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An Analysis of Mathematical Literacy Ability Viewed from the Goal Orientation

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Abstract

The purpose of this study was to analyze the ability of mathematical literacy viewed from the student goal orientation in the Osborn Model with the REACT Strategy. The research method used is Mixed Methods with a concurrent embedded model of quantitative method become primary. The population in this study were all students of SMP N 14 Semarang. Meanwhile, the samples taken for this study were grade VII-I students using the Osborn Model learning with REACT Strategy (experimental class), and grade VII-E students using the Discovery Learning (control class) by purposive sampling, while the subjects of the qualitative study were 6 selected students from class VII-I consisting of two students each in high, medium, and low mastery goal and performance goal. Data collection technique was done through quantitative data collection using tests, and qualitative data collection using questionnaires and interviews. The results showed: that the average test (t_{value} = 4.03 > t_{value} = 1.669), the different proportional test (z_{value} = 2.04 > z_{table} = 1.64), the average difference test (t_{value} = 3.45 > t_{value}) = 1.669), and the different proportional tests (z_{value} = 4.21 > z_{table} = 1.78) Based on the results of the study, therefore it can be concluded that literacy ability of students using the Osborn Model learning with REACT Strategy were better than the students who use Discovery Learning and students with mastery goals were able to master mathematical literacy ability very well compared to students with performance goals.

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INTRODUCTION

High mathematical ability is considered very beneficial for learning or in solving everyday problems. Mathematics is studied and developed to equip students with the ability to think logically, analytically, systematically, critically, and creatively (Wardono, Waluya, Mariani, and Candra, 2016). Mathematics has the same goal as the National Education System in developing students' potential and also the purpose of mathematics learning in line with the idea of mathematical literacy ability.

The results of the 2015 PISA study which was attended by 70 countries, the average score of mathematical literacy obtained by Indonesia was better than the previous year's score of 386 and ranked Indonesia 63th (OECD, 2016). According to (Wardono, and Kurniasih, 2015) the ability of Indonesian students to solve questions that require the ability to study, give reasons, communicate effectively, and solve and interpret problems in various situations is still poor.

Factors that influence the low level of mathematical literacy skills are that teacher learning always emphasizes the final score rather than the achievement of mathematics learning material; it makes changes to the goals of student achievement (Federici, Skaalvik, and Tangen, 2015). Observations and interviews with the teacher of SMP N 14 Semarang showed that parents always emphasize high scores on students, and also parents emphasize values that exceed the average grade values, and teachers also always emphasize high test results. These factors make students have differences in the attempt, and the process of achieving goals in learning mathematics is called the goal orientation. Differences in attempt to achieve goals or Goal Orientation that students have resulted in differences in mathematical literacy abilities students have.

In the research a preliminary study in the form of a test of the initial mathematical literacy ability (initial TKLM) in the material of round number in Grade VII of SMP N 14 Semarang. The researcher conducted a preliminary study by giving a test of the initial mathematical literacy ability (initial TKLM) in the material of round number in Grade VII of SMP N 14 Semarang. The cause of the low mathematical literacy ability is that students have difficulty in solving contextual substances, students experience problems in changing contextual substance problems in the form of mathematical models, difficult to express reasons and communication of the results of the questions and even students often have difficulty in determining the steps used as a strategy in solving problems.

The result of preliminary research is similar to the research conducted by (Wijayanti, Waluya, and Masrukan, 2018), and (Setiani, Waluya, and Wardono, 2018) who say the same thing that there are four (Mathematising, Reasoning and Argument, Using Symbolic, Formal and Technical Language and Operation) as well as Devising Strategies for Solving Problems of the seven abilities of the mathematics literacy assessment process in PISA that students still have error in working on the problem.

Several factors influence errors in working on the PISA problem. According to (Zhao, Valcke, and Desoete, 2011) that factors influence students' mathematical literacy abilities. These factors concern the teaching model and teacher priorities. Teachers need to design a learning model and learning strategies to improve mathematical literacy skills appropriately (Lin, and Tai, 2015). One learning model that facilitates students in improving mathematical literacy skills and requires students to solve problems involving reasoning is the Osborn Model (Sugandi, 2013). The Osborn model is a learning model using brainstorming methods or techniques (Aziz, Rochmad, and Wijayanti, 2015; Sinaga, 2015).

