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Mathematical literacy ability on project based learning model with RME approach assisted by schoology

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Abstract

Mathematical literacy skills need to be improved so that students are able to solve mathematical problems correctly. This study aims to (1) To find out the mathematical literacy abilities of students in the PjBL model with the RME approach assisted by media, Schoology can achieve classical completeness or more; (2) To find out which one is better between the average mathematical literacy abilities in the PjBL model, the RME approach is assisted by Schoology's media in the experimental class and the DL model's Scientific approach in the control class. The population in this study was VII grade students in a school in the city of Semarang. This research is quantitative research. Sampling is done by random sampling technique. The results of the study showed that using the PjBL model of the RME approach assisted by Schoology in achieving classical completeness, and learning the PjBL with the RME approach assisted by the Schoology media in the experimental class had an average mathematical literacy ability compared to DL learning Scientific approaches in the control class.

1. Introduction

Education plays an important role in developing and improving the quality of human resources. The definition of education according to Law Number 20 of 2003 is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state. So to realize this goal, one way is to improve the quality of Indonesian education in this case which will be tried specifically, namely the quality of mathematics education. Mathematics is one of the subjects taught in every level of education, starting from elementary school, junior high school, high school, to college level. The world of education is closely related to mathematics because in the world of mathematics education is one of the important subjects taught at every level of education, because it provides many benefits and can be applied in various fields of life (Mahendra, 2017). Other than that, mathematics is one of the sciences capable of supporting the improvement of the quality of human resources (HR) because mathematics is a science that is the mother of all science (mother of science). Therefore it can be seen that mathematics equips students with complete abilities to be used in dealing with the problems of daily life.

For that we need a special ability that helps students to be able to solve problems that exist in life. According to Mulyono & Lestari (2016: 159), mathematical literacy is one of the important skills that must be possessed by students, because it helps students to understand mathematics and use it in the real world to submit suspicions and provide logical reasons. Apart from that according to the TIMSS report in 2015, in the field of mathematics Indonesia was ranked 45th out of 50 TIMSS participating countries. Based on an international survey, the acquisition of Indonesia's average score in the field of mathematics was 397. This shows that Indonesia is still below the international average score of 500. The average score of all correct answers in the field of mathematics is 26 from the international score of 50.

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These results reflect the mathematical literacy abilities of Indonesian students are still low and far below the OECD State average also shows that Indonesian students are still experiencing difficulties in solving the PISA math questions used to measure mathematical literacy skills. Whereas according to Stacey (2014) states that mathematical literacy is needed by all people in facing the problems of modern life, because mathematical literacy is very closely related to the work and duties in everyday life. Mathematical literacy helps one to understand the role or usefulness of mathematics in everyday life while applying it. Based on the description, it can be seen that there is a gap between expectations and reality regarding these objectives. Hope that students have good abilities in mathematical literacy skills after taking mathematics lessons have not been achieved.

So that an effort is needed to improve students' mathematical literacy skills. One effort that can be done is to hold an innovation in mathematics learning. Innovation in mathematics learning can be done by using a model or approach that is suitable to improve students' mathematical literacy abilities. The model or approach to learning mathematics must be able to help students have the ability to formulate, apply, and interpret mathematics in various contexts. One approach in mathematics learning that can be used is the RME approach. In Indonesia RME is often referred to as Indonesian Realistic Mathematics Education (PMRI). The RME approach has the characteristics of using context. RME stands for Realistic Mathematics Education where later in Indonesia was adapted and introduced to PMRI. According to De Lange (1987) the five characteristics of Realistic Mathematics RME are: (1) using contextual problems (phenomenological exploration or use of contexts); (2) using a model (the use of models or bridging by vertical instruments); (3) appreciate the variety of answers and student contributions (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).

The steps of the realistic approach according to Zulkardi (2002) are as follows. (1) Preparation where in addition to preparing contextual problems, the teacher must really understand the problem and have a variety of strategies that might be taken to solve it; (2) Opening where in this section students are introduced to learning strategies that are used and introduced to problems from the real world. Then students are asked to solve the problem in their own way; (3) The learning process where students try various strategies to solve problems according to their experience, can be done individually or in groups. Then each student or group presents their work in front of students or other groups and other students or groups give responses to the work of students or groups of presenters. The teacher observes the course of class discussions and responds while directing students to get the best strategies and finding rules or principles that are more general in nature; (4) Closing where after reaching agreement on the best strategy through class discussion, students are invited to draw conclusions from the current learning. At the end of learning students must work on evaluation questions in the form of formal mathematics. So RME is an approach in mathematics learning that begins with contextual problems. This is an advantage of RME as Wardono revealed (2014) that the superiority of RME is emphasizing learning by doing, in accordance with the concepts developed by Freudental by relating things related to real life. Because this approach performs the process of presenting material in accordance with everyday life.

