MATHEMATICS LITERACY ON PBL LEARNING WITH PMRI APPROACH ASSISTED E-LEARNING EDMODO

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ABSTRACT

This study aims to find out that there are differences in mathematical literacy ability in content Change and Relationship class VII Junior High School 19, Semarang by PBL learning model with a PMRI (Indonesian RME) approach assisted E-learning Edmodo, PBL with a PMRI approach, and expository; to know whether the group of students with learning PBL models with PMRI approach and assisted E-learning Edmodo can improve mathematics literacy; to know that the quality of learning PBL models with a PMRI approach assisted E-learning Edmodo has a good category; to describe the difficulties of students in working the problems of mathematical literacy ability oriented PISA. This research is a mixed methods study. The population was seventh grade students of Junior High School 19, Semarang Indonesia. Sample selection is done by cluster random sampling so that the selected experimental class 1, class 2 and the control experiment. Data collected by the methods of documentation, tests and interviews. From the results of this study showed average mathematics literacy ability of students in the group PBL models with a PMRI approach assisted E-learning Edmodo better than average mathematics literacy ability of students in the group PBL models with a PMRI approach and better than average mathematics literacy ability of students in the expository models; Mathematics literacy ability seventh grade students of Junior High School 19, Semarang in the class using the PBL model with a PMRI approach assisted E-learning Edmodo have increased and the improvement of mathematics literacy ability is higher than the improvement of mathematics literacy ability of class that uses the model of PBL learning with PMRI approach and is higher than the improvement of mathematics literacy ability of class that uses the expository models; The quality of learning using PBL models with a PMRI approach assisted E-learning Edmodo have very good category.

Keywords: Mathematics Literacy; PMRI, E-learning Edmodo; Change and Relationship; PBL.

INTRODUCTION

Math proficiency is considered very beneficial for learners to follow learning at levels more or to overcome problems in their daily lives. Mathematics studied and developed in order to equip students with the ability to think logically, analytical, systematic, critical, and creative. It thus is the reason for the importance of mathematics to be learned. However, during the learning of mathematics is still not able to make students proficient in mathematics. According Rusmining et al., (2012), Indonesia has a low education quality in all aspects. According to the Soul (2005), students learn math without realizing its usefulness, while according Zulkardi (2007) there is a big problem in mathematics education in Indonesia. The problem is the students' ability in solving problems related to daily life is still low (in Zulkarnain, 2013). Indonesian students are only able to answer questions PISA level 1, 2 and 3, and some students can solve level 4. (Edo, S. I., et all, 2013).

Indonesian student success in solving problems of PISA is largely determined by the evaluation system and the ability of teachers to develop students' mathematical literacy. (Johar, R., 2012). Now the need to improve science, technology and mathematics literacy among students has become a major focus for the learning of science, technology and mathematics in schools. (Adeneye, et all, 2012)

Based Kemendikbud (2011) note that Indonesia's ranking in PISA in 2000 was ranked 39th out of 41 countries, in 2003 was ranked 38th out of 40 countries, and in 2006 was ranked 50th out of 57 countries, while in 2009 was ranked 61 out of 65 countries. This means that the mathematics education in Indonesia has not been able to complete the mathematics literacy . This is in line with Mudzakkir (2006) the fact the field shows that mathematics literacy ability have not been trained to the fullest.

In practice, the learning of mathematics in school do not always emphasize to students in order to improve the ability of logical thinking, analytical,

systematic, critical, and creative, but still focused on the textbook. Husna (2014) says there are several sources of constraints faced by teachers in assessing mathematics literacy, namely: 1) lack of knowledge about the competence of teachers of mathematics literacy, 2) there is no mathematics literacy assessment format, 3) because in Medan, rarely do literacy competence mathematics, so that teachers are not directed learning in mathematics literacy skills, just the ability achieve material. This adversely affects the value of mathematics Indonesia in an international comparative study conducted by the OECD PISA. Based on the OECD (2010) for the fields of mathematics, the ability of the students who were tested using a 6 levels, and the results showed that: (1) no Indonesian students (0%) that reached level 6; (2) to level 5 only 0.1%; (3) to level 4 only 0.9%; (4) to level 3 was 5.4%; (6) for level 2 is 16.9%; (7) for level 1 is 33.1%.