Every learning of mathematics must begin with the introduction of problems that are appropriate to the situation and propose contextual problems to students (Budiono, and Wardono, 2014). Students are still unable to deal with new problems, because students do not understand and find mathematical concepts to solve problems in everyday life. According to Crawford (Kaselin, Sukestiyarno, and Waluya,

2013), REACT strategy emphasizes students to understand the concept of material that is learned through relating, experiencing, applying, cooperating, and transferring. The Osborn model will be more leverage if it is carried out using the REACT Strategy. Based on the above description, the purpose of this study was intended to analyze the mathematical literacy ability viewed from the student's goal orientation in the learning of Osborn Model using REACT Strategy.

METHODS

The research method used is Mix Method with a concurrent embedded model of quantitative method become primary.

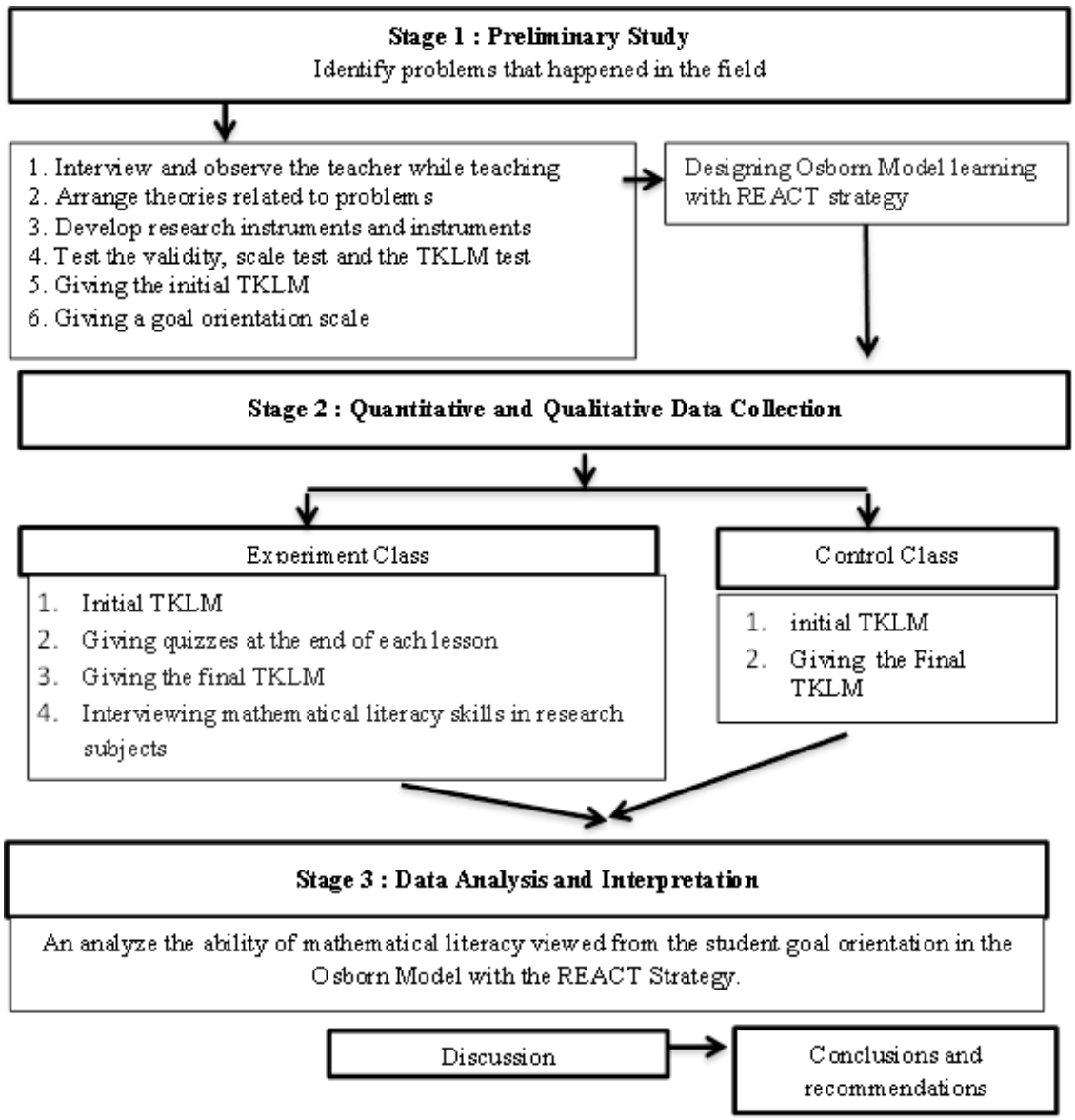

Figure 1. Concurrent Embedded Model of Quantitative Method Become Primary

Quantitative research in the form of mathematical literacy ability before learning and quality in the form of learning Osborn Model using REACT Strategy, and qualitative research

in the form of analysis of mathematical literacy ability viewed from student goal orientation. The study was conducted in SMP N 14 Semarang. The material taken for the study was Algebra Operations, and the subjects of the study were grade VII SMP N 14 Semarang as the subject of quantitative research divided into the experimental class (VII-I) and the control class (VII-E). In qualitative research, the research subjects used were only those who obtained the Osborn Model learning with the REACT Strategy, namely the experimental class (VII-I). The selection of research subjects using purposive sampling technique. The research subjects were selected from the experimental class (VII-I) which were grouped into two-goal orientation categories. The Goal orientation with the mastery goal characteristics was chosen by three students with high, medium, and low goal mastery categories, while the performance goal characteristics were chosen by three students with high, medium, and low-performance goal categories.

The data source in this study was students who obtained from the results of the initial TKLM and final TKLM, results in sheets and interviews. Quantitative data analysis was divided into two, namely initial data analysis and final data analysis. Analysis of preliminary data (taken from the results of the initial mathematical literacy ability which has a purpose to find out the similarity of the average of the experimental and control classes) using the normality test, homogeneity test, and two average similarity tests. The final data analysis (conducted after learning the Osborn Model using REACT Strategy) used two similarity tests on average, two different tests on average completeness test, completeness test, average difference test, and different proportional test.

Qualitative data analysis was done in three main steps of analysis techniques, namely data reduction (data reduction), data display (data presentation), and conclusions (conclusions).

RESULTS AND DISCUSSION

The results of this study were performed in two stages of research, namely quantitative and qualitative. The grouping of students based on the goal orientation questionnaire was carried out before the implementation of the learning process in the experimental class. Goal orientation has two characteristics, namely mastery goals and performance goals based on the analysis results of the goal orientation scale obtained grouping data as in Table 1.

Table 1. Grouping The Students Based on Goal Orientation Goal

Goal orientation characteristics	The number of students
Mastery goal	8
Performance goal	7
Not differentiated	17

Based on the results of the goal orientation questionnaire analysis obtained 4 students with goal orientation characteristics of mastery goal 2 (high, medium, since there was no low category found) and performance goals 2 (high, medium, since there was no low category found) which then taken to deeply analyze the mathematical literacy ability after the learning process.

The results of the study on the Osborn Model using the REACT strategy was considered better than the Discovery Learning Model obtained from the results of the first four tests is the average test of mathematical literacy abilities.

Table 2. The Average Test of Mathematical Literacy Abilities Results

	t_{value}	t_{table}
TKLM Final	4.03	1.6603

From Table 2, it is obtained that $t_{value} > t_{table}$ so that H_0 is rejected. That is, the average of mathematical literacy ability of students in the Osborn Model learning class with the REACT strategy reaches to 75.

The second test is an average proportional test. The result of the average propotional test results, from Table 3.

Table 3. The Average Propotional Test Results

	z_{value}	z_{table}
TKLM Final	2.04	1.64

From Table 3 obtained that $z_{value} > z_{table}$ so that H_0 is rejected. That is, the percentage of students who achieve a minimum of 75 completeness in the learning class of the Osborn Model using the REACT Strategy that reaches the minimum completeness criteria has exceeded 75%.

The third test carried out was the average difference test. The average different test results as seen in Table 4

Table 4. The Average Different Test Results

	t_{value}	t_{table}
TKLM Final	3.45	1.6603

Form Table 4 obtained $t_{value} > t_{table}$ so that H_0 is rejected. That is, the average of mathematical literacy ability of students in the Osborn learning class using REACT Strategy is more than the average of mathematical literacy ability of students in the class taught using the Discovery Learning.

The fourth test carried out was the average different proportional test. The result of the average different test as seen in Table 5

Table 5. The Average Different Proportional Test Results

	z_{value}	z_{table}
TKLM Final	4.21	1.78

Table 5 showed that $z_{value} > z_{table}$ so that H_0 is rejected. That is, the proportion of students' completeness of mathematical literacy ability in the learning of Osborn Model using REACT Strategy is more than the proportion of students' completeness in the class taught using the Discovery Learning . Based on the results of the study, it was found that the learning of the Osborn Model using the REACT Strategy on mathematical literacy ability was better than the class taught using the Learning of Discovery model.

Based on Sugandi research result (2013), it was found that mathematical literacy ability using the Osborn Model was better than the conventional learning, the Osborn Model is better since students are active in releasing the audience to solve the problems they faced. Based on the results of previous researchers, there are weaknesses in the Osborn Model, namely. Students still cannot face new problems, since students do not understand and find the mathematical concepts to solve problems in everyday life.

