



Mathematics Literacy Based on Students' Self-efficacy By DAPIC Problem-Solving Realistic Approach With EDMODO-assisted

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Abstract

Mathematical literacy is one of the important fundamental life skills, therefore mathematics teaching must lead to mathematical literacy. Realistic Approach, using real-world problems as a starting point for learning and developing mathematical concepts. The collaborative learning of DAPIC Problem-Solving Realistic approach with Edmodo-assisted to improve mathematical literacy, gives students the opportunity to build their own mathematical knowledge through teacher guidance. This study aims to describe the ability of mathematical literacy in terms of students' self-efficacy in learning DAPIC Problem-Solving Realistic approach assisted by Edmodo. This type of research is a mixed method type of concurrent embedded design. The research subjects were students of class IX SMP Eka Sakti Semarang. The results obtained from the DAPIC Problem-Solving Realistic approach assisted by Edmodo on mathematical literacy, that students with high self-efficacy can master the seven components of the literacy process well, students with moderate self-efficacy are able to achieve well the components of communication, mathematizing, and mathematical using skills. tools, but weak in other literacy process skills. While students with low self-efficacy, five aspects can be mastered although not optimally, but have not been able to master the Communication and Mathematizing aspects.

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INTRODUCTION

Quality human resources (HR) are an important factor in development in the current era of globalization. Human development is assessed using a three-dimensional approach: (a) Long and healthy life, (b) Knowledge and (c) Decent standard of living, all of which are summarized in human development index (HDI), where Indonesia's HDI in 2013 was 68.4; ranking 108 out of 187 countries (BPS, 2014). The dimension of knowledge is an important factor influencing the development of human resources, and education is a process to develop all aspects of the human personality which includes knowledge, values, attitudes, and skills (Wardono, Waluya, Kartono, Mulyono, & Mariani, 2018).

Budiono & Wardono (2014) argue that mathematics is a universal science that underlies the development of modern technology, has an important role in various scientific disciplines and advances the power of human thought. Mathematics teaches a person to have personal and cultural integrity, be open and responsive to scientific advances (National Council of Teachers of Mathematics [NCTM], 2000). Meanwhile, according to Anthony & Walshaw (2009), mathematics has an important role to form a person who can plunge and socialize in people's lives.

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 (OECD, 2016). The definition can be analyzed in three aspects, namely process, content, and context. In the process aspect, there are seven underlying abilities, namely communication, mathematizing, representation, reasoning, and argument, devising strategies for solving problems, using symbolic, formal, and technical language and operation, and using mathematics tools.

The mathematical literacy of Indonesian students at the international level is still very concerning, as evidenced by the participation in the assessment through the Program for International Student Assessment (PISA) sponsored by countries that are members of the Organization for Economic Cooperation and Development (OECD) since 2000,

the results achieved by students Indonesia is far from satisfactory. Indonesia's ranking is still at the bottom with the average still far from the international score, in PISA 2015 it is ranked 62 out of 70 countries. In PISA 2018 it is ranked 74th out of 79 countries, and the OECD recommendation is the need to improve the education system in Indonesia (OECD, 2019). The solution for that, Wardono & Mariani (2014) recommends that teachers use PISA-oriented assessments in learning, so that students' mathematical literacy can be honed, and help improve Indonesia's ranking in PISA.

According to Bruner (in Hudoyo, 1988, p.56) learning mathematics is learning about mathematical concepts and structures contained in the material being studied and looking for relationships between mathematical concepts and structures. Junaedi & Asikin (2012) explained that mathematics learning needs to be designed so that it can encourage students to have mathematical skills, such as the ability to understand, communicate, connect, reason and solve mathematical problems.

In fact, during the learning process, students are not always able to absorb information well, and find it difficult to understand mathematical concepts (Istiyani, Muchyidin, & Rahardjo, 2018). Students' interest in mathematics is still low, this can be due to the number of tasks that must be completed, student task orientation, mastery of skills, student personality, personal concepts, feelings of inadequacy, motivation, self-confidence, anxiety, use of teaching methods that are less varied so that students feeling bored, fear / phobia of mathematics, and others (Tella, 2007). Students' difficulties in learning mathematics are solving words in a problem, understanding the intent and all the information from the problem, being confused about digesting information, imagining the context, making mathematical models of problems, using accurate methods in calculations, calculating errors during calculations, interpreting answers. according to the context of the question (Joubert, 2009).

