UJMER 10 (1) 2021 9 – 14

Unnes Journal of Mathematics Education Research

http://journal.unnes.ac.id/sju/index.php/ujmer

Students' Mathematical Literacy Based on Self-Esteem By Brain Based Learning With Trigo-Fun E-Module

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Article Info

Article History:
Received 15 October 2019
Accepted 31 January 2020
Published 15 June 2021

Keywords:
Mathematical Literacy;
Self-Esteem,
Brain Based Learning,
E-moduleTrigo-fun.

Abstract

This study aims to describe the ability of mathematical literacy based on the mathematical self-esteem of class X students. This type of research is a mixed method. The design of this study is sequential explanatory. The population in this study was class X SMA Negeri 1 Slawi consisting of ten classes. The sampling technique using purposive sampling and selected class X.10 as an experimental class. Determination of the subject grouped by self-esteem with high, medium, and low categories to be interviewed about students' mathematical literacy abilities. The results showed that learning the description of mathematical literacy ability in terms of students' self-esteem varied. This is shown from 4 students with high self-esteem obtained by mathematics literacy results in the form of 2 students in the high category and 1 student in the medium category. From 27 students with moderate self-esteem, mathematics literacy results were obtained in the form of 7 students in the high category, 14 students in the moderate category, and 6 students in the low category. From 4 students with low self-esteem mathematical literacy results in the form of 1 student in the high category and 3 students in the low category.

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p-ISSN 2252-6455
e-ISSN 2502-4507

INTRODUCTION

Mathematical learning has a strategic role in improving thinking skills. Muijs and Reynolds (2008) revealed mathematics is the main vehicle for developing logical thinking skills and higher cognitive skills in children. Mathematics plays an important role in human life in various fields of knowledge, as is the purpose of mathematics expressed by the National Council of Teachers of Mathematics (NCTM, 2000), one of which is mathematics for life. Junaedi & Asikin (2012) explained that mathematics learning needs to be designed in such a way as to be able to encourage students to have mathematical skills, such as comprehension, communication, connection, reasoning and mathematical problem solving abilities.

Wardhani & Rumiati (2011) stated that Indonesia joined the Program for International Student Assessment (PISA) in 2000, 2003, 2006, 2009, 2012 and 2015 with results that did not show much change in each of its participation. According to the 2009 PISA results, mathematics literacy of Indonesian students ranked 61 out of 65 participants. Whereas in 2012, Indonesia ranked 64 out of 65 countries (OECD, 2013). Then in 2015, Indonesia ranked 63 out of 72 countries (OECD, 2016). This is because students often find it difficult to associate mathematics learned in school with various situations in daily life. Therefore, mathematics literacy ability must be improved as explained by Johar (2012) that PISA orientation reflects changes in curriculum goals and objectives that pay more attention to what students can do than what they learn in school so students are expected to have the ability to literacy.

Important mathematical literacy skills are used in everyday life. This is in accordance with the opinion of Venkatakrishnan & Graven (2006) that mathematical literacy provides students with an understanding of the role of mathematics which is very useful in the modern world. According to Suyitno et al (2017), mathematics literacy is an activity of applying mathematics in real life. Whereas according to the OECD (2016) mathematical literacy is defined as the capacity to recognize and understand the role of mathematics in the world, solve mathematical problems in various contexts, interpret mathematical statements, and apply mathematics rationally.

Based on the results of interviews with a number of students in SMA Negeri 1 Slawi, students revealed that they had experienced a break in concentration when solving math problems because of a feeling of being left behind with their friends supported by intense competition in the Tegal Regency referral high school. It is recognized by other students, that students often judge themselves unable to understand mathematics like their other peers. This feeling of self-respect is called self-esteem (Kernis, 2003). Lutan in Fauzan (2016) concludes that self-esteem is self-acceptance, by oneself which is related to us worthy, valuable, capable and useful. The feeling of "I can" and "I am valuable" is the essence of the understanding of self-esteem. The effect of self-esteem on students' abilities needs to be analyzed in more depth whether it has a positive effect or not on the process and learning outcomes.

To overcome obstacles in learning mathematics, teachers must have effective teaching methods in Teaching and Learning Activities as revealed by Shah & Abdul (2008) that teachers must be able to choose specific methods and strategies to facilitate student understanding. Effective teachers never stop exploring various ways to improve student achievement. This is in accordance with the opinion of Mulyono & Dewi (2016) the learning process takes place naturally in the form of student activities and experiences, not just the transfer of knowledge from teacher to student, learning strategies are more important than results. The latest innovations allow for an unprecedented view of how the brain works. Caine in Pool (1997) emphasizes the importance of building a culture and environment in which students feel safe and not afraid. One of the innovative learning is Brain Based Learning hereinafter referred to as BBL. Jensen (2008) describes the steps of learning BBL as follows: (1) Pre-exposure, (2) Preparation, (3) Initiation and acquisition, (4) Elaboration, (5) Incubation and inserting memory, (6) Verification and belief checking, and (7) Celebration and integration.

