Analysis of mathematical literacy ability based on goal orientation in model eliciting activities learning with murder strategy

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Abstract. The purpose of this research are (1) to analyze the learning quality of MEAs with MURDER strategy, (2) to analyze students’ mathematical literacy ability based on goal orientation in MEAs learning with MURDER strategy. This research is a mixed method research of concurrent embedded type where qualitative method as the primary method. The data were obtained using the methods of scale, observation, test and interviews. The results showed that (1) MEAs Learning with MURDER strategy on students' mathematical literacy ability is qualified, (2) Students who have mastery goal characteristics are able to master the seven components of mathematical literacy process although there are still two components that the solution is less than the maximum. Students who have performance goal characteristics have not mastered the components of mathematical literacy process with the maximum, they are only able to master the ability of using mathematics tool and the other components of mathematical literacy process is quite good.

1. Introduction
The rapid development of technology and science allows students to get information quickly and easily so students should have the ability to acquire, select, manage, and utilize any information received. This ability requires students to think logically, analytically, systematically, critically, and creatively. One of the subjects that can foster the ability to think logically, analytically, systematically, critically and creatively is mathematics [1]. Mathematics lessons should be given to all students started from elementary school. This is because mathematics is very useful in all aspects of human life [2]. The purpose of mathematics learning consists of five competencies: mathematical problem solving, mathematical communication, mathematical reasoning, mathematical connection, and mathematical representation [3]. Ability that includes of the five competencies is the ability of mathematical literacy. Ojose defines mathematical literacy as knowledge to know and apply basic mathematics in daily life [4]. Mathematical literacy is an ability that should be owned by students in order to apply their mathematical knowledge to solve problems in everyday life. The importance of mathematical literacy ability has not been matched by Indonesia's achievements in mathematics. This can be seen from the result of Indonesia's participation in PISA (Program for International Student Assessment). At PISA in 2012, Indonesia get the 64th rank from 65 countries with the average score of 375 while the average of international score is 494 [5]. The study results of the PISA in 2015 followed by 70 countries, the average score of Indonesian mathematical literacy obtained better than the previous year's score of 386 and Indonesia get the 63rd [6].
The low ability of students’ mathematical literacy based on the study results of the PISA is reinforced by the reality of the school. This is seen after the researchers conducted a preliminary study in the form of early mathematical literacy ability test (early TKLM) in the material of square and rectangle of VIII grade in SMP N 3 Semarang. The result of early TKLM showed that the students’ mathematics literacy ability is still low. It is found that students have difficulties in changing real-world problems into the form of mathematical model and students are wrong in determining the steps of completion which is used as a strategy to solve problems.

One of the factors causing the low ability of students’ mathematical literacy is the mathematics learning in schools is still focused on the achievement of value and less of emphasizing on the process so the students can improve the ability or the mastery of the material that causes students have a focus goal in achieving the end result in different learning or known as goal orientation. Goal orientation concerning the purpose or goal to be achieved individual in an assignment [7]. The characteristics goal orientation is mastery goal and performance goal. Mastery goal is a motivational orientation that students possess which emphasize the acquisition of new skills and mastery of the material. Performance goal is a student orientation to get good results or values.

The differences in goal orientation which the students have can cause different efforts that affect the differences in students' mathematical literacy ability. In solving the problem of mathematical literacy, students are difficult to understand, create mathematical models and apply the mathematical concepts he has to solve daily life problems. Therefore, teachers should be able to use appropriate learning models and strategies. Learning models that can improve students' mathematical literacy ability is Model Eliciting Activities (MEAs). MEAs is a learning mathematics model begins by present a real-world problem and students are required to understand and explain concepts of mathematics through mathematical modeling used to solve mathematical problems, where students work in groups during the learning process [8,9]. MEAs learning will give more optimal results if complemented by the MURDER strategy. MURDER strategy consists of several phases of mood, understand, recall, detect, expand, and review [1].

