

Mathematical Literacy in Discovery Learning with Scaffolding Strategy Reviewed from Self Efficacy

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Abstract

The purpose of this study was to determine the quality of learning with Discovery Learning scaffolding strategies to students' mathematical literacy. This research uses mix method research with embedded concurrent design of the method of research that combines the use of quantitative and qualitative research methods simultaneously or together but different weighting methods. The instrument used in this study in the form of instrument tests and interviews. Data analysis included data reduction, data presentation, draw conclusions and validity of the data. Mathematical literacy as measur in this study is limited to the domain that is communication, mathematising, representation, reasoning and argument, devising strategies for solving the problem of as, using symbolic, mathematics tools. Indicators to measure self efficacy, namely magnitude, strength, generality. The results showed that: (1) Discovery Learning scaffolding strategy of good quality at the planning, implementation and evaluation of learning, (2) Students at a low self efficacy group can not achieve good indicator of mathematical literacy, namely communication, mathematising, representation, devising strategies for solving problems and using mathematics tools, reasoning and argument, and using symbolic, formal and technical language (3) Students who have medium self efficacy was can achieve good indicator of communication, mathematising, representation, devising strategies for solving problems and using mathematics tools, and reasoning and argument. But still there is a mistake in using symbolic, formal and technical language.(4) Students who have high self efficacy can achieve good indicator of communication, mathematising, representation, devising strategies for solving problems and using mathematics tools, and reasoning and argument.

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INTRODUCTION

Indonesia must be prepared to face the challenges of globalization such as the WTO, the ASEAN Community, APEC, CAFTA. Hence, to deal with rapidly evolving globalization will require high quality human resources. Ramadhani, Mariani & Waluya (2015: 67) states that the development of an increasingly modern era, especially in the era of globalization has required human resources of high quality. While Sumarni, Sugiarto & Sunarmi (2016:110) states that in the era of globalization, human beings need to develop the knowledge, skills and creativity in acquiring, selecting and managing information. The quality of human resources is one of the factors that determine the progress of a nation, while the quality of human resources depends on the quality of education is summed up by Manah, Isnarto, & Wijayanti (2017: 20).

One effort to improve the quality of education in Indonesia is to improve the quality of mathematics education. Mathematics is a science that can develop capabilities based on 21st century skills Setyaningrum, Chotim & Mashuri (2012: 132) that mathematics is one of the subjects that are considered difficult by students. Therefore, it takes a strong self efficacy on students so that they can succeed in the learning process of mathematics. Self efficacy is the belief or the individual's belief about his ability to organize, perform a task, achieve a goal, generating something and implement action to display a particular skill (Aziz, Rochmad, Wijayanti, 2015:231).self efficacy very mportant to improve mathematics achievement. This is consistent with research conducted Chen, Lee, & Hsu (2015: 4) which gives the results of research that students with high mathematics self efficacy to show a more positive outlook towards learning mathematics. Someone who has high self efficacy can reduce the fear of failure and

improve the cognitive abilities of a person, so that the higher a person's perceived self efficacy, the greater the effort expended in the face of challenges. Conversely, the more people doubt his ability, then reduce the effort or give up altogether.

This is similar to the research Sefiany, Masrukan, & Zaenuri (2016: 228), which gives the conclusion that self efficacy positively affects the ability of mathematical communication. The study was conducted by matching Soleymani & Rekabdar (2016: 17) which concludes a positive relationship between self efficacy in mathematics and mathematics achievement. Nicolaidou & Philippou (2004: 59) states that the effect of self efficacy on performance in mathematics as strong as the effect of general mental ability.

Noting the PISA survey results from year to year and the results of research conducted by Stacey (2011: 109), is fitting that Indonesia should improve mathematical literacy for students. Indonesian students are not only required to mengerj math problems, but also expected to solve problems related to mathematics in accordance with the opinion of Ward and Rumiati (2011: 51) which states that literacy mathematics helps a person to understand the role or usefulness of mathematics in everyday life as well using her to make the right decisions as citizens who build, care, and thinking. Balim (2009: 2), according to the learning model constructivism approach that makes students more effectively by building their own knowledge will need to be used.