Another learning innovation is the application of learning media by utilizing technology. Technology-based learning media can help the process of learning mathematics in accordance with the statement of Helmut (2010) that the development

of visual technology for independent learning in mathematics and research shows a beneficial impact on sustainable development in mathematics education. Adding technology-based learning media can improve students in improving mathematics learning. Digital media used in class make it easier for students to solve problems (Edson, 2017). One of the media that can help learning is the Trigo-Fun E-module.

Trigo-Fun E-Module is an audio visual digital material and is created using unity 3D software. In addition to presenting information in the form of text, this e-module can also display images, sound and video on PC and smartphones based on Android and iOS. Because it has these advantages, it is expected that the use of this media can support students' mathematical literacy. Software applications to help students learn in the form of E-modules and these applications can be made by the teacher as creatively as possible. With the help of instructional media, BBL can be more optimal in supporting students' mathematical literacy abilities.

BBL assisted by the Trigo-Fun E-module is expected to be more effective because learning is equipped with the help of modern and creative learning tools. This is supported by the opinion of Oviatt (2013) that familiarity with technology is very important for better concentration by utilizing existing skills. The application of BBL learning assisted by the Trigo-Fun e-module is expected to result in students optimizing learning in the classroom.

The formulation of the problem in this study is how students' mathematical literacy abilities were viewed from students' self-esteem. The objectives to be achieved are to analyze students' mathematical literacy abilities in terms of students' mathematical self-esteem. The quality of learning in this study was measured using three stages, namely planning the learning process, implementing the learning process, and evaluating learning outcomes.

METHODS

This research is a mixed method type. Data collection is carried out with a sequential explanatory strategy. This strategy is applied by the collection and analysis of quantitative data in the first stage followed by the collection and analysis of qualitative data in the second phase which is built on the basis of quantitative preliminary results (Creswell, 2009).

The study was conducted in Senior High School 1 Slawi with the population of the study was class X students in the 2018/2019 school year. The research subjects were 34 students for classes with Trigo-fun e-module Brain Based Learning and 30 students for classes with Problem Based Learning.

Data sources in this study were students obtained from the results of the mathematics literacy ability test (TKLM), the results of the self-esteem questionnaire, the results of the interview sheet of mathematics literacy ability, the observation sheet of the teacher's activities during the learning process. The TKLM results as a source of quantitative research data, while the data source for qualitative research is the student TKLM answer sheet, the results of the self-esteem questionnaire, and the results of the mathematics literacy ability interview. Quantitative data were tested using normality test, homogeneity test, proportion completeness test, average completeness test, proportion comparison test, average comparison test, and influence test. While qualitative data analysis is performed by validating data, making verbal data transcripts, data reduction, data presentation, and data verification.

RESULTS AND DISCUSSION

At the stage quality of planning on the learning process, the results obtained are all very good (above 4.20). Table 1 below is a breakdown of learning device validation scores

Table 1. Results of Validation of Learning Devices and Research Instruments

Learning Devices / Research Instruments	Average	Category
Syllabus	4.44	Very Good
Learning implementation plan	4.40	Very Good
Trigo-fun E-module	4.50	Very Good
Student Mathematics Self-esteem Questionnaire	4.60	Very Good
Question	4.47	Very Good
Interview Guidelines	4.47	Very Good
Observation Sheet Learning	4.50	Very Good
Student Response Questionnaire	4.60	Very Good

From these results, it can be said that the research tools and instruments in the category are very good and feasible to be used in research.

Measurement of the quality of this stage is seen through the observation sheet of the implementation of learning and student questionnaire responses are minimal in either category. Observation of the implementation is carried out to measure the suitability of learning done in class with the lesson plans that have been prepared. While the student response questionnaire was given to find out the response and student response to learning conducted in class. This assessment is carried out during the learning process that takes place in three meetings. Results Observation of the implementation of learning is explained in Table 2 as follows.

Tabel 2. Observation Results of Learning Implementation

Experiments			Control		
Average	percentagee	criteria	Average	percentagee	criteria
4,39	87,8%	Very good	4,26	85.21	Very good
4,30	86.08%	Very good	4,30	86.08	Very good
4,08	81,74%	Very good	4,35	86.96	Very good
4,26	85,21%	Very good	4,30	86.09	Very good

Based on the results of data analysis conducted in the assessment of student response questionnaires, the average score obtained is 2.95 or 73.49%, so it can be said that students assess the learning that is carried out is good.