It appears that only students' mathematics literacy ability up to level 3. This is in accordance with Stacey (2010) examines the literacy level achieved by the students of Indonesia from 2000 until 2009 the level of achievement of the literacy ability of students Indonesia when viewed from the scores achieved can only reach values below 400 with the highest cognitive ability on average can only reach level 3 and 4.

Weak mathematics literacy for category level 3 to level 6 is caused by 1) Students are not able to develop the capacity to think is optimum in mathematics at school; 2) The process of learning mathematics students have not been able to make a habit of reading, thinking and working, in order to understand the essential and strategic information in solving problems; 3) from the settlement of the problems that made the student, it appears that it is still too large a dose mechanistic and dose reasoning is still low; 4) mathematics courses for students not yet become a "school of thought". Students still tend to "receive" information and then forget about it, so that the subjects of mathematics has not been able to make students astute, intelligent and nimble (Depdiknas, 2011). Based on interviews with math teachers class VII Junior High School 19, Semarang stated that the ability of students is still low: the ability to solve problems in context.

Under these conditions, it is necessary for innovation mathematics student-centered, learning provides the opportunity for students to be able to increase the activity of learning. Problem Based Learning (PBL) is a learning that uses real-world problems as a context for students to learn about problem solving skills (Arends, 2007). In the model of PBL, the problem posed by the teacher is a real-world problems and interesting. Characteristics or traits PBL according Akınoğlu and Tandoğan as follows: (1) the learning process should begin with a problem which is predominantly concrete problems; (2) materials and learning activities should pay attention to the circumstances of how that can attract the attention of students; (3) The teacher is a supervisor

during the learning process; (4) students need to be given enough time to think or collect information and develop strategies for problem solving and creativity they have driven while learning; (5) the level of difficulty of the materials studied are not at high rates which can make students despair; (6) the learning environment comfortable, quiet and safe should be constructed so that developing students' ability to think and solve problems. According Nalole (2008) deals with the presentation of mathematics that begins with something concrete, in the Netherlands have long been developed Realistic Mathematics Education (RME), in Indonesia known as PMRI (Pendidikan Matematika Realistik Indonesia)

PMRI (Indonesian RME) in line with PISA (Mathematics Literacy) (Marpaung, Y and Julie, H., 2011). Teaching using PMRI (Indonesian RME) helps students develop sophisticated mathematical reasoning way through three heuristics: reinvention, didactical phenomenology, and modeling. Modeling is an important part of mathematics literacy component (George J. Roy and Farshid Safi, 2008). Learning PMRI (Indonesian RME) to motivate each student who studied mathematics in the capacity of mathematical context used in mathematical problem solving so as to facilitate its completion (Barnes, H and Elsie Venter. 2008). With PMRI (Indonesia RME) make learning mathematics more meaningful and fun for students. The learning process will be meaningful and fun,...(Judah P. Makonye, 2014). The building blocks activity based on PMRI) supports the development of students' spatial visualisation ability (Risma, D. A., Putri, R.I.I., Hartono, Y., 2013)_which becomes part of PISA mathematical literacy component in shape and space content. Learning RME According to Webb (2011) not only because of its relationship with the real world context, but associated with suppression imaginable. RME put on the student issue deals with the situation imaginable. RME principle is that engagement in mathematics for students should begin within a meaningful context and the development of understanding and ability to make sense of a mathematical representation of formal reasoning begins with the students themselves. Teachers themselves need to develop the positive experience of the use of mathematics in context. After teachers develop their experience of mathematics literacy, they will reflect on the learning process they have done (Brown, B and Marc Schäfer., 2015)

According to de Lange (1987) in Prastiti (2007) five characteristics of RME are: (1) using the contextual issues (phenomenological exploration or the use of Contexts); (2) using a model (the use of models or bridging by vertical instruments); (3) appreciate the variety of answers and contributions of students (the use of students own); (4) interactivity (the interactive character of the teaching process or interactivity); (5) integrated with other learning topics (the intertwining of various learning strands).