One of the models used will be is Discovery Learning. According to Bruner, as cited by Effendi (2012: 4), learn with Discovery Learning models can help students to work on finding a solution and produce knowledge that is really meaningful for students. Prasad (2011: 33) states Discovery

Learning will provide students the opportunity to be actively involved in the learning process. Based on the above, the researchers carry out research using scaffolding Discovery Learning strategies in SMA Negeri 15 Semarang. The purpose of this study was to determine the quality of learning with Discovery Learning with scaffolding strategies to students' mathematical literacy.

METHODS

This type of research is mixed method (a mix of quantitative and qualitative). Mixed method research design used is concurrent embedded the method of research that combines the use of quantitative and qualitative research methods simultaneously or together but different weighting methods. Mathematical literacy data collection on Discovery Learning scaffolding strategies using quantitative and qualitative methods in tandem. The study was conducted in SMA Negeri 15 Semarang with three variable linear equation materials.

The population of this research is the class X SMA 15 academic year 2018/2019. Of the 10 Class X in SMAN 15 randomly selected two classes as samples in accordance with the study design. Sampling technique of quantitative research by cluster random sampling. The technique derived from class X IPA 7 as an experimental class and class X IPA 6 as the control class. In qualitative research, research focused on the subject of class X IPA 7 are classes that are subject to Discovery Learning instructional scaffolding strategy. The researchers gave questionnaires to the students' self efficacy for grouping students based on self efficacy. Self efficacy questionnaire of 50 statements. Each statement given the choice of score 1-4 so that the amount of a maximum score of $50 \times 4 = 200$ and the lowest score of $50 \times 1 = 50$.

After the questionnaire is given, students are categorized into three criteria: low student self efficacy, self efficacy siswa middle and high students' self efficacy. Each of these categories have two representatives that are analyzed in depth mathematical literacy. In this study, research subjects taken by various levels of self efficacy, which consists of two students with high self efficacy, self efficacy of 2 students with moderate, and 2 students with low self efficacy.

The next stage of learning provides students with Discovery Learning with scaffolding strategy, where learning is done over and over again to familiarize students with the mathematical literacy problems later students were given a test of mathematical literacy. After being given the mathematical literacy tests, researchers conducted interviews to representatives of student self efficacy categories of high, medium and low pre-selected. The results of the interview used as additives to analyze data and mathematical literacy of students based on self efficacy.

Sources of data in this study were obtained from questionnaires student self efficacy, mathematics literacy tests, and interviews. A total of

36 students of class X IPA 7 are determined self efficacy is based on self efficacy questionnaire score before the learning. Students in math literacy test were analyzed and the research subjects were interviewed as triangulation. Quantitative data was tested using normality test, homogeneity, completeness test, and test the average difference. While the qualitative data analysis is done by reducing the data, presenting data, and draw conclusions from the data collected and verified conclusions.

The quality of learning that is intended in this study include the quality of the planning, implementation, and evaluation stages of learning. In the planning stage of

learning that includes learning device and instrument validation study consisting of syllabus, lesson plans, worksheets, math literacy problems, learning keterlaksanaan sheet, and guidelines for the interview. Quality learning planning stage if it has validated the device in a valid category. The implementation stage is measured by indicators keterlaksanaan learning lessons. Phase implementation of quality learning if learning keterlaksanaan both categories.

The evaluation phase of the indicators measured test results of mathematical literacy. Quality evaluation phase if the average literacy math students on Discovery Learning with greater scaffolding strategy of KKM amounted to 73. The proportion of students on Discovery Learning completeness scaffolding strategies that meet the KKM reach higher than 75% of all students. The average literacy math on Discovery Learning with scaffolding strategy better than average on Discovery Learning mathematics literacy and mathematical literacy completeness proportion to the Discovery Learning with scaffolding strategy is higher than the proportion of mathematical literacy mastery on Discovery Learning. The quality of learning is said to be good if the three domains are met minimal in both categories, namely planning and preparation, classroom management and organization.