A person's success is not determined solely by knowledge and technical abilities (hard skills), but rather by the ability to manage oneself and others (soft skills) (Waluya, 2012). Bandura (1994) states that self-efficacy is defined as a person's belief about

his own "ability" to produce a level of achievement that affects events in real life. The opinion of Sunawan, Sugiharti, and Anni (2017) that students who have high levels of self-efficacy tend to enjoy learning mathematics, but students who have low self-efficacy tend to have high emotions of anger, anxiety, and boredom. Meanwhile Bindak and Ozgen (2011) argue that self-efficacy for mathematical literacy in students can change and can be improved by using appropriate learning strategies.

According to Doll (in Yulaelawati, 2007, p.45) learning planning is part of curriculum design related to learning experiences. Meanwhile, Rochmad and Masrukan (2016) argue that the main supporters of successful learning in the classroom if the teacher uses appropriate, varied learning models, teaches well (good teaching) and uses good questions (good questions). In addition, according to Wardono & Ary Woro (2015) that realistic innovative learning of Edmodo e-learning containing independent creative intelligent characters with PISA-oriented assessments increases mathematical literacy skills.

This study uses a realistic approach to learning DAPIC Problem Solving assisted by Edmodo, where DAPIC problem solving learning consists of five elements that make up the acronym, namely, (1) define, (2) assess, (3) plan, (4) implement, and (5) communicate, (Meier, Hovde & Meier, 1996).

Learning is done collaboratively with realistic mathematics as a learning approach, as well as e-learning Edmodo as a media aid. One form of learning media that is in accordance with the development of internet technology is e-Edmodo media (Wardono et al, 2018). Edmodo is a social media platform that is often described as Facebook for schools and can function even more as needed (Rismayanti, 2012).

In line with the problems raised, this study aims to describe mathematical literacy skills in terms of students' self-efficacy in learning DAPIC Problem-Solving Realistic approach assisted by Edmodo.

METHOD

This study uses a mixed method type concurrent embedded design, and the quantitative research design used is a nonrandomized control group, pretest-posttest design. Beginning with a preliminary study, then this research collects both quantitative and qualitative data, followed by data analysis and interpretation.

This research was carried out at Eka Sakti Junior High School Semarang with the research population being grade IX students for the 2019/2020 academic year. Taking the research subject 32 students for the experimental class with DAPIC Problem Solving learning with realistic approach assisted by Edmodo, and 31 students for the control class with Discovery Learning.

Sources of quantitative data in this study were obtained from the results of the mathematical literacy ability test (TKLM), while the qualitative data sources were the results of a self-efficacy questionnaire, and the results of interviews with mathematical literacy skills. Quantitative data were tested using normality test, homogeneity test, average completeness test, proportion completeness test, proportion comparison test, average comparison test, and self-efficacy influence test. Then qualitative data analysis was carried out by validating data, making verbal data transcripts, reducing data, presenting data, and verifying data.

RESULTS AND DISCUSSIONS

The learning process of DAPIC Problem Solving realistic approach assisted by Edmodo obtained the following results: (1). At the planning stage of the learning process, validation of learning tools obtained an average score of 4.5 and validation of research instruments the average score was 4.6. Table 1 and Table 2 are details of the validation scores of learning tools and research instruments, respectively.

Tabel 1. Learning Tool Validation Results

Instruments	Score	Category
Syllabus	4.52	Very Good
Lesson Plan	4.53	Very Good
Worksheet	4.47	Very Good

Tabel 2. Research Instrument Validation Results

Instruments	Score	Category
Student Self-Efficacy Questionnaire	4.75	Very good
Mathematical Literacy Test Questions	4.5	Very good
Interview Guide	4.5	Very good
Observation Sheet	4.67	Very good
Students Response Questionnaire	4.75	Very good

From the table it can be concluded that the learning tools and research instruments are feasible to use because they have a very good category

Tabel 3. Grouping of Students

Self-efficacy criteria	Many students	Results (%)
Low	4.52	40.6
Midle	11	34.4
High	8	25.0
Total Students	32	100.0

The grouping of students based on self-efficacy is carried out before the implementation of the learning process. Self-efficacy is grouped into three categories, namely high, medium, and low. Based on the results of the self-efficacy questionnaire analysis, the grouping data obtained as Table 3, namely the percentage of students with high self-efficacy is 25.0%, students with moderate self-efficacy are 34.4%, and students with low self-efficacy are 40.6%. Based on Table 3, the selection of research subjects was carried out with two subjects selected for each category to analyze mathematical literacy skills in depth during the learning process, so that 6 research subjects were selected.

