UJMER 10 (1) 2021 54 – 58

Unnes Journal of Mathematics Education Research

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

Mathematics Literacy Skill on *Problem Based Learning* Assisted by E-Module Agito Based on Learning Motivation

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Article Info

Article History:
Received 15 October 2019
Accepted 26 February 2020
Published 30 January 2021

Keywords:
E-Modul Agito, Mathematics Literacy Skill, Mathematics Learning Motivation, Problem based learning

Abstract

This research aims to describe mathematics literacy skill of students based on learning motivation. This *mixed method* research used *sequential explanatory* design with *non-randomized control group, pretest-posttest* design. This research was conducted at SMK Negeri 2 Purbalingga with population taken from X automotive light vehicle department. The technique to take the sample was *purposive sampling.* The findings showed various mathematics literacy skill based on learning motivation. It was shown from 4 students with high learning motivatios, 3 of them having high mathematics literacy skill and 1 moderate mathematics literacy skill. There were 23 students with moderate motivation, 1 of them having high mathematics literacy skill, 20 moderate, and 2 poor mathematics literacy skill. There were 7 poor learning motivation consisting of 5 moderate mathematics literacy skill and 2 poor skill.

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

INTRODUCTION

Problem in Indonesian education is very complex. Educational problems have many influential factors. The proof is – its high number has not been solved. One of them, according to PISA 2015, was Indonesian rank, the 64th out of 72 countries joining PISA assessment (OECD, 2016). The influential factors of education came from fast-growing technology development. This disruption era, where everything is digitalized and the development of various digital devices causes inseparatable life from digital device usages. Most of people use digital devices and one of them is teenager.

The use of digital devices by teenagers could be used excessively. The developing entertaining cotent such as online game could make its users, especially teenagers, whom are mostly learners to be addicted and decrease their learning motivation. Lee *et al* (2007) stated that online game lowered learning motivation because their time would be spent in front of laptop computer or *handphone* screen. According to Jannah *et al* (2015), less online game addiction would lead to higher learning motivation and higher online game addiction would decrease learning motivation. According to Ulfa (2017), onlie game lowered learners' achievemetns.

One of learning results which becomes a need of learner to face 21st century competition is mathematics literacy skill. According to PISA in Sari (2015), mathematics literacy skill is an individual's skill to formulate, use, and interpret mathematics into various contexts. Mathematics literacy skill is also defined as ability to understand and implement basic sciences of mathematics into daily life. According to Wardono & Mariani (2017), three main notions of mathematics literacy concept are (1) ability to formulate, implement, and interpret mathematics into various contexts, (2) understanding of mathematics reasoning and its conceptual implementation, procedures, facts, and mathematics tools to draw, explain, and predict phenomena, and (3) using mathematics literacy skill, to help individuals implementing mathematics in daily life

To be able to face the competitions, there is a need of mediating solution for various influential factors to educational problem. One of the solution is using digital tools as media of learning activity. In using digital tools, one of the media is *website.* According to Edson (2017), *website* is as a meant of learning to improve problem scope which could be solved by learners. The use of website as meant of learning improved effectiveness and efficiency of learning and its flexibility and availability of complete learning material sources (Ibrahim & Alqahtani, 2018). According to Hamdunnah *et al* (2016), learning achievement effectiveness of students would be more effective after using constructive module and *website.* According to Wang (2018), *website* could become a good assessment medium of contextual problem solving skill. *Website* could create good behavior and attitudes of learners because its learning focus could be centralized maximally (Supandi *et al,* 2018). According to Wardono *et al* (2016), *website* which could be used as learning media could improve mathematics literacy skill of learners.

One of *websites* as learning media is E-module Agito. The module is a *website* module which uses *Problem Based Learninng* which integrates steps of *Problem Based Learning* and short movie as the contents (Priyonggo *et al,* 2019). E-module Agito could be accessed at http://hendiwidi.com/agito/index.php.

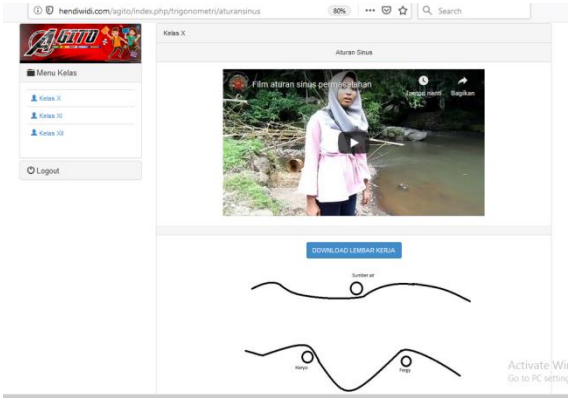

Figure 1. The Page Layout of E-Module Agito Problems for Communicative Components of Mathematics Literacy Skill

The short movie was used in the module because it was a good learning medium for youth learners. It could be an effective learning centre (Harnata *et al,* 2014). It could also develop thoughts to be more intellectual, to analyze, and to implement the knowledge (Husmiati, 2010). Other important thing is learning model selection. *Problem based learning* was used in the module becase *Problem based*

learning was a learning model with capability to develop mathematics literacy skill. *Problem based learning* is a model by involving students to solve problems through scientific stages so they could learn knowledge related to the problems and to have problem solving skill (Ngalimun, 2013).