Based on the description above, the purpose of this research are: (1) to analyze the learning quality of MEAs with MURDER strategy, and (2) to analyze student's mathematical literacy ability based on goal orientation in MEAs learning with MURDER strategy.

2. Methods
This research is a mixed method of concurrent embedded type where qualitative method is as the primary method and quantitative research is as the secondary method. We use qualitative research to analyze the quality of MEAs learning with MURDER strategy and to analyze students’ mathematical literacy skill based on goal orientation in MEAs learning with MURDER strategy. Quantitative research as supporting data to analyze students' mathematical literacy ability based on goal orientation. Quantitative research is used alternative treatment post-test-only with nonequivalent group design.

The research was conducted in public junior high school (SMP N) 3 Semarang. The material taken is cube and cuboid. The population is all students of VIII grade of SMP N 3 Semarang. The research sample is VIII-D as experiment class given MEAs learning with MURDER strategy and VIII-C as control class given discovery learning. Research subjects were selected from the experimental class, grouped based on goal orientation characteristics, namely mastery goal and performance goal.

The data were obtained using the methods of scale, observation, test and interviews. Scale method is used to determine the student's goal orientation and to select the subject of research. Observation methods are used to obtain the quality of learning MEAs with MURDER strategy. The test is used to obtain data on the value of the mathematical literacy ability of students'. Before this test given to the students, the test is tested beforehand to determine the validity, reliability, power differentiator, and the level of difficulty of the four 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 end of the test execution or know as final TKLM. The collected data is then analyzed to test the hypothesis. The interview method is done after the final TKLM to obtain more information about the ability of students' mathematical
literacy which is the subject of research. Quantitative data analysis consists of early data analysis (from early TKLM which aims to find out the initial conditions of the experimental class and control class) using normality test, homogeneity test, equality test and final data analysis (from final TKLM done after learning implementation in experimental class and control class) using the average test of mathematical literacy ability, test of mathematical literacy ability proportion, average difference test of mathematical literacy ability, and test of different proportion of mathematical literacy ability. Qualitative data analysis using three main steps: data reduction, data presentation, and conclusion.

3. Results and discussion

Based on early TKLM data analysis, it is found that the experimental class and control class are normal distribution, homogeneous and there is no difference in the average ability of mathematics literacy. It means that the students of the experimental class and the control class have the same mathematical literacy ability in solving the problem of mathematical literacy. Grouping the students based on goal orientation scale is done before the implementation of MEAs learning with MURDER strategy. Goal orientation students are grouped into two characteristics: mastery goal and performance goal. Based on the analysis results of the goal orientation scale obtained grouping data as in Table 1.

| Grouping The Students based on Goal Orientation | The Number of Students |
|-----------------------------------------------|-----------------------|
| Mastery Goal                                  | 13                    |
| Performance Goal                              | 5                     |
| Not Differentiated                            | 14                    |

From Table 1, the subject is only selected from the students’ mastery goal and and performance goal characteristics while the students’ characteristics which not differentiated are not discussed by researchers. From each goal orientation characteristic selected two students to be subjected to research to analyze the mathematics literacy ability in depth. The research subjects with mastery goal characteristics were selected from two students with the highest scores of mastery goals (strong MG) and the lowest (weak MG). The research subjects with performance goal characteristics were selected from two students with the highest score performance scale score (strong PG) and the lowest (weak PG). This aims to see a significant difference between students of both goal orientation characteristics in solving the problem of mathematical literacy. The purpose of the first study is to analyze the learning quality of MEAs with MURDER strategy. The learning quality in this study is measured based on 3 steps, the planning step, implementation step, and assessment step. The learning quality of MEAs with MURDER strategy obtained the result that the learning planning step obtained the average total value of the assessment results of teaching administration and research instruments is 4.35 (included in good category). It means the step of learning planning conducted by researchers is qualified.