RESULTS AND DISCUSSION

Quality of Learning

Evaluation phase measured by indicators of mathematical literacy test results and the results of self efficacy questionnaire. Mastery Test is used will be left party t test. The t-test was used to determine whether the average value of the mathematical literacy of students at Discovery Learning with scaffolding strategy is better than a minimum value completeness criteria (KKM) of 73. Based on the obtained

test One Sample Test Sig value. 0.000 < 0.05, H_0 rejected. so H_1 received it can be concluded the average literacy mathematics student at Discovery Learning with scaffolding larger strategy of KKM is 73.

To test whether the student's mastery of mathematical literacy is 75%, then after the average value calculated mathematical literacy test is then performed proportions. This test is performed to determine whether the proportion of students at Discovery Learning completeness scaffolding strategies that meet the KKM is 73 to less than or equal to 75%. From The calculation $Z_{hitung} = 1.7717$, for a significance level $\alpha = 5\%$ is obtained $Z_{tabel} =$ Measuring the quality of learning at the planning done by testing the validity of learning and $Z(0,5; \alpha) = Z(0, 45) = 1.64$ Because $Z_{hitung} = 1.7717 >$ research instruments covering the syllabus, lesson plans, worksheets, math literacy problems, learning keterlaksanaan sheet and mathematical literacy interview guidelines. Based on the analysis of learning tools and instruments will study suggested that the syllabus, lesson plans, worksheets, math literacy problems, learning keterlaksanaan sheet and interview guides in mathematical literacy valid category. The implementation stage is measured by indicators keterlaksanaan learning lessons. Learning implementation assessment carried out during the learning process that takes place in four meetings. Based on the observation that it can be stated to be that the enforceability of the study included both categories. $Z_{tabel} = 1.64$ then H_0 rejected. Thus, the proportion of students at Discovery Learning completeness scaffolding strategies that meet the KKM is 73 more than 75%.

To test the average difference if the average literacy of mathematics at Discovery Learning with scaffolding strategy better than average literacy math on Discovery Learning use test *Independent sample t-test*, Acceptance

H_0 by looking at the output equal variance assumed and equal variance not assumed the real level of 0.05. From the calculations, the same variance, then the selected Equal variances assumed.

Obtained value ($t_{hitung} = 2.838$). Because the value ($t_{hitung} = 2.838$) > ($t_{tabel} = 1.67412$), so H_0 rejected. Thus, the average literacy of mathematics at Discovery Learning with scaffolding strategy in terms of self efficacy is better than average literacy math on Discovery Learning.

Next to determine whether the proportion of the number of students who achieve mastery on Discovery Learning with scaffolding strategy is better than the proportion of the number of students who achieve mastery on Discovery Learning to use using z statistic. Calculations derived from $Z_{hitung} = 2.177773$, for a significance level $\alpha = 5\%$ is obtained $Z_{tabel} = Z(0,5 - \alpha) = Z(0,45) = 1.64$,

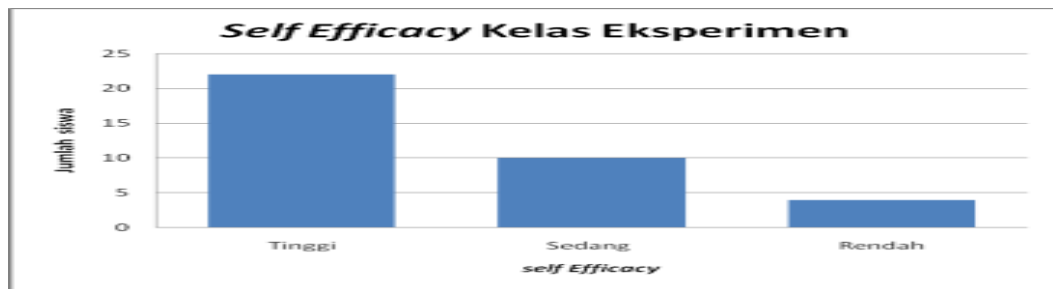
therefore $Z_{hitung} = 2.177773 > Z_{tabel} = 1.64$ then H_0 rejected. Thus, the proportion of mathematical literacy mastery on Discovery Learning with scaffolding strategy is higher than the proportion of mathematical literacy mastery on Discovery Learning.