Ardyanto, and Wardono (2015) stated that mathematical literacy ability experienced an increase before and after learning, an increase in students' mathematical literacy skills using learning with REACT Strategy was higher than students who received conventional learning. Based on the results of previous researchers there are weaknesses in REACT Strategy, namely students who have not been active in group activities and rely on smart friends in their groups, students seem embarrassed if they are wrong in giving opinions to answer the problems given by the teacher. Osborn's model with REACT student strategy can express his or her opinion freely but by the mathematical concept so that it can solve problems related to daily life.

The results of the second study were an analysis of mathematical literacy ability viewed from students' goal orientation in the learning of Osborn Model using the REACT Strategy. The results of the data on mathematical literacy ability of the subject of the study can be seen in Table 6.

Table 6. Data on Mathematical Literacy Ability of The Subject of The Study

Mathematical literacy ability	Goal orientation			
	Mastery goal		Performance goal	
	MG_1	MG_2	PG_1	PG_2
Communication	95	80	60	80
Mathematising	90	85	85	65
Using mathematics tools	100	100	100	100
Devising strategies for solving problems	100	100	87	80
Using symbolic, formal and technical language and operation	93	93	80	73
Reasoning and argument	100	93	87	73
Representation	100	100	100	100

Based on Table 6, it can be seen that students who have mastery goal characteristics can solve math literacy problems very well. Student mastery goals can master the

components of the mathematical literacy process in a very good category. The ability of students mastery goal Devising strategies for solving problems can be seen in Figure 2.

Student mastery goals are very capable of mastering literacy ability of Communication, Mathematising, Using mathematics tools, Devising strategies for solving problems, Reasoning and arguments, and Representation. In the students' mastery goal indicated that they were able to master literacy ability Using symbols with a few errors that are not too fatal, therefore, based on the results of the study found that students mastery goals were able to solve mathematical literacy questions and be able to develop mathematical literacy ability. The ability of students mastery goal Reasoning and Argument can be seen in Figure 2.

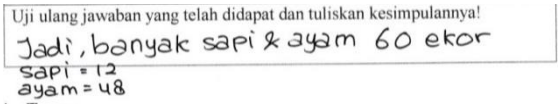

Figure 2. Reasoning and Argument Ability of Mastery Goal Students

Students with mastery goal have the ability to solve mathematical literacy questions based on the desire for goals in mastering the subject matter, students with mastery goals also prefer to enrich the insight into the material that not only comes from teaching materials given by the teacher, and students with mastery goals will stop learning if they have mastered the subject matter very well. Students with mastery goals will always develop their mathematical literacy ability to master the subject matter. This is in line with (Puspitasari, Purwanto, and Noviyani, 2013), (Benita, Roth, and Deci, 2014); (Maretasani, and Dwijanto, 2016)) who showed that students with high mastery goals have a higher level of ability than a student with performance goal.

Students who have characteristics of performance goals (PG) can solve math literacy questions well. Students with performance goals are very capable of mastering literacy skills Using Mathematics Tools, Devising strategies for solving problems and Representation but there are few errors that are not too fatal, Students' performance goals can master the abilities of Communication, Mathematising, Using Symbolic, Formal and Technical Language and Operation, and Reasoning and Argument there is a non-fatal error. The ability of students performance goal Reasoning and Argument can be seen in Figure 3.

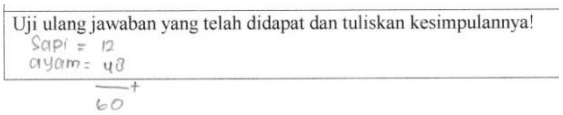

Figure 3. Reasoning and Argument of Performance Goal Students

Students with performance goals have weak literacy ability so that there were still process components that do not meet the criteria very well; this is due to that student with performance goals only have the goal of getting the best value. Students with performance goals feel satisfied if they can obtain teacher grades, and are also quite satisfied with the teaching materials and questions shared by the teacher, and students with performance goals will stop learning if the values they have are considered good. According to Benita, Roth, & Deci, (2014) students who have a performance goal will experience negative consequences in psychology (where students compare themselves with other students), this results in students who have performance goals unable to develop in mastering the material.

CONCLUSION

Based on the analysis and discussion, it can be concluded that through the results of the learning that have been done showed that the class taught using the learning of Osborn Model with the REACT Strategy was better than the class taught using the Discovery Learning Model. The results of the analysis of mathematical literacy ability viewed from the goal orientation indicated that students who have mastery goal characteristics were very good at mastering the mathematical literacy ability compared to students who have characteristics of performance goals.

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