Learning implementation step obtained the average total value from observation results of learning implementation is 85.3% (included in good category). It means the implementation of learning conducted by researchers is qualified. The implementation of MEAs learning with MURDER strategy can work very well because of the positive support from students to be active during the learning process. Students are active in discussing and helping each other to solve the problem. From the questionnaire of student responses, students responded well to the learning with an average score of 76.4%. Based on student response questionnaire, MEAs learning with MURDER strategy responded by most students can make students have more spirit along the learning process, facilitate students in understanding the material, and make students feel happy doing the task given by the teacher. It is because in MEAs learning with MURDER strategy students are able to develop all the potential in thought and certainly motivate students to better in understanding the material.

The assessment step obtained the significance score in the normality test 0.200> 0.05 so it can be concluded final TKLM data from normal distributed population. Then tested for hypothesis, (i)
obtained $t_{count} = 5.65$ while $t_{table} = 1.66$ on the average test of mathematical literacy ability so $t_{count} > t_{table}$ it means the ability of students' mathematical literacy in experimental class reach the score of 75; (ii) obtained $z_{count} = 2.04$ while $z_{table} = 1.64$ in the completeness test of mathematical literacy ability $z_{count} > z_{table}$ it means the percentage of students' completeness in the experimental class got the 75 score has exceed 75%. It can be concluded that the ability of students' math literacy in MEAs learning class with MURDER Strategy has reached completeness. (iii) obtained $t_{count} = 4.09$ while $t_{table} = 1.678$ at test of different of average ability of mathematics literacy, so that $t_{count} > t_{table}$ which mean that the average of student's mathematical literacy ability of experimental class is better than the average of student's mathematical literacy ability of control class; (iv) the result of $z_{count} = 4.09$ while $z_{table} = 1.68$ at test of different proportion of mathematical literacy ability so $z_{count} > z_{table}$ which mean that the completeness proportion of student's mathematical literacy ability of experimental class is better than the completeness proportion of student's mathematical literacy ability of control class. These results show that MEAs learning with MURDER strategy can provide better results to improve students' mathematical literacy ability.

From these three results, it can be concluded that MEAs learning with MURDER strategies is qualified. The results provide a description that MEAs learning with MURDER strategy can provide better results in improving students' mathematical literacy ability. This happens because in MEAs learning with MURDER strategy problems which presented in the form of real-world problems and in solving the problem students directed to create a mathematical model first so it's more directed in finding solutions of the problems given. This is in line with the statement of Yildirim [9] stated that MEA learning can improve students' conceptual understanding. Jozestani [11] stated that the efficacy of MURDER learning have indicate its positive influence in improving students' ability. The second research objective is to analyze the ability of students' mathematical literacy on MEAs learning with MURDER strategy based on goal orientation. Based on the results of mathematics literacy analysis based on goal orientation obtained data as in Table 2.

Table 2. The results of mathematics literacy analysis based on goal orientation

| The Ability of Mathematical Literacy | Goal Orientation |
|-------------------------------------|------------------|
|                                     | Mastery Goal     | Performance Goal |
| Communication                       | 85%              | 60%              |
| Mathematising                       | 90%              | 80%              |
| Using mathematic tools              | 100%             | 100%             |
| Devising strategies                | 100%             | 85%              |
| Using symbol                        | 100%             | 90%              |
| Reasoning and argument              | 100%             | 75%              |
| Representation                      | 100%             | 60%              |