To support an increase in mathematical literacy apart from the form of approach taken also a learning model that can spur students to answer these various problems. Efforts to improve the quality of learning can be done through the selection of appropriate and innovative learning models. The right learning model is used, namely the Project Based Learning model. According to Jones et al., As quoted by Thomas (2000), Project Based Learning models are tasks that are given based on challenging questions or problems, involving students in planning, problem solving, giving decisions or investigating activities, giving students the right to autonomy. over a period of time, and culminate in a real product or presentation. The investigation phase requires the character of students' epistemic curiosity to emerge maximally. The interactive process with colleagues helps the process of knowledge construction (meaning-making process).

According to Moursund (in Wena, 2011: 147), some of the benefits of Project Based Learning include the following: (1) Increased Motivation; (2) Increased Problem-Solving Ability; (3) Improved Library Research Skill; (4) Increased Collaboration; and (5) Increased Resourced-

Management Skill. Project-Based Learning is a learning method that uses problems as a first step in gathering and integrating new knowledge based on their experiences in actual activities. Project Based Learning is a student-centered learning model to conduct an in-depth investigation of a topic. Students constructively deepen learning with a research-based approach to problems and questions that are weighty, real, and relevant (Grant, 2002). Regarding the principles of Project Based Learning according to Grant (2002), as follows. (a) Learning is student-centered involving tasks in real life to enrich learning; (b) Project assignments emphasize research activities based on a theme or topic that has been determined in learning; (c) Investigations or experiments are carried out authentically and produce real products that have been analyzed and developed based on themes / topics arranged in the form of products (reports or works). The products, reports or results of the work are then communicated to get feedback and feedback for the improvement of the next project.

Through a variety of things that have been explained, of course, it can be seen that this process is inseparable from the role of the development era so that the development of association in the modern era is expected to be used by the world of education as a means to help improve the quality of human resources. One of them can be done by using E-Learning media. The E-Learning media that will be introduced this time is Schoology. Schoology is an online learning session, classroom management, and social networking platforms that improve learning through better communication, associations, increased access to curricula and additional content (Biswas, 2013: 187). So from that with the existence of Schoology learning media, it is hoped that the learning process will become more conducive, increasing students' interest in the learning process. The results of the study by Afriyanti et al. (2018: 615) shows that the use of Schoology can increase interaction between learning participants (communication skills), mastery of concepts towards material increases, consequently students' abilities (problem-solving abilities) in the classroom increase. This is because Schoology, which is an E-Learning media, requires students to be able to find references to learning resources outside of the teacher, such as accessing extensive information through the internet, which basically raises student activity due to the availability of adequate learning materials and platforms more interesting.

The use of Schoology media also makes the learning atmosphere more interesting because this is because students can easily obtain information related to learning materials from various sources. In addition, by using Schoology the means to discuss with colleagues is also more flexible because it is facilitated well. This certainly supports the process of learning activities which are later expected to be able to improve mathematics learning outcomes as well as improve students' mathematical literacy abilities. Based on the background above, the formulation of the problems to be examined in this study are (1) does the students' mathematical literacy skills in the Project Based Learning model of the RME approach assisted by Schoology achieve classical completeness or more? (2) Is the average mathematical literacy ability in the Project Based Learning model of the media-assisted RME approach Schoology better than the average literacy ability in the Discovery Learning model of the Scientific approach? The objectives of this study are as follows (1)

To find out the mathematical literacy abilities of students in the Project Based Learning model, the RME approach can achieve classical completeness or more. (2) To find out which is better between the average literacy ability in the Project Based Learning model, the RME approach is assisted by Schoology media and the average literacy ability in the learning model in the control class. This study has indicators of mathematical literacy skills used, namely (1) communication; (2) mathematics; (3) using tools; (4) reasoning and argumentation; (5) representation; (6) develop problem solving strategies; (7) use language, techniques, and symbol operations (OECD: 2013). Following is the elaboration of the seven components of mathematical literacy skills (OECD, 2013). (1). Communication. Mathematical literacy involves the ability to communicate problems where a person sees a problem and is then challenged to recognize and understand the problem; (2). Mathematics (Mathematizing). Mathematical literacy involves the ability to transform (transform) problems from the real world into mathematical forms or just the opposite, ie interpreting a mathematical result or model into the original problem; (3). Representation. Mathematical literacy involves the ability to restate (representation) a problem or a mathematical object; (4). Reasoning and Arguments.

Mathematical literacy involves the ability to reason and give reasons rooted in the ability to think logically to analyze information to produce reasonable conclusions; (5) Formulating strategies for problem solving (Devising Strategies for Solving Problems). Mathematical literacy involves the ability to strategize in solving problems ranging from simple to complex; (6). Using symbolic, formal, and technical languages, and operations (Using symbolic, formal, and technical language, and operations). Mathematical literacy involves the ability to use various symbols, formal, and technical languages in mathematics; (7) Using mathematical tools (Using Mathematical Tools). Mathematical literacy involves the ability to use mathematical tools properly.

While mathematical literacy competencies in PISA are grouped into three group (OECD, 2017), namely (1) Reproductive Process Competence wherein this group, students are asked to repeat or copy information previously obtained. For example, students are expected to be able to repeat the definition of something in mathematics. Based on the skills aspect, students can work on simple calculations that might require a less complicated and general solution; (2) Connection process competencies where connections are built on reproductive groups by applying problem solving to non-routine situations on this connection, students are asked to be able to make connections between several ideas in mathematics, making connections between teaching material learned and real life in school and society. Students can also solve simple problems. Especially students can solve problems related to solving in life but still simple; (3) Competence in the reflection process where mathematical processes, knowledge, and skills in this group include elements of the student's description of the processes needed in solving problems. This process is related to students' ability to solve settlement strategies and apply them to problem solving. This reflection competency is the highest competency measured in PISA, which is reasoning ability using mathematical concepts. Through this competency test, it is expected that each student is faced with a certain situation in doing this reflection, the student analyzes the situation he will face in the future, identifies and discovers the "mathematics" behind the situation.

The hypothesis proposed in this study is as follows (1) students' mathematical literacy skills in the Project Based Learning model of the RME approach assisted by media in achieving classical completeness; (2) the average mathematical literacy skills in the Project Based Learning model of the RME approach assisted by media School better than the average mathematical literacy abilities of students in the Discovery Learning model of the Scientific approach;

2. Methods

In this study the type of research used was quantitative with true experimental design. According to Sugiyono (2015: 112) states that it is said to be true experimental design (a true experiment) because in this design, researchers can control all external variables that influence the course of the experiment. The main characteristic of true experimental designs is that the samples used for experiments as well as control groups are taken randomly from certain populations. In addition, the data obtained must be tested first. So that in this study to be examined is how mathematical literacy skills with learning Project Based Learning aided by the Schoology media are applied. The population in this study were seventh grade students of State Middle Schools in Semarang City 2018/2019 academic year. Sampling uses random sampling technique. This is done by randomly selecting two classes from the population without any strata differences between each class. In this study, one class was selected as an experimental class, namely class VII C using the Project Based Learning model of the RME approach assisted by Schoology media and one class as a control class namely VII E using Discovery Learning learning Scientific approach. The learning material used in this study is social arithmetic material.

Initially the first two meetings of the experimental class and the control class were carried out in the process of learning activities using the control class learning model namely Discovery Learning Scientific approach to determine the level of students' mathematical literacy skills in both the sample classes. Then after the experimental class learning was done using the Project Based Leaning model with the RME approach assisted by Schoology media. Whereas in the learning control class carried out using the Discovery Learning Scientific approach model which later in the sixth meeting will be given the final ability test to determine whether the learning model given to the experimental class is able to provide an increase in students' mathematical literacy abilities. In addition, various

tests will be conducted to measure literacy skills in both sample classes. The independent variable in this study is the Project Based Learning model of the RME approach assisted by Schoology and the Discovery Learning model of the Scientific approach. The dependent variable in this study is mathematical literacy ability. Data collection techniques used in this study are (1) the documentation method used to obtain related data in research; (2) test method in the form of giving an initial ability test and final ability test.

Quantitative data analysis techniques were used to test whether the Project Based Learning model of the RME approach assisted by Schoology achieved classical completeness in achieving the results of tests of mathematical literacy abilities. As well as testing whether the average test results using the Project Based Learning model of the RME approach assisted by media, Schoology is better than the average value using the Discovery Learning model of the Scientific approach.

3. Results and Discussion

The questions used to measure students' mathematical literacy abilities have previously tested the validity, reliability, level of difficulty and power difference. When testing is done, each item is declared valid, and reliable. In addition to the level of difficulty, each item has a different level of difficulty. However, if viewed from the overall level of difficulty that appears, it is not uniform, meaning that in each item there are each category from difficult, moderate to easy. This also occurs in different power tests where each item has its own criteria. However, it can be concluded that in all items tested the criteria are good. So that it can be ascertained that the questions given to measure tests of mathematical literacy skills in students are considered feasible. Based on the results of the normality test and homogeneity of the initial data of the experimental class, the control class, and the trial class indicate that the initial data is normally distributed and there is no difference in variance between the three classes. The results of the similarity of the initial data also showed that the initial abilities of the two classes were not significantly different. The normality test is used as a basic assumption that must be met for parametric test requirements. The formula used is the Kolmogorov-Smirnov test. In this study the normality test was calculated using SPSS 16 software through the Kolmogorof-Smirnov Non-Parametric tests. The test criteria are accept H_0 if the sig value in the Test of Normality table sig Kolmogorov-Smirnov column> level of significance (0.05) (Wardono, 2017: 27-28).

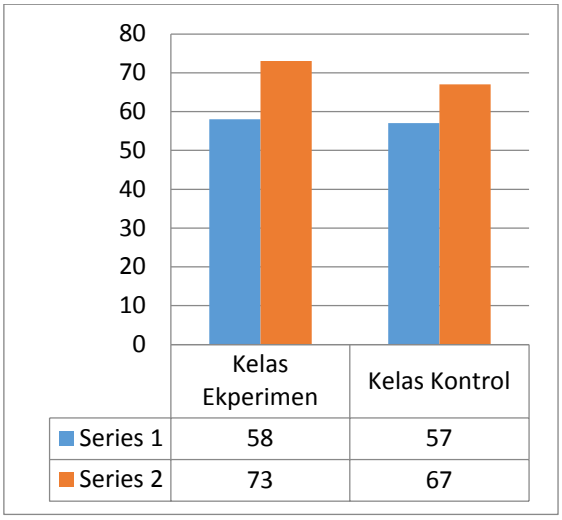
While the homogeneity test is used to determine whether the experimental class and the control class have the same variance or not. The homogeneity test is needed as a basic assumption that must be fulfilled to test the difference in the average of two samples. The homogeneity test in this study was carried out using the SPSS 16 program with the Lavene test. Degree of trust is 5% if the significant value in the Lavene test is> 5% then H_0 is accepted, the opposite is rejected (Wardono, 2017: 29-30).The normality test and homogeneity test are carried out as a requirement for the use of statistics to test the hypothesis. If the population is normally distributed and has a homogeneous variety, further tests can be carried out. The mean similarity test is used to determine whether the two samples have the same initial ability. The average similarity test used is the Anova Test. In this study the similarity test of the average is done using calculations program *SPSS* 16 with *Anova*. Degree of confidence is 5%, if the value is sig. In the Anova table > 5%, if then sig in tabel *Anova* >5%, so H_0 is accepted, otherwise it is rejected. Calculation of hypothesis test 1. Significant level, the test criteria used are reject H_0 if $z_{hitung} \geq z_{(0,5-\alpha)}$ and $z_{(0,5-\alpha)}$ is obtained from the standard normal list with opportunities $(0,5-\alpha)$ (Sudjana 2005 :234). For the 5% significance level, the price $z_{tabel} = z_{(0,5-\alpha)} = 1,64$. And $z_{hitung} = 2,22$. So $z_{hitung} \geq z_{(0,5-\alpha)}$ And rejected dan H_1 accepted, which means that the proportion of students who complete individually on mathematical literacy skills with the PjBL approach to the RME approach assisted by Schoology media is more than 74.5% of the total students in class or the results of tests of students' mathematical literacy skills in the PjBL model the RME approach assisted by media School achieved classical completeness.

