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Problem Solving Ability Viewed from Students' Cognitive Style on Brain-Based Learning Model Based on Self-Assessment

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Abstract

This study aimed to describe the ability of problem solving based on students' cognitive styles. This study used a mixed method with explanatory sequential design. The population was the students of XI-IPS class from SMA 4 Buru in academic year 2019/2020. The subjects in this study were students of class XI-IPS 1 which were selected based on cognitive style analysis using the Group Embedded Figure Test (GEFT). Data collection techniques used observation, tests and interviews. The results showed that the students 'mathematical problem solving abilities in the cognitive style category had different mastery of indicators in solving students' mathematical problems. This difference does not depend on the cognitive style category of students, yet because of student learning activities.

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INTRODUCTION

Some things that can affect the achievement of the competency goals of mathematics learning by students one of which is that if the mathematical ability of students can be mastered well. One of the goals of learning mathematics according to NCTM (2000) and BNSP (2006) is that students have the ability to solve math problems (Mashuri et al. 2018). This is in line with Budiargo (2016) states that One of the abilities in mathematics is the ability to solve problems. According to Torio (2015) one of the goals in learning mathematics is to make students an effective problem solver. The ability to solve mathematical problems often gets special attention. This is because according to (Huda, et al. 2017) problem solving is one important component of the Mathematics Curriculum and contains the essence of Mathematical activities, so it needs attention in the learning process. Furthermore, according to (Prabawa and Zaenuri, 2017; Ulya, 2015) problem solving is the essence, cannot be separated from mathematics and has a role as the core of the domain of competence in the implementation of the learning process of mathematics.

Although problem solving is an important aspect in the process of learning mathematics, in reality students still often experience difficulties in solving mathematical problems. This is in line with Kaur (2014) states that in learning mathematics, students often have difficulty doing problem solving activities, even intelligent students also experience it. Furthermore Putra, (2018) in his research results revealed that the problem-solving ability of students at one of the SMPN in Cimahi was still low. Hence, the solution is needed to improve the ability of problem solving with the appropriate model of problem-solving stages to improve students' mathematical problem-solving abilities.

One popular mathematical problem solving stage model is Polya's problem solving. Polya's mathematical solving model (2004) includes understanding problems, determining problem solving strategies, implementing problem solving strategies, and reflecting or reviewing answers. Problem solving skills in student mathematics can be influenced by several factors. These factors arise because each individual has differences (Ulya, 2015). When students solve problems, students look for the right solution of the problems they face in different ways. Students' strategies in solving mathematical problems certainly cannot be separated from the way students receive and process information which is called cognitive style (Winarso, 2017). Furthermore Prabawa (2017) states that the ability of problem solving will be more optimal if it is built through appropriate design and learning scenarios by paying attention to aspects of the cognitive style of each student.

Cognitive styles are the ways in which students receive different stimuli and think about learning. According to Mulyono (2012) cognitive style is a consistent method by which a person captures stimulus or information, how to remember, think, and solve problems, deal with problem situations or deal with various types of environmental situations. The choice of different solutions from students can be due to differences in cognitive styles (Vedigarys, 2015). There are many dimensions of cognitive style developed by experts that can distinguish individuals. And one important dimension is Field Dependent (FD), Field Intermediate (FDI), and Field Independent (FI) (Idris in Ulya, 2015). FD individuals tend to work with external motivation, i.e. seek guidance and cues from others. FDI individuals tend to have abilities like FD or FI students because FDI lies between the two. FI individuals view problems analytically, able to analyze and isolate relevant details, detect patterns, and critically evaluate problems (Yousefi in Ulya 2015). The problem is the teacher has not paid attention to the cognitive style of students in learning. The teacher still considers students to have the same ability to absorb lessons in solving mathematical problems (Vedigarys, 2015).

Furthermore, according to Marwazi, et al (2019) in order to improve the quality of solving mathematical problems correctly, there are many factors that must be considered by teachers in the learning process including cognitive style and learning models. Therefore the quality of student mathematics learning must be considered in the learning process that is applied in student mathematics learning. According to Asikin and Junaedi (2014) states that in mathematics education, for example, there are many skills that must be mastered by mathematics teachers, some of which are the skills to set appropriate

mathematics classes, the skills to conduct classroom action research, and the skills to analyze student learning outcomes. So the teacher must be skilled in applying mathematics learning, for example with the accuracy of the learning model because the juaga learning model greatly affects student learning activities. Riau & Junaedi (2016) one that influences it is the accuracy of the learning model used.