Problem PISA mathematics focuses on real-world problems. Problem PISA developed by 4 content, the fourth such content include: Shape and Space, Change and Relationship, Quantity, and Uncertainty and Data. PISA questions on the content Change and Relationship thoroughly focused on the need for quantification. Important aspects include understanding the relative size, the recognition of numerical patterns, and the ability to use numbers to represent real-world objects quantitative attributes. On this content also deals with the subject of algebra. Mathematical relationships often expressed by equations or relationships that are common, such as addition, subtraction, and division. The association was also expressed in a variety of algebraic symbols, graphics, geometric shapes, and tables. Therefore, any representation of the symbol that has the purpose and nature of each, the translation process often becomes very important. Based on that there are similarities between the characteristics of PBL models, realistic approach, and about the type of PISA is the use of contextual issues. Use of the contextual issues that can be documented in a coherent one can use learning media by utilizing the internet. One social network that pretty much has the features to support learning is Edmodo. Pange, J. and Dogoriti, E. (2014) suggested Edmodo is a social network which is considered to provide a safe education for students and educators to learn. The use of social networks for learning has many advantages such as access to learning is not limited by space and time. It is also supported by the results of research Patahuddin (2012) "The Internet has the potential as a medium for learning mathematics in a richer, joyful, and meaningful way." In this case the use of the Internet into mathematics learning has the potential to create a learning atmosphere that is meaningful and fun.

Based on this background, the authors wanted to do research by lifting the title "Mathematics Literacy On PBL Learning With PMRI Aproach Assisted E-Leraning Edmodo".

Formulation of the problem of this study were (1) Is there a difference in the mathematics literacy ability of class VII Junior High School 19, Semarang by PBL learning model with a PMRI aproach assisted E-learning Edmodo Edmodo, PBL learning models with a PMRI aproach, and expository models, (2) Does mathematics literacy ability in the classroom learning gets PBL models with PMRI approach assisted E-learning Edmodo, a class that gets learning PBL models with a PMRI approach, and expository models classes increased, (3) How is the quality of learning PBL with a PMRI approach assisted E-learning Edmodo, and (4) How the difficulties experienced by students in working on PISA oriented. The purpose of this study were (1) Knowing that there are differences in mathematical literacy ability of students of class VII Junior High School 19, Semarang by PBL learning model with a PMRI approach assisted Edmodo, PBL with a PMRI approach, and expository model, (2) Knowing that

mathematics literacy ability gets PBL model learning with PMRI approach assisted E-learning Edmodo increases, (3) Knowing the quality of learning PBL models with PMRI approach assisted E-learning Edmodo have good category, and (4) Examine, describe the difficulties of students in working on PISA oriented.

METHODS

This research includes studies combined (mixed methods) that uses concurrent models embedded with a quantitative method as the primary method. According to (Sugiyono, 2013: 537) This research method is more interesting, because researchers can collect two kinds of data (quantitative and qualitative or otherwise) simultaneously, in a single stage of data collection. Thus the data obtained to be complete and more accurate.
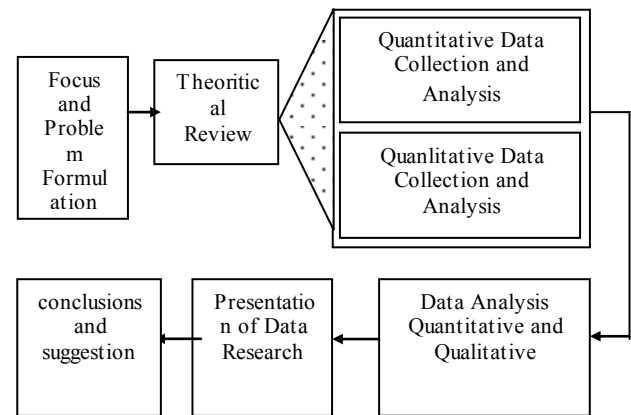
The population in this study were students of class VII Junior High School19, Semarang academic year 2014/2015. The samples in this study using cluster random sampling method. The sample used in this research is class VII F as ekspeimen 1 PBL models were subjected to treatment with a PMRI approach assisted E-learning Edmodo, class VII G as the control class given expository, and the class as a class VII H 2 were subjected to experimental treatment PBL models with PMRI approach.