Table 2 showed that students who have the characteristics of mastery goal able to solve the problem of mathematical literacy well but there are still two components that the solution is less than the maximum, those are the ability of communication and mathematising. In communication ability, mastery goal students can communicate problems, students have written information that is known and asked from the problem but there are some deficiencies. Mastery goal students only write some information when it should be written completely according to the information contained in the problem. The ability of students mastery goal communication can be seen in Figure 1, Figure 2 and Figure 3.
In mathematising ability, mastery goal students can write a mathematical model that will be used to solve the problem correctly but there are a few deficiencies. The mastery goal students only write one mathematical model to calculate the volume while there are two cubes that must be searched for the volume. The results of the interview also show the same thing with the final TKLM result that the mastery goal students are still incomplete in mentioning the mathematical model that will be used to solve the problem so that the mastery goal students need to be given additional questions to inquire the unspecified mathematical model. The mathematising ability of mastery goal students can be seen in Figure 2. In the ability of using mathematics tool, mastery goal students can use mathematical tool in the form of a ruler to describe the problem precisely and neatly. Figure 3 shows that the mastery goal student can write down the solution steps as a strategy to solve the problem. The completion steps are written in a coherent, the formula used and the calculation process done exactly so the final solution is found exactly. Which means, the ability devising strategies for solving problems students mastery goal very well. In the ability of using symbols, formal and technical language and operation, mastery goal students can create mathematical symbols according to the problem, can understand and explain the use of mathematical symbols that have been made. In the ability of reasoning and argument, mastery goal students can make conclusions along with the reason exactly and completely according to the problem. In the representation ability, mastery goal students can present the problem by presenting the image with a proportional size and the image is given a complete description of the size according to the problem. In contrast to students’ mathematical literacy ability that have mastery goal characteristics, students who have performance goal characteristics have not mastered the components of mathematical literacy process maximally, the performance goal students is only able to master the ability of using mathematics tool and their ability in other components of mathematical literacy process is quite good. Figure 4 shows that performance goal student are less precise in communicating problems. The words used to write down the information that is known and asked from the problem seem like copying the problem. Which means, the ability of student communication performance goal is good enough.
In the ability of mathematizing, performance goal student are less precise and incomplete in writing a mathematical model that will be used to solve problems. In the ability of using mathematics tool, performance goal student can use a mathematical tool in the form of a ruler to describe the problem precisely and neatly. In the ability devising strategies for solving problems, performance goal student are not coherent in writing the steps of completion as a strategy to solve problems. Based on the interview, performance goal student have difficulty in understanding and explaining the completion steps but can determine the final solution appropriately. In the ability of using symbols, formal and technical language and operation, performance goal student can make mathematical symbols that match the problems, but based on the interview results, the student does not understand the use of mathematical symbols that have been made. In the ability of reasoning and argument performance goal student less complete in writing conclusion of problem and conclusion which made not according to problem. In the representation ability of performance goal student can present the image with a proportional size but the picture has not been given a description of the size. The representation ability of mastery goal students can be seen in Figure 5.

Students with mastery goal characteristics have better mathematical literacy ability than students with performance goal characteristics. The results showed that students with mastery goal characteristics are able to master the seven components of mathematical literacy process although there are still two components that the solution is less than the maximum. Students with performance goal characteristics have not mastered the components of mathematical literacy process maximally, they are only able to master the ability of using mathematics tool and their ability in other components of mathematical literacy process is quite good. Because, students who have mastery goal characteristics tend to enrich their knowledge by looking for other sources, not just fixated with the material that has been given by the teacher alone and will stop learning if they feel they have mastered a material well. While students with performance goal characteristics will be satisfied with the material given by the teacher, they will seek additional material outside the school if they consider the material given by the teacher at the school to make them less recognizable and get a satisfactory score, students with performance goal will stop learn when you feel the score is good.

4. Conclusion
Based on the results of research and discussion obtained the following conclusions. (1) MEAs Learning with MURDER strategy on students' mathematical literacy ability is qualified. (2) The ability of students' mathematical literacy with mastery goal characteristic is better than the students who have performance goal characteristic. Students who have mastery goal characteristics are able to master the seven components of mathematical literacy process although there are still two components that the solution is less than the maximum. Students with performance goal characteristics have not mastered the components of the mathematical literacy process maximally, they are only able to master the ability of using mathematics tool and their ability on other components of mathematical literacy process is quite good.

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