From the problems and the theories, then the research aims to analyze mathematics literacy skill seen from student learning motivation.

METHODS

This research used *mixed method* with *sequential explanatory – nonrandomized control group, pretest-posttest design.* In this research, the quantitative data was collected first before the qualitative data then it was analyzed and elaborated. In this research, it was given mathematics literacy skill test at the bginning and intial motivation questionnaire. Then, after the learning, it was given final mathematics literacy skill test and final motivation questionnaire.

This research was done at SMK Negeri 2 Purbalinga with X gaders of academic year 2018/2019 as the population. There were 67 subjects from light automotive department. They were grouped into 2 consisting of 34 participants taught by *Problem based learning* assisted by E-module Agito as experimental group and 33 participants taught by *Discovery Scientific learning* as control group. In the experimental group, the subjects were grouped into high, moderate, and poor learning motivation categories.

The quantitative side, the data was gained from assessment started from initial literacy test and final literacy skill test. The data was tested its normality, homogeneity, completeness proportion, level of improvement difference, learning motivation level difference, and influences of learning motivation to mathematics literacy skill. The qualitative side was gained from technique triangulation: questionnaire, interview, and documentation. There was also source triangulation from students, teachers, and peers.

RESULT AND DISCUSSION

In the assessment, it was gained initial test with BTA 34 and final test was determined by BTA 40. The initial test showed that experimental and control groups were normally distributed and homogeneous with significant level for normality 0.460 > 0.05 and significance of initial data homogeneity 0.427 > 0.05 by using SPSS 16.0. In the final test, both groups were normally distributed and homogeneous with normality significance 0.849 > 0.05 and final homogeneity of the data 0.091 > 0.05 by using SPSS 16.0.

In the final test, the proportion of mathematics literacy skill of the students whom passed the minimum grade classically was 70%. The result was proven by Z_{count} 1.94 higher than Z_{table} 1.64. The learning achievement effectiveness after using the constructive module and *website* were more effective (Hamdunah *et al,* 2016).

From the initial and final test, it was gained improvement of mathematics literacy skill with N-gain average score 0.359, categorized moderate improvement and the average of mathematics literacy skill improvement taught by *Problem based learning* assited by E-module Agito was higher than students taught by *discovery scientific learning.* The result was gained from t-test with t_{count} result 6.000345951 higher than t_{table} 1.99714. The learning media by using *website* could improve mathematics literacy skill of the students (Wardono *et al,* 2016). The finding is in line with Wicaksana *et al* (2017) and Afriyani *et al* (2018) where mathematics literacy skill had improvement while using *website* as media.

The result of initial and final motivation questionnaire showed learning motivation was also improved with N-gain average score 0.321, categorized moderate. The improvement of learning achievement average of the experimental group was higher than the control group with t_{count} 5.432426543 higher than t_{table} 1.99714 from the t-test.

The qualitative research was grouped into three student categories with high, moderate, and poor learning motivation based on the questionnaire. High category mathematics literacy is the ability of students who master at least two components of mathematical literacy very that very well and the other components are well mastered. Score on high category mathematics literacy test is more than 70. Moderate category mathematics literacy is the ability of students who well mastered the four components and the other components are adequately mastered. Score on the moderate category mathematics literacy test between 41 to 70. Poor category mathematics literacy is the ability of students who adequality

mastered the mathematical literacy components and score on the poor mathematics literacy test is less than 41. Here is the categorization of the learners based on learning motivation.

Table 1. Categorization of Learning Motivation

Categories	Numbers of the Students
High	4
Moderate	23
Poor	7

There are 4 high learning motivation student with 3 of them having high mathematics literacy skill and 1 categorized moderate. There were 23 moderate learning motivation students with 1 of them categorized high mathematics literacy skill, 20 of them moderate, and 2 of them categorized poor. There were 7 poor learning motivation students with 5 of them having moderate mathematics literacy skill and 2 of them having poor mathematics literacy skill.

From the restuls, it could be seen that high learning motivation students did not always have high mathematics literacy skill and the poor learning motivation students did not always poor mathematics literacy skill. However, learning motivation still influenced mathematics literacy skill. The data from the final test showed that learning motivation influenced mathematics literacy skill. From t-test done, it was gained that –(t count) was -4.728937 lesser than t_{table} -2.037 and t_{count} 4.728937 higher than t_{table} 2.037. Then, it could be proven that there was influence of motivation to mathematics literacy skill. Score of b was 0.608 showing that there was strong correlation between motivation and mathematics literacy skill with regression linier equation $\hat{y} = -5{,}76997 + 0.608484\hat{x}$. The R square showed 0.411 so learning motivation influenced mathematics literacy skill 41.1% and 58.9% was determined by other factors.

CONCLUSION

From the analysis and the discussion, it could be concluded that various mathematics literacy skill based on learning motivation. Mathematics literacy skill was not always influenced by learning motivation but learning motivation influenced mathematics literacy skill in several aspects. There was still correlation between learning motivation and mathematics literacy skill. Besides that, the use of *website,* for example E-module Agito, could improve learning motivation and mathematics literacy skill.

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