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Mathematical Literacy Ