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Problem-Solving Ability in terms of Adversity Quotient On SFE Learning Based on Firing Line

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Abstract

This study aims to determine the effectiveness of Student Facilitator and Explaining (SFE) learning based on Firing Line and mathematical problem-solving abilities in terms of Adversity Quotient (AQ). The method used is a mixed method with a sequential explanatory design. The study was conducted on class VIII of SMP Teuku Umar Semarang in the academic year 2018/2019 with class VIII 2 as the experimental class and class VIII 3 as the control class. Quantitative data collection with a problem-solving ability test and qualitative data collection is done by interview, observation, questionnaire, and documentation. The results of the problem-solving ability test were analyzed to determine the effectiveness of mathematics learning with the average completeness test, classical completeness test, proportional t-test, average t-test, and improvement test. Students are grouped according to the AQ category which consists of Quitters, Campers, and Climbers to then select three subjects from each category to be interviewed. The results of the study were obtained (1) effective SFE based on Firing Line learning; (2) mathematical problem-solving skills, Quitters students are able to understand problems and plan problem-solving. Campers students are able to understand problems, plan problem-solving and implement solutions. Student Climbers are able to understand problems, plan problem-solving, implement solutions, and re-examine the results of resolution.

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INTRODUCTION

Mathematics is a science that can be used by students to solve problems in everyday life (Dinni, 2018). One of the abilities that will be achieved in the learning process of mathematics is problem-solving ability. Sumarmo (Fauziah, 2015) stated that problem-solving ability is one of doing math (mathematical skills) that can be classified in high-level thinking skills. Mathematical problem-solving can help students improve students' analytical power and can help in applying that power to various situations (Budiargo & Sopyan, 2016). In the process of thinking to solve problems, students need attention and assistance from teachers both in the mathematical context and in real life contexts (Darojat & Kartono, 2016). Students need to be guided step by step during the problem-solving process. Because problem-solving is considered a particular learning outcome for life, that does not mean that a person only performs simple tasks in his daily life (Baltaci, Yildiz, & Guven, 2014; Lester, 1994).

A question can be said to be a problem-solving question if it has the following characteristics (1) Non-routine questions; (2) Long questions/story questions; (3) Based on real life, understanding concepts, and skills in answering questions; (4) About the context; (5) Focused on the development and strategies of students in answering questions (NCTM, 2000). Polya (1973) revealed that mathematical questions that measure aspects of problem-solving can be solved using steps namely (1) Understanding the problem (understanding the problem); (2) Devising a plan (strategy planning); (3) Carry out the plan (implementing the strategy); (4) Re-examine (looking back).

In accordance with the results of international research related to the performance of students in Indonesia in solving the description questions (problem-solving) is still not satisfactory (Junaedi, 2012). In general, this happens because students do not practice many problem-solving skills, especially on non-routine questions, so students are less skilled in making manipulations and influence their ability to make mathematical models (Haryati, Suyitno & Junaedi, 2016). Ratnaningsih (Anisa, 2014) and Fakhrudin (Nataliasari, 2014) suggest that the ability to solve problem-solving question for high school students or junior high school students is still low and unsatisfactory. This is in line with what was found by Novriani & Surya (2017), the average percentage of students in solving problem-solving question reached 54.48% and was categorized as still low.

Given the importance of problem-solving skills for students in learning mathematics, the teacher should be able to determine a strategy or appropriate learning model so that it can help students more easily develop students' mathematical problem-solving abilities. One learning model is Student Facilitator and Explaining based on Firing Line. According to Aqib in Khalashinikov (2018) argues that the Student Facilitator and Explaining is a guide learning model of teaching for teachers by asking students to present ideas or opinions to other participants. According to Silberman (2018: 212), the Firing Line strategy can help students be better prepared in learning and have the opportunity to respond to questions quickly that are asked to him and make students more active and eager to prepare themselves to be more serious, diligent and more responsible. The steps of Student Facilitator and Explaining learning based on Firing Line are as follows (1) The teacher conveys the learning objectives and motivates students by relating the material and knowledge students have; (2) The

teacher conveys information regarding the material to be studied; (3) Students form heterogeneous groups; (4) Students discuss by gathering information from various sources; (5) Students do firing line activities with steps, students arrange chairs in the form of two lines X and Y facing each other, each student X receives a card that the teacher shares containing a task or question that will be asked to be answered by each student Y the one sitting facing him, the student starts the first assignment in a not so long time, based on the teacher's command each student Y moves one chair next to his left in his team, each student X fires a second assignment or question to each student Y who sits in front of him, continue with the number of rounds according to the number of assignments that will be given and after completion the students return to the group to discuss again; (6) Students make a concept chart or map; (7) The teacher provides opportunities for students to explain to another students through discussions with their groups; (8) Each group demonstrates the results of the discussion in front of the class; (9) Teachers and students together make conclusions.

The success of students in learning depends on how students overcome the difficulties that exist. Intelligence in facing difficulty is called Adversity Quotient. According to Stoltz in Hidayat (2018), Adversity Quotient is the ability that a person has in observing difficulties and processing these difficulties with possessed intelligence so that it becomes a challenge to solve. Stoltz divides 3 types of AQ, namely types of Quitters tend to reject the existence of challenges and problems that exist; Campers have limited ability to change, especially big changes. They accept changes and even propose some good ideas but only as long as they are in their safe zone; Climbers are individuals who can be relied upon to make changes because the challenges offered make individuals develop because they dare to take risks, overcome fear.

The formulation of the problem in this study are as follows: (1) How is the effectiveness of Student Facilitator and Explaining learning based on Firing Line on students' mathematical problem-solving abilities?; (2) How is the problem-solving ability of students in Student Facilitator and Explaining learning based on Firing Line viewed from Adversity Quotient?.

METHODS

This study was a mixed methods research with sequential explanatory designs. The sequential explanatory model is a combination research model that combines quantitative and qualitative research methods sequentially, wherein the first stage the research is carried out using quantitative methods and in the second stage is carried out by qualitative methods. Quantitative methods play a role in obtaining measurable quantitative data and can be descriptive, comparative, and associative, while qualitative methods have a role to prove, deepen, expand, weaken, and abort quantitative data that has been obtained at an early stage (Sugiyono, 2016: 415).

The population in this study was the eighth-grade students of SMP Teuku Umar Semarang academic year 2018/2019. In quantitative data, the sample used is 2 classes with one class as the experimental class and one class as the control class. The research sample was selected by random sampling technique. For qualitative data, selected data sources are used from class VIII.2. Determinants of research subjects based on random sampling techniques, consideration of this sampling based on Adversity Quotient (AQ) students in mathematics learning. Quantitative data

collection techniques are carried out by problem-solving ability tests. The problem-solving ability test is done twice, namely pretest and posttest. Qualitative data collection techniques are carried out by observation, documentation, interviews and AQ questionnaires.

RESULTS AND DISCUSSION

Learning Effectiveness

Quantitative research was conducted to analyze the effectiveness of learning with Student Facilitator and Explaining learning models based on Firing Line. Research preparation is carried out through a series of learning device validations. Based on the assessment of the learning device by the validator, the average value was obtained in the good category. Before the research was carried out, an initial test of the problem-solving ability of class VIII students was carried out to determine the students' completeness criteria and sampling based on random sampling techniques. The initial ability test is done by giving 2 items about problem-solving skills and combined with the questions given by the teacher for daily tests on Trigonometry material. Based on the preliminary test data the problem-solving ability in all classes VIII in the population is obtained (1) the average results of students' problem-solving abilities ($\bar{x}$) is 59 with a standard deviation (s) 10.05. Thus the criteria for completion in this study are $\bar{x} + \frac{1}{4} s = 62$; (2) the values of Sig. normality and homogeneity are 0.110> 0.05 and 0.934> 0.05 respectively, so that the initial data can be concluded to be normally distributed and homogeneous, so randomly selected sample classes are the experimental class (class VIII.2) and the control class (class VIII.3) After the initial similarity test for the ability of the two classes was obtained, the Sig. 0.385> 0.05 value was obtained, indicating that the average initial ability in students' problem-solving abilities in the two classes did not differ significantly. and after being given treatment in the study in both classes, pretest and posttest were carried out, the results of which would be used in the hypothesis test. The pretest was done assuming that all Student has studied the material of two-dimentional figure in the fifth grade of elementary school.

After carrying out the research and analyzing the results data of the study obtained informations that (1) based on the results of calculations with the One-sample Test, obtained = t_{hitung}=7.731> t_{tabel}= 1.69 then H_0 rejected means that the average problem-solving ability in the experimental class is 73.57 this values exceeds the complete limit criteria, namely 62; (2) based on the calculation results with a test of the proportion of one party, obtained z_{hitung}= 1.948> z_{tabel}= 1.64 then H_0 is rejected. That is, more than 75% of the final test results of mathematical problem-solving abilities of experimental class students were declared complete and achieved classical completeness; (3) Based on the results of calculations with the Independent Samples Test, it is obtained t_{hitung}= 2.534> t_{tabel}= 1.67, then H_0 is rejected. That is, the mathematical problem-solving ability of the experimental class students is better than the mathematical problem-solving ability of the control class students; (4) Based on the results of calculations with proportional t-tests, obtained t_{hitung}= 2.194> t_{tabel}= 1.69 then H_0 is rejected. That is, the proportion of students' mathematical problem-solving ability in the experimental class is better than the mathematical problem-solving ability of the control class students; (5) Based on the results of calculations with an increased test, obtained t_{hitung}= 2.012> t_{tabel}= 1.69 then H_0 is rejected. That is, increasing the problem-solving abilities of students before

or after being taught in the experimental class is more than an increase in students' problem-solving skills before or after being taught in the control class. So it can be concluded that the Student Facilitator and Explaining learning based on Firing Line is effective

The effectiveness of learning is an indicator of the achievement of successful learning. In addition to several factors above, the success of learning is also determined by the creativity of the teacher in developing learning. The Student Facilitator and Explaining learning process based on Firing Line makes students play an active role and can train students' mathematical problem-solving skills. Students are given the task to understand, plan, solve problems that exist in the LKPD and the task of solving problem-solving questions on the challenge card. Students are asked to present the results of the discussion and other students are asked to be able to respond and re-examine the answers. This is supported by Gagne's learning theory and constructivism, namely, the learning process capable of involving students to build their own knowledge by discussing discovering concepts, investigating objects directly, and solving problems. The process of student interaction between groups in the discussion, presentation, and enthusiasm of students in each syntax of firing line activities carried out every learning activity is able to train students to be actively involved in the learning process according to Vygotsky's learning theory and means learning theory David Ausubel.

Students' Problem Solving Abilities are reviewed from Adversity Quotient

Qualitative research was conducted to determine the decryption of students' mathematical problem-solving abilities based on AQ. The following is a bar chart that states the average score obtained by each group of students based on AQ.

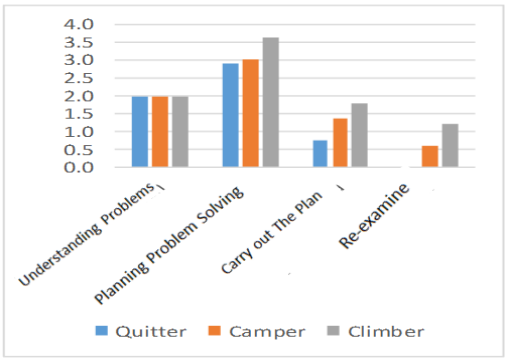

Figure 1. Average Earnings Score for each AQ Category

Based on the analysis of the Quitters subject in the stage of understanding the problem, it can be seen writing down what information is known, writing down the things that were asked on the question and not writing down a picture/sketch of the problem. From the answer sheet and the results of the students interview obtained information that on the known and asked part, the students write the same thing about what was in the question. At the stage of planning the problem-solving, the Quitters subject is able to prepare a problem-solving plan based on known information and knowledge that has been possessed and is able to estimate the strategies/formulas correctly that will be used in problem-solving. At the stage of implementing the problem-solving plan, the students are less able to solve problems based on a predetermined plan/strategy and obtain a problem that is not complete and appropriate. The stage of re-examining, students has not been able to check the truth at each step taken in problem-solving and has not been able to arrange the problem solving with different steps. This is consistent with the results of several studies that have been conducted, Yani (2015) which revealed that Quitter students had difficulty in solving

problems. Sunandar (2018) found that AQ type Quitter students in understanding students' problems still mentioned things that were known and questioned but were not sufficiently complete, could not plan to solve problems and were unable to reexamine their answers. Pratiwi (2016) found that Quitter students were able to input data and write formulas that were appropriate to the problem, unable to carry out the plan.

Students with the Campers category in problem-solving are able to understand problems, plan problem-solving and implement solutions. At the stage of understanding the problem, students are able to write down what is known and asked. At the stage of planning the solution, students are able to write strategies and formulas that will be used and are able to carry out solutions in a coherent and correct manner, but less accurate in calculating so that some of the results are incorrect. At the re-examination stage, Campers type students are less able to conclude the outcome of the settlement and are unable to arrange problem-solving with different steps. This is in accordance with Hidayat (2018) suggesting that students in the AQ Campers category in solving problems, students are able to carry out the three stages of Polya namely understanding problems, planning solutions, and implementing plans.

The Climbers subject was very good at compiling known things, writing down the things that were asked and explaining the scales of the problem. The Climbers subject wrote short, clear and precise sentences. Subject Climbers is able to develop a problem-solving plan by writing the formula used in detail, complete and precise and able to simplify the problem with its own sentence. In carrying out the completion plan, the Climbers subject is also able to solve the problem with a predetermined strategy, make decisions and take action by determining and communicating conclusions appropriately. The Climbers subject was able to check back the answers obtained and just not been able to mention the different steps in some questions. Based on the description shows that Climbers subjects always try hard in solving problems faced and try until the goals or targets are met. This is in accordance with Stolz's Theory (2000) that Climbers type individuals are individuals who always strive to achieve success, are ready to face problems, and always eager to achieve their goals. This is in accordance with the research conducted (Darojat, 2016) which states that Climbers students can state the steps to solving problems well. All indicators of NCTM problem solving can be achieved by Climbers students.

CONCLUSION

Based on the results of the study, the following conclusions were obtained (1) The Student Facilitator and Explaining Learning based on Firing Line is effective; (2) Based on the analysis of problem-solving capabilities based on AQ the following results are obtained. Students with the Quitters category in problem-solving are able to understand problems and plan problem-solving. Students with the Campers category in problem-solving are able to understand problems, plan problem-solving and implement solutions. Students with Climbers are able to understand problems, plan problem-solving, carry out solutions, and re-examine the settlement results

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