0 if $t_{count} \geq t_{table}$(Wardono, 2017). Because $t_{count} = 4.74 > 1.69 = t_{table}$ then H_0 is rejected. This means that the average problem-solving ability of students who get learning with Whole Brain Teaching-assisted geogebra has exceeded the value of 60.

Based on the first average difference test is the average difference test of two samples that are the experimental class and control class obtained $t_{count} = 3.51$, while $t_{table} = 1.67$. The test criterion is reject H_0 if $t_{count} \geq t_{table}$ (Wardono, 2017). Since $t_{count} = 3.51 > 1.67 = t_{table}$ then H_0 is rejected. This means that the average problem-solving ability of students in learning Whole Brain Teaching-assisted geogebra better than the problem-solving ability of students in learning Problem Based Learning. Based on the second difference test the difference is the difference test of proportion of two samples that are experiment class and control class obtained $z_{count} = 2.902$, while $z_{table} = 1.65$. The test criterion is reject H_0 if $z_{count} \geq z_{table}$ (Wardono, 2017). Since $z_{count} = 2.902 > 1.65 = z_{table}$ then H_0 is rejected. This means that the proportion of students' problem solving abilities in learning Whole Brain Teaching-assisted geogebra more than the proportion of problem solving skills of students in Problem Based Learning learning.

Based on the that description, the learning quality of Whole Brain Teaching model-assisted geogebra included in the quality category. This is because (1) the result of the validation of the learning tools and research instruments by the expert validator enters on good criteria; (2) result of observation of implementation of learning enter on good criteria; (3) student's positive responses to learning go beyond 75%; (4) the proportion of students who achieve completeness exceeds 75%; and (5) the average problem-solving ability of the experimental class students is better than the control class. The results of this study are in accordance with research conducted by Agustin, et.al (2011); Wulandari, et.al (2014); Bawaneh, et.al (2011); Bawaneh, et.al (2012); Isnawati & Syamsu (2015) stating that the Whole Brain Teaching

model is more successful in understanding and improving student learning achievement.

In this research the students are given problem solving problem on the material of geometry-flat side. Researchers provide problem solving based on NCTM indicator of surface area and volume of prism and limas, then students are asked to solve the problem.

Student-solving abilities are assessed based on Polya's problem solving steps. The following figure is a bar chart showing the average scores obtained by each group of students based on learning styles.

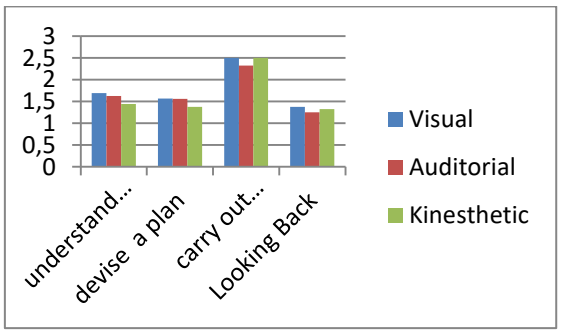

Figure 1. Average Obtaining Score for Each Learning Style Category

Patterns of problem-solving ability of visual type students are (1) Students of visual type can understand the problem. Level of understanding of visual type student problems include good category. Visual type students are able to name what is known and asked; (2) Visual type students can devise a plan for problem solving. Students can name the formula needed to solve the problem; (3) Visual type students can solve problems and implement problem-solving plans in accordance with the plans being made; (4) The visual type student looking back the answer. This is in accordance with the results of the study (Bire, et al, 2014) which states that the visual learning style has the greatest influence on learning achievement. Visual type students can achieve the four NCTM's problem solving indicators.

Pattern of problem solving skills of auditorial type students are (1) Auditorial type students can understand the problem well. Auditorial type students can determine information that is known and asked from the problem well; (2) Auditorial type students can devise a plan the problem solving appropriately; they can determine the formula to be used to solve the problem correctly; (3) Auditorial type students can implement and resolve problem solving in accordance with the problem-solving plan well. However, the auditorial type students are easily satisfied and less thorough in solving the problem-solving problem; (4) Auditorial type students experience confusion in looking back the answers that have been obtained. This is consistent with the results of the study (Bire, et al, 2014) which states that the auditorial learning style has the smallest influence on learning achievement. NCTM's problem solving indicators that can be achieved by auditorial type students are the first, second and third indicators of building new mathematical knowledge through problem solving, solving problems in various contexts related to mathematics and applying appropriate strategies to solve problems while other indicators are reflecting the problem solving process has not been achieved.

Patterns of problem-solving ability of kinesthetic type students are (1) kinesthetic-type students can understand the problem well, the student can determine the information known in the matter well enough; (2) Students of kinesthetic type have difficulty in devise a problem solving plan. The kinesthetic-type student hesitates in determining the formula to be used to solve the problem-solving problem; (3) Kinesthetic-type students can carry out and solve the problems well despite the hesitation in devise a problem-solving plan; (4) Students of kinesthetic type can looking back the answers obtained. This is consistent with the results of the study (Bire, et al, 2014) which states that the kinesthetic learning style has the second largest influence on learning achievement after the visual learning style. The NCTM's problem solving indicators that can be achieved by

kinesthetic-type students are the first, second and fourth indicators of building new mathematical knowledge through problem solving, solving problems in various contexts related to mathematics and reflecting problem-solving processes, while for the second indicator that is implementing a strategy the right to solve the problem has not been achieved.

CONCLUSION

The quality of learning Whole Brain Teaching assisted geogebra on problem solving ability of 8th grade students in solve the problems in good category. Student's problem solving of visual learning style can solve the problems up to the looking back stage and can achieve all NCTM's problem solving indicators; the auditorial students are able to complete the given problem until the stage of implementing the problem-solving plan and can achieve three NCTM's problem solving indicators ie first, second and third indicators; and the kinesthetic students are still having difficulties in the stage of developing problem-solving plans and NCTM's problem solving indicators that can be achieved by kinesthetic students are the first, second and fourth indicators.

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