The treatment in this study is learning to use the PBL models with a PMRI approach assisted E-learning Edmodo, learning to use the PBL models with PMRI approach and learning use expository models. The dependent variable was the mathematics literacy of students.

The data were obtained using the methods of documentation, testing, observation and interviews. Documentation methods used to obtain data on the name of the student, lesson plans used by teachers, and the replay value of the final semester of the school year 2014/2015 at the experimental class and control class. Observation methods used to obtain the quality of learning using PBL models with a PMRI approach assisted E-learning Edmodo. The test is used to obtain

data on the value of the mathematics literacy ability of students as sample. Prior to this mathematics literacy ability tests given to students, test tested beforehand to determine the validity, reliability, power differentiator, and the level of difficulty of the eight questions. From the test results that have been calculated, the entire matter is qualified to serve as a test of mathematics literacy ability at the beginning and end of the test execution.

The collected data is then analyzed to test the hypothesis. Analytical techniques used are: (1) analysis of variance test one path, to determine the average difference between the experimental class 1, experiment 2, and control; (2) z test, to test the level of classical completeness; and (3) the gain test, to determine the increase math literacy ability of students in the experimental class 1, experiment 2, and control.

RESULTS AND DISCUSSION

PISA researchers developed similar instruments that are tailored to the material received by the students in the class VII. Adjustments are made on the content aspect, in this study using content Change and Relationship. The material in accordance with the content of the variables is linear equations. The research starts from the initial test in class VII in Junior High School 19, Semarang to determine the ability of mathematical literacy. From the initial tests conducted obtained information that mathematics literacy ability of students still unsatisfactory.
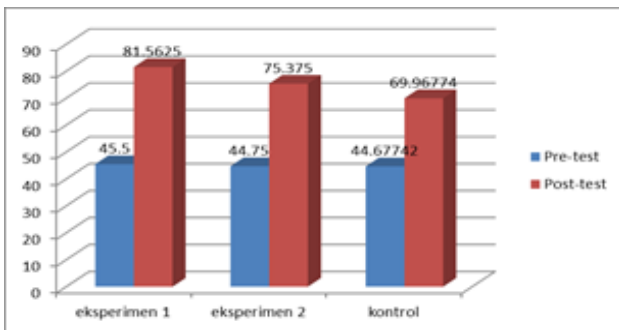

Figure 1 Histogram Improving Mathematics Literacy Content Change and Relationship on experimentation Class 1

Increased mathematics literacy very significant from occurring in the experimental class 1 is the class that uses the learning model of PBL with PMRI approach assisted E-learning Edmodo. Experimental class 1 has the highest average compared with experimental class 2 that uses the PBL model with a PMRI approach and grade control using a model of expository. This can be demonstrated by the percentage of students who achieve mastery learning in the experimental class 1 is 93.75%, completeness experimental class 2 was 81.25%, and the thoroughness of the control class is 70.96%. Supported also by the resulting increase in the classical experimental class 1 by 67% and the increase in

individual categories of 0% low, medium category of 71.875%, and amounted to 28.125% high category.

Table 1. Results of individual criteria for the normalized Gain

	Experiment 1	Experiment 2	Control
Low	0 %	0 %	9,68 %
Moderate	71,875 %	96,875 %	90,32 %
High	28,125 %	3,125 %	0 %

Table 2 Results of Pre-test and post-test Mathematical Literacy Ability

Class	*Pre-test*	*Post test*	*(Pre-test) – (Post test)*
Experiment 1	45,5	81,5625	36,0625
Experiment 2	44,75	75,375	30,625
Control	44,68	69,9	25,3

Description: (Pre-test) - (Post test): the average increase mathematics literacy ability of students

Table 3. Test Results Similarity Average Post-test

F_{count}	α	F_{table}	Conclusion	It means
27,884	5%	3,095	Fcount ≥ Ftable	There is a significant difference