One learning model that can improve problem solving abilities in students' cognitive styles is the Brain Based Learning (BBL) model. This is suggested or recommended by Budiargo (2016) that teachers can optimize students' mathematical problem-solving abilities with one of the Brain Based Learning learning models. Brain Based Learnig learning model or learning based on brain ability is a learning model that is aligned with the workings of the brain that are scientifically designed for learning. Furthermore Silvana (2016) states that brain-based learning is a way of thinking about the learning process. Based on his results Sukoco (2016) Learning with a Brain Based Learnig approach is superior compared to conventional learning. In addition, Budiargo (2016) concluded that Brain Based Learning is effective against students' mathematical problem-solving abilities. From the explanations with the various research findings above, it can be concluded that Brain Based Learning is effective and can optimize the problem-solving ability of students' mathematical problems. According to Silvana (2016) The core of the Brain Based Learnig model is that students play an active role in building the knowledge they have, the teacher acts as a facilitator and mediator of learning. This is in line with Sukoco (2016) states that the role of teachers in learning with the BBL approach is as a facilitator as well as a motivator. As a facilitator the teacher gives input related to how to solve the problem). Furthermore, Mekarina (2017) states in her research findings that the application of a brain ability-based learning approach (BBL) can improve student achievement and motivation in learning mathematics.

addition to the learning model, assessment is also very important to be used to assess students through learning. Furthermore Apipah (2017) states that the assessment of students themselves also affects the quality of learning outcomes. Self-Assessment is an assessment by students carried out in assessing the work to himself. Furthermore, Astuti (2018) states that Self-Assessment can provide opportunities for students to assess themselves, provide awareness to students about their strengths and weaknesses so that interaction will arise between the teacher and students in learning. Furthermore Suarta (2015) said that self-assessment became a new vision in the evaluation of learning for the progress of students' studies. then according to Apipah (2017) Self-Assessment students need to be utilized and followed up. So it can be concluded that the Self-Assessment or assessment conducted to assess the work itself is one of the visions in the evaluation of learning for the progress of students' studies that can lead to interactions between teachers and students that need to be utilized in learning. The formulations of this research are: 1) whether BBL learning based on Self-Assessment is effective on problem solving skills. 2) How to describe the ability of problem solving based on cognitive style through BBL learning models based on Self-Assessment.

METHODS

This study uses a combination method (mixed method) with explanatory sequential design. The population in this study were students of XI class SMA 4 Buru in academic year 20192020.

In quantitative research is used to determine the effectiveness of Brain Based Learning based on Self-Assessment. The data used are the results of tests of mathematical problem-solving abilities. The sample in this study was class XI-IPS 1 as an experimental class, class XI-IPS 2 as a control. Quantitative data analysis techniques were tested using normality test, homogeneity, minimum completeness criteria test (KKM), classical completeness test, average difference test of the two classes using the Anova test.

Qualitative research was conducted to determine the description of mathematical problem-solving abilities based on students' cognitive styles in each category of independent field (FI), intermediate field (FDI), and dependent field (FD) cognitive styles. The data used were the results of students' cognitive style tests. The subjects in this study were 33 students of class XI-IPS 1 determined by three categories of independent field (FI) cognitive style, intermediate field (FDI), and dependent field (FD). Through the

experimental class 9 students took the independent field cognitive style (FI), intermediate field (FDI), and dependent field (FD) which had been selected based on the results of cognitive style test data. Each of the three cognitive styles was chosen by three students in the FI cognitive style category namely S1, S2, and S3, three students in the FDI cognitive style category namely S4, S5, and S6, and three students in the FD cognitive style category S7, S8 and S9. Qualitative data were obtained using four stages, namely data validity, data reduction, data presentation and conclusion drawing. Test the validity of the data on the credibility of the data using triangulation techniques in which data testing is done by checking the data at the same source but with different techniques namely tests of mathematical problem-solving skills and student interviews.