While the hypothesis 2 test has the criteria H_0 accepted if $t < t_{1-\alpha}$, and $t_{1-\alpha}$ with $dk = (n_1 + n_2 - 2)$ dan peluang $(1-\alpha)$. Based on calculations with statistics t obtained $t_{hitung} = 2,011 > t_{tabel} = 1,6698$. So H_0 rejected, and H_1 accepted, means that the average value of the final ability of mathematical literacy skills in the PjBL model of the assisted RME approach is better than the average value of the final ability of

mathematical literacy skills with Discovery Learning Scientific approaches.

The Table 1 is a table of results of tests of mathematical literacy skills in both sample classes.

Table 1. Results of Test Mathematical Literacy Skills



Series 1 is the result of the average value of the initial test of mathematical literacy skills. While series 2 is the average result of the final test scores of mathematical literacy skills. Based on the results of testing hypotheses 1 and 2 the results obtained, that the Project Based Learning learning approach of media-assisted Schoology is able to achieve classical completeness, and has an average mathematical literacy ability that is better compared to Discovery Learning learning Scientific approach in the control class. The results achieved in this study are of course supported by the existence of active learning where in group activities each group member has a role so that they are more responsible for their group assignments. Giving roles for each group member also makes students more enthusiastic in participating in class learning. The roles received by each group member for each meeting are different so that students get different responsibilities. This is in accordance with Piaget's theory as cited in Rifa'i & Anni (2012: 170) which suggests that the learning process is an active process, because knowledge is formed from within the subject of learning so it needs to be created a learning condition that allows children to learn on their own and without pressure.

Based on the analysis of learning implementation, it can be concluded that the students 'mathematical learning abilities in the Project Based Learning (PjBL) class with Realistic Mathematics Education (RME) approach in Schoology media are completed in a classical manner and have better literacy skills compared to students' mathematical literacy skills. in the classroom with Discovery Learning Scientific approach in social arithmetic learning material because in the class that uses Project Based Learning (PjBL) Realistic Mathematics Education (RME) approach assisted by media Schoology students play an active role during the learning process to find independent problem solving strategies in form of project activities. Learning by using the Project Based Learning (PjBL) model provides opportunities for students to form knowledge by themselves from the experience of students through discussion when working on projects rather than through memorization. This is in line with the theory of David P. Ausubel that the learning process will be meaningful if the teacher presents the subject matter by linking concepts that are relevant to existing ones in the structure of student cognition (Harefa, 2013). So that the Project Based Learning (PjBL) model can help students solve problems, especially in real problems. In addition, this is also in line with the research conducted by Nurfitriyanti (2016) that there is a positive influence in the application of the Project Based Learning (PjBL) learning model. A similar thing was expressed in Surya's research (2018) that the Project Based Learning (PjBL) model can improve student learning outcomes and creativity which can be seen in improving learning outcomes and supported by the theory of chapter 2 that has been presented.

Therefore the Project Based Learning model of the RME approach can be used by state junior high school mathematics teachers in mathematics learning to develop students' mathematical literacy skills, because the learning model has a press point teaching students to develop mathematical modeling in solving problems related to everyday life by means of group discussions through project activities. In addition, the use of PISA-like questions can be used by junior high school mathematics teachers in learning so that students have more vocationally oriented PISA questions and are accustomed to working on story problems with PISA-like difficulties to develop students' mathematical literacy skills. Also by doing learning using media Schoology can be used by state junior high school mathematics teachers, although it would be more appropriate if the use of media is done in a computer laboratory, so that each student can access more comfortably. Besides

the advantages of using media Schoology makes it easy for teachers and students to access assignments and additional content, and Schoology is an international-based networking media that allows students to get learning resources related to similar questions PISA posted by other Schoology users.

4. Conclusion

Based on the results of research and discussion in chapter 4, conclusions can be drawn as follows. (1) Mathematical literacy skills of class VII students in one of the Public Middle Schools in Semarang who obtained the Project Based Learning model of the RME approach assisted by media in achieving classical completeness. (2) The average mathematical literacy ability of class VII students in one of the state junior high schools in the city of Semarang who obtained the Project Based Learning model of the RME approach assisted by Schoology media was better than those who obtained the Discovery Learning model of the Saintific approach.

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