Based on Table 3 it can be concluded that the average mathematics literacy ability were no significant differences. Then conducted a further test using Scheffe test. Further trials have been because the number of members in each group different samples and data group have the same variance / homogeneous. Based on the conclusions obtained further test the average post-test mathematics literacy 1 experimental group was better than the average post-test mathematics literacy ability group 2 experimental and group control with expository models. In other words, the average mathematics literacy group is highest PBL learning model with a PMRI approach assisted E-learning Edmodo

Results were in accordance with Dogoriti and Pange (2014) the proper use of social networks offers significant potential to improve education outcomes. 1 student response experiments to study the use E-learning Edmodo also give a positive response. Based on interviews learners recognize that learning to use E-learning Edmodo is a new thing so as to provide variety in teaching and variation in the assessment. All students in the experimental class 1 also recognizes that learning to use E-learning Edmodo add motivation in learning and provides many benefits.

The quality of learning in the classroom using the PBL model with PMRI approach included in the excellent category. This is according to research conducted by Chandra Septian Budiono (2014) concluded that the quality of learning using similar PISA PBL model with PMRI approach and assisted student worksheet media executed very good quality.
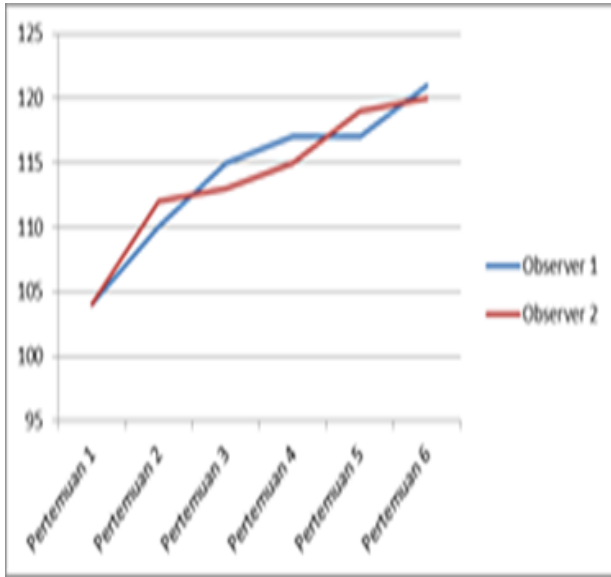
Figure 2 Histogram Quality Learning in Classroom Experiment 1

Cooney, et al (1975: 204) gives a hint, that the difficulties students in learning mathematics that focused on two important types of mathematical knowledge, ie knowledge of concepts and knowledge of the principles. Concepts and principles of basic knowledge of mathematics is to master the students, so that students can solve math problems properly. Thus to know the difficulties of the students in working on PISA can type in terms of knowledge about the concepts and principles on the material linear equations of the variables tested.

Difficulties students may result in the identification of problem solving algebra written submission followed by oral questions relating to students' understanding of concepts and principles contained in the issues that have been given to students. If these results indicate that students make a mistake, then the student will need to do a diagnosis of difficulty, how students make the mistake.

Based on the analysis of students' responses and interviews with respondents researchers found difficulties experienced by students in working on the same type with PISA is presented in Figure 3 and Figure 4 below.

Problem number 10:

Tickets adalahRp 20,000 a drama for children and Rp 50,000 for adults. There is a group consisting of 30 people (children and adults) pay Rp 870,000. Determine a lot of children in the group!
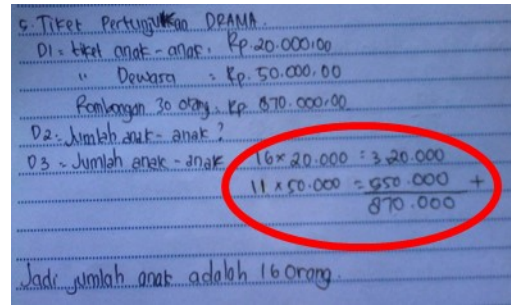
student answers:

Figure 3 Student Answers From Problem Number 10

Based on the results of student work 1 which has a low Traffic, showed that the students were only able to component communication and component Using Mathematics Tool. Students are able to write what is known and what is asked of the matter, and the students could only answer the questions given by way of guessing the number of children group and adult group number in order to obtain that amount of money to be paid 870,000.00 IDR. So the students do not change the problem into a mathematical model.
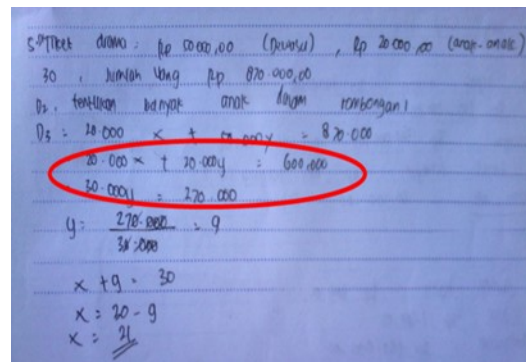

Figure 4 Student Answers From Problem Number 10

Based on the results of the work and interviews, two students who have the ability was not yet meet the seven components of the process. The first component is communication, students are able to communicate through writing down problem given what is known and what is being asked. The second component is that mathematising, students are able to transform real-world problems into mathematical models. The third ability is Representation, students have not been able to choose the variables used. In the work of students using two variables and when do interviews regarding the selection of these variables, the student admitted that she experienced confusion when using one variable. The fifth ability is Devising Strategies for Solving Problems, students have been able to establish the equation, but the students have not been able to substitute variables correctly. Namely the ability of the sixth Using Symbolic, Formal and Technical Language and

Operation, students have not been able to use the language of symbols through conversion into a mathematical model and there are some errors in calculation operations. The ability of seventh ie Mathematics Using Tool, students are able to use tools using play money provided so as to determine the amount of the group of children and adult group.

Based on the analysis of answers and interviews of certain respondents, it can be concluded that students who have difficulty in working on PISA setipe because of the students do not have a high curiosity through search PISA questions when learning to use E-learning Edmodo, it is very noticeable differ significantly with students who have high ability and has a high curiosity. The students are very actively looking for problems similar PISA PISA or questions that require reasoning, then they upload it into E-learning Edmodo group and try to do it. So the ability of these students are trained according to seven indicators mathematics literacy.

CONCLUSIONS

Based on the results of research and discussion, conclusions can be drawn use the PBL model with PMRI aproach assisted E-learning Edmodo to improve the mathematics literacy ability class VII Junior High School 19, Semarang can be summarized as follows. (1) the average mathematics literacy ability of students in the group PBL models with PMRI approach assisted E-learning Edmodo better than average mathematics literacy ability of students in the group PBL models with PMRI approach and better than average maathematics literacy ability students in the group expository model; (2) The ability of the mathematical literacy of students of class VII junior High School 19, Semarang in the class using the PBL model with PMRI aproach assisted E-learning Edmodo has improved and improvement of mathematics literacy ability is higher than the improvement class that uses the model of PBL learning with PMRI approach and is higher than the improvement class that uses expository models; (3) The quality of learning using a PBL model with PMRI aproach assisted E-learning Edmodo has a very good category; (4) difficulties experienced by students of class VII Junior High School 19, Semarang in solving PISA type associated with the concepts and principles are (a) in the mastery of concepts, students still have difficulty in using images and symbols to present concepts, (b) in the control principle of the students still have difficulty in using the principles correctly.

Suggestion

Based on the above conclusion, the researchers recommended that advice is (1) for the seventh grade mathematics teacher at Junior High School 19, Semarang selection and use of learning PBL models with PMRI approach assisted E-learning Edmodo can do to improve students' mathematical literacy ability, (2) for mathematics teacher at Junior High School 19, Semarang

more often in use examples of problems PISA so that students have a vocabulary of about problems PISA more and learners accustomed to work on the problems of the same type with about PISA, (3) for teachers in Junior High School 19, Semarang use E-learning Edmodo can provide variety in learning and assessment, so they can make variations and learning innovations.

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