Data self Efficacy

self efficacy obtained from a questionnaire of 50 statements. Each statement given the choice of score 1-4 so that the amount of a maximum score of $50 \times 4 = 200$ and the lowest score of $50 \times 1 = 50$.

Data Self efficacy of students is a form of self efficacy score of the questionnaire that has been given. Based on this data, researchers were able to classify the self efficacy of students into 3 levels of self efficacy is high, medium and low.

In this study, self efficacy assessment carried out in the experimental class. Assessment of self efficacy can be seen in the figure below.



Picture 1. Images of self efficacy Students

From the results of self efficacy questionnaire on acquired experimental class 4 students have low self efficacy, self efficacy 10 students have moderate and 22 students have high self efficacy. Furthermore, the results of self efficacy questionnaire examined in more depth about the mathematical literacy through interviews and final test results of mathematical literacy. Subjects were chosen as follows: (a) Subject to the category of self efficacy low, as the subjects of the experiment E-04, (b) Subject to the category of self efficacy was named as subjects of the experiment E-12 (c) Subject to the category of self efficacy as high as as subjects of the experiment is E-20.

Mathematical literacy Self Efficacy High, Medium, and Low

1) self Efficacy Low

Students in the group of low self efficacy is less well able to communicate with what is known, and is not able to change the problems of the real world into the form of mathematical or otherwise. Students with low self efficacy is not able to represent the problem, can not be restated (representation) of a problem or a mathematical object, and have not been able to think logically to analyze the information to make conclusions. Students with self efficacy poor are less able to use strategies to solve the problem well, yet be able to use the proper symbol to make

representations, and not be able to use mathematical tools, such as taking measurements, operations and so on, have difficulty in using mathematical tools ,

2) self Efficacy Medium

Students which have self efficacy medium is being able to communicate properly what is known, was able to change the problems of the real world into the form of mathematical or otherwise, to represent a problem, and there are mistakes in using the formula so that the results are unclear and difficult to understand. Students with self efficacy is being able to think logically to analyze the information to make conclusions, and is able to provide conclusions from the conclusions given the answer but sometimes less clearly understood. Students who have self efficacy is being able to use strategies to solve the problem well, being able to choose appropriate strategies to solve problems, being able to use the proper symbol to make representations, and able to use mathematical tools,

3) self Efficacy High

Students who have high self efficacy are able to communicate very well what they are known, can identify problems, formulate mathematical situations, and able to change the problems of the real world into mathematical form or sebaliknya. Siswa with high self efficacy were able to change (transform) the problems of the real

world into mathematical form, can be restated (representation) of a problem or a mathematical objects, and able to think logically to analyze the information to make conclusions. Students who have high self efficacy are able to use strategies to solve the problem well, and is able to use the proper symbol to make representations, capable of using mathematical tools.

CONCLUSION

Based on the research results can be summarized as follows: (1) Learning Discovery Learning Strategies Scaffolding good quality in planning, implementation and evaluation of learning, (2) Students in groups of low self efficacy can not achieve good indicator of mathematical literacy, namely communication, mathematising, representation, devising strategies for solving problems and using mathematics tools, reasoning and argument, and using symbolic, formal and technical language (3) Students who have self efficacy was can achieve good indicator of communication, mathematising, representation, devising strategies for solving problems and using mathematics tools, and reasoning and argument. But still there is a mistake in using symbolic, formal and technical language.(4) Students who have high self efficacy can achieve good indicator of communication, mathematising, representation, devising strategies for solving problems and using mathematics tools, and reasoning and argument.

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