(2). At the implementation stage of the learning process, observations are given on the implementation of learning and student response questionnaires to measure the quality of learning. From the observation of the implementation of learning that has been carried out, an average score of

4.39 or 85% was obtained, so that the learning carried out in the study has a very good category, and 85% is in accordance with the lesson plan. The results of the analysis of student response data, obtained an average score of 3.25 or 81%, so it can be said that students assess the learning implemented is 81% good.

In the DAPIC Problem Solving lesson in collaboration with the realistic approach assisted by Edmodo, the teacher gives students the opportunity to build their own mathematical knowledge. Each problem is presented in the form of daily life cases and has various sub-solutions, such as raising real life problems, solving problems individually or in groups, presenting and discussing, developing formal mathematics, applying knowledge. This is intended so that students practice their mathematical literacy skills.

(3). At the assessment stage of learning outcomes, a Mathematical Literacy Ability Test

(TKLM) is given and the results of the TKLM are normally distributed and homogeneous. Furthermore, the calculation of completeness test and comparative test is used, with a significant level or used is 0.05. In the experimental class the proportion of completeness obtained is 78.1%, with the value of z_{count} being 0.41 and $z_{(1/2(1-\alpha))}$ is 1.96 so that $-z_{(1/2(1-\alpha))} < z_{count} < z_{(1/2(1-\alpha))}$, which means the proportion of completeness is 75%. It was also obtained that the proportion of completeness in the control class was 38.2%. Based on the results of the proportion comparison test, the value of z_{count} is 3.28 and the value of $z_{(0,5-\alpha)}$ is 1.64, so $z_{count} > z_{(0,5-\alpha)}$, which means the proportion of completeness of class students who receive learning materials using DAPIC Problem Solving a realistic approach assisted by Edmodo is more than the proportion of complete class students who get learning materials using Discovery Learning.

From the results of TKLM, the average value is 79.6 with t_{count} value is 1.72, and $t_{(1-\alpha)}$, dk is 1.69, so $t_{count} > t_{(1-\alpha)}$, dk , which means the average ability the mathematical literacy of students from classes who received learning materials using the DAPIC Problem Solving realistic approach assisted by Edmodo was more than 76. The control class average obtained was 72.5. Based on the results of the average comparative test analysis, the value of t_{count} is 2.15 and the value of $t_{(1-\alpha)}$, dk is 1.69, so $t_{count} > t_{(1-\alpha)}$, dk , which means the average mathematical literacy ability class students who get learning materials using DAPIC Problem Solving learning realistic approach more than classes that get learning materials using Discovery Learning.

This agrees with Wardono (2013) which states that innovative learning can improve mathematical literacy skills. Wardono & Ary Woro (2015) stated that Edmodo's innovative realistic e-learning containing independent creative intelligent characters with PISA-oriented assessments improves mathematical literacy skills. Wardono & Scolastika (2014) states that realistic innovative learning with character learning and PISA assessment that has been developed can be categorized as valid, practical, and effective to improve problem solving literacy skills.

Therefore, there is a need for innovation in learning mathematics in the classroom in the form of

applying learning models that can hone students' mathematical literacy. One of the learning models that can improve students' mathematical literacy skills is the DAPIC Problem Solving learning model with a realistic approach.

The purpose of this study is to describe the ability of mathematical literacy in terms of students' self-efficacy, the description description is described as follows. The high self-efficacy group has been able to fulfill the seven components of the literacy process well. Both subjects mastered the components of using mathematics tools, using symbolic, formal, and technical language, and operations but were still limited in understanding operations and symbols in mathematics. The moderate self-efficacy group has been able to fulfill the seven components of the literacy process although it is still not optimal. The moderate self-efficacy group has been able to achieve components with good communication, mathematizing, and using mathematical tools, but is weak in other literacy processes. The low self-efficacy group is weak in all (seven) components of mathematical literacy, especially in the Communication, Mathematizing component.

In the communication component, students with high self-efficacy are able to present appropriate mathematical problem-solving methods/ideas/ideas. It shows that students can state known information, exchange views about the correctness, adequacy, and efficiency of various problem-solving methods, as well as compare their solutions with those of their classmates and decide on their own solutions. Students with moderate self-efficacy also have quite good communication, although they have not been able to solve problems according to the concept. However, for students with low self-efficacy, they are only able to communicate a few ideas of the concept of completion according to the problems presented, even though the ideas are not appropriate.

In the mathematizing component, students with high self-efficacy can collaborate in discussions to verify and develop mathematical conceptual and procedural knowledge, transforming problems from the real world to mathematical forms. Students can state information correctly and completely and make mathematical forms of the cases submitted correctly and precisely. Students with moderate self-efficacy

have also been able to change the problem in the case of the problem to a mathematical form correctly, and with the right definition, but it is not complete. Students with low self-efficacy have not been able to master the mathematising aspect, have not been able to make an accurate and complete mathematical model.

In the representation component, students with high and moderate self-efficacy can develop their own models to solve problems by applying familiar experiences or methods, presenting problems and interpreting them well, although there are still some errors in the solution. While students with low self-efficacy have not been able to master the representation aspect, students have not been able to make representations of cases in pictures.

In the reasoning and argument component, students with high self-efficacy can think logically to make conclusions, check, or provide justification for statements or solutions to problems. Students with moderate self-efficacy can provide the right conclusions as well as the correct and complete reasons or ways of doing things. However, students with low self-efficacy have not been able to master the reasoning and argument aspects, students only write incomplete conclusions.

In the component of devising strategies for solving problems, students with high and moderate self-efficacy can apply the steps of completion in a coherent manner. Students with low self-efficacy are also able to provide the correct completion steps but with incorrect calculation results.

In the components of using symbolic, formal, and technical language and operations, students with high and moderate self-efficacy are able to use symbols, formal language and techniques, and operations to formulate, solve or interpret problems well. Students with low self-efficacy have not been able to master aspects of using symbolic, formal and technical language and operations, students are not careful with symbols, are less able to understand, and explain appropriate mathematical symbols.

In the using mathematics tools component, students with high and moderate self-efficacy can use mathematical tools such as measurements, rulers, and so on well, with precise and neat scales. Meanwhile, students with low self-efficacy are less proficient in

using mathematical tools such as measurements, rulers, and so on, because there are illustrations that do not match the descriptions in the pictures, are not neat, and are not optimal.

TKLM shows the average score obtained for students with high self-efficacy is 93.75, students with moderate self-efficacy are 81.41, and students with low self-efficacy are 63.39.

Based on the regression calculation, the results show that self-efficacy has a positive influence on students' mathematical literacy skills, although it is not dominant, namely 34.6%, and there are 65.4% by other factors such as social factors, students' psychological conditions, and students' physical conditions at the time. literacy assessment is carried out.

From the results of TKLM and interviews with subjects, it can be concluded that students who have high self-efficacy have excellent mathematical literacy skills, students with moderate self-efficacy have sufficient mathematical literacy skills, and students who have low self-efficacy have not been able to mastering aspects of mathematical literacy correctly, precisely, and completely. This is in accordance with the statement from Zimmerman (2000) that self-efficacy assessment can direct the assessment of students before carrying out certain activities. The position or nature of this self-efficacy assessment plays an important role in students' academic motivation.

The statement from Schunk and Pajares (2001) that students who have high efficacy will complete learning tasks well, participate in learning more readily, work harder, last longer when they encounter difficulties, and are able to obtain higher achievements. Students with low self-efficacy tend to choose lesson assignments and activities related to the material they like and find it easy for them. Students who have low self-efficacy have a character that tends to give up more easily in dealing with difficult problems.

This is in accordance with Ahmad and Safaria (2013) that students with high self-efficacy will have higher goals than students with low self-efficacy. They also believe in solving problems and getting very good scores on math tests.

CONCLUSION

In the analysis of mathematical literacy abilities in terms of student self-efficacy, it can be concluded that there is an increase in literacy skills, namely students who have high self-efficacy are able to master the process aspects of mathematical literacy abilities to the maximum and very well. Students who have moderate self-efficacy can improve mastery of the process aspects of mathematical literacy skills well but not optimally. Meanwhile, students who have low self-efficacy, from the seven aspects of the process of mathematical literacy skills, some can be mastered by students well although not optimally and are weak in the components of Communication and Mathematizing.

The use of integrated Edmodo with DAPIC Problem Solving learning with a realistic approach is sufficient to help teachers in growing students' mathematical literacy skills in the classroom. Learning Management System (LMS) is an integrated online learning/e-learning management system. Edmodo as an aid in learning is very helpful for students in increasing students' self-efficacy and mathematical literacy skills.

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