RESULTS AND DISCUSSION

The results of the analysis of the effectiveness of the learning model of the Brain Based Learning based on Self-Assessment on students' mathematical problem solving ability consists of the minimum completeness criteria test (KKM), classical completeness test (proportion test), and average difference test. The results of the Brain Based Learning assessment based on Self-Assessment on the ability to solve mathematical problems indicate that the results of the calculation of the minimum completeness criteria test (KKM) indicate that sig = 0.005 = 0.5% <5%. The value of sig <5%, with tcount = 2.98 and ttable = 1.69 to obtain tcount> ttable. then H0 is rejected and H1 is accepted, which means the average results of tests of students' mathematical problem solving abilities given the learning model of Brain Based Learning based on Self-Assessment reach KKM which is 68. Completeness test the proportion obtained z_count value is 0.09 for the significant level (α) = 5% obtained the value of ztable = z_0,475 is 1.96. Because the value of z_count is -1.96 <0.09 <1.96 then - z_ (0.5 (1-α)) <z_count≤z_ (0.5 (1-α)), it means that H_0 is accepted. Furthermore, the proportion of students who obtain a Brain Based Learning based on Self-Assessment has achieved mastery equal to 75 or over 75%. In addition, the average difference test on problem solving abilities in the Brain Based Learning class based on Self-Assessment obtained sig = 0.022 = 22%> 5%. The value of sig> 5%, with tcount = 2.35 and ttable = 1.69 to obtain tcount> ttable then H0 is rejected and H1 is accepted. Therefore, it can be concluded that the problem solving ability of students in the experimental class is better than in the control class students.

Furthermore, a qualitative study was conducted to determine the pattern of description of mathematical problem-solving abilities based on students' cognitive styles. Through the cognitive style test students used the Group Embededded Figure Test (GEFT) instrument. After testing, the data were analyzed, then three of each subject were selected in the category of independent field cognitive fields (FI), intermediate fields (FDI), and dependent fields (FD). Based on the test results (GEFT), obtained 4 students in the independent field cognitive style category (FI), 6 students in the intermediate field cognitive style category (FDI), and 23 students in the dependent field cognitive style category (FD) with a total of students in the experimental class is 33 students. Subject analysis of independent field cognitive style (FI) consists of S1, S2 and S3. The subject of intermediate field cognitive style (FDI) consists of S4, S5 and S6. Subject dependent field cognitive styles (FD) consisting of S7, S8 and S9 each subject of cognitive style was analyzed qualitatively.

Based on the results of cognitive style analysis, it was found that students with independent field cognitive style (FI) tend to have better problem solving abilities than students with intermediate field cognitive style (FDI) and students with intermediate field cognitive style (FDI) tend to have more problem solving abilities better than students with field dependent cognitive styles (FD). However, there were some students with independent field cognitive style (FI) tend to have the same problem-solving abilities as intermediate field cognitive style students (FDI) and field dependent cognitive style students (FD). While, students with intermediate field cognitive style (FDI) were located between the two independent field cognitive style (FI) and field dependent cognitive style students (FD). Nonetheless, some students with a dependent field cognitive style (FD) tended to have the same abilities as an intermediate field cognitive style (FDI) and an independent field cognitive style student (FI). S7 students were able to understand the problem but have not been able to plan a settlement plan, carry

out a settlement plan and check again. S5 students were able to plan a settlement plan, but had not been able to understand the problem, carried out a settlement plan and checked again. S3 students were able to understand the problem, plann a solution to the plan, but had not been able to carry out the plan of completion and check it well again. In BBL-based Self-Assessment learning, the results showed that the cognitive problem-solving abilities of students in the cognitive style category had different indicators of mastery in solving mathematical problems. This difference did not depend on the cognitive style category of students, yet because of student learning activities.

CONCLUSION

It could be concluded taht learning with BBL model based on Self-Assessment was effective on students' mathematical problem-solving abilities. The mathematical problem solving-ability of students in each cognitive style category had a different mastery of problem-solving indicators. The results showed that the students' mathematical problem solving abilities in the cognitive style category had different mastery of indicators in solving mathematical problems. This difference did not depend on the cognitive style category of students, yet because of student learning activities. Therefore, the implementation of learning must be able to run in accordance with an understanding that can be captured by students with the learning model applied.

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