At the stage of evaluating learning outcomes, the quality of learning is measured quantitatively by providing TKLM and a mathematics self-esteem questionnaire. Provision of TKLM was carried out on both samples. At the stage of assessment of learning outcomes, it was found that TKLM results were normally distributed and homogeneous. Based on the calculation results, the zhitung value is 1.7823. For the significant level $\alpha = 5\%$, the z value (0.45) is 1.64. Because $1.7823 \geq 1.64$, zcount itung z (0.5-α), meaning H0 is rejected. So, the proportion of class students who get learning material using Brain Based Learning assisted by Trigofun e-module has reached more than 75% completeness. Based on the results of calculations, the value of t is 3.307. For α 5% and dk 33, the value of t (0.95) 33 is 1.694. Because 3,307> 1,694, then tcount> t (1-α), dk, meaning H0 is rejected and H1 is accepted. So, μ> 67. So, the average mathematical literacy ability of students from the class who obtained learning material using Brain Based Learning assisted by the Trigofun e-module was more than 67.

Based on the analysis results, the zhitung value is 5.00462. For a significant level (α) of 5%, the value of z (0.5-α) is 1.64. Because 5.00462≥ 1.64, then zcalculate ≥ z (0.5-α), meaning that H0 is rejected or H1 is accepted. So, the proportion of completeness of students who get learning material using Brain Based Learning assisted by Trigofun e-module is more than the proportion of completeness of students who get learning material using the Problem Based Learning learning model. For other hypotheses test shows the value of t is 3.7067. For α 5% and dk 62, the value of t (0.95) 64 is 1.669. Because 3.7067> 1.669, then t> t (1-α), dk, meaning H0 is rejected and H1 is accepted. So, the average mathematical literacy ability of class students who get learning material using Brain Based Learning assisted by Trigofun e-modules is more than classes that obtain learning material using the Problem Based Learning learning model.

Based on the regression calculation, the results show that self-esteem has a positive influence on students' mathematical literacy ability, although not dominant, self-esteem affects students' mathematical literacy ability by 19.7%, and there are still 80.3% of students' mathematical literacy abilities influenced by factors other.

Based on the results of the analysis on the mathematics self-esteem questionnaire obtained data on the grouping of students presented in Table 3 as follows.

Tabel 3. Pengelompokkan Siswa Berdasarkan *Self-esteem* Matematika

Category	The Number of Students	Percentage
High Self-esteem	3	8.82 %
Medium Self-esteem	27	79.4 %
Low Self-esteem	4	11.76 %
Total	33	100 %

The results showed that the learning of Brain Based Learning assisted by a good quality Trigo-fun e-module and the description of mathematical

literacy ability in terms of students' self-esteem varied, this was shown from 4 students with high self-esteem obtained by mathematics literacy results in the form of 2 categories students high and 1 student in the medium category. From 27 students with moderate self-esteem, mathematics literacy results were obtained in the form of 7 students in the high category, 14 students in the moderate category, and 6 students in the low category. From 4 students with low self-esteem mathematical literacy results in the form of 1 student in the high category and 3 students in the low category.

The description above shows that there are differences in mastery of mathematical literacy skills between students in the category of high mathematics self-esteem and students in the category of moderate or low mathematics self-esteem. Students who have high mathematical self-esteem tend to have higher mathematical literacy abilities than students with lower mathematical self-esteem. This is consistent with the opinion of Brockner & Guare (1983) about low self-esteem which makes it difficult for students to complete their own assignments. This finding also confirms that self-esteem is a very important concern in learning as expressed by Young & Hoffmann (2004) self-esteem is associated with a number of life factors, one of which is student success in school. So self-esteem is important for every teaching and learning activity in school. Therefore students with low mathematical self-esteem still need a lot of activities that stimulate reasoning and conceptual understanding

Students with low mathematical self-esteem also need to habitual problem solving activities with a variety of math literacy problems. This is in accordance with the explanation Kusumah & Sugiman (2010) that to deepen the ability of problem solving it is necessary to utilize real problems as the beginning of learning which will then be used in the process of mathematical and mathematical form development. This is also in line with the recommendations of PISA in Wardani & Rumiati (2011) teachers must improve the learning process in schools as an indicator of mathematical literacy by increasing the portion of reasoning, problem solving, arguing and communicating.

CONCLUSION

Based on the results of the analysis and discussion of the results obtained description of the ability of mathematical literacy in terms of students' self-esteem shows varying results. This means that students 'self-esteem does not affect students' mathematical literacy abilities absolutely. Therefore, quality learning remains the focus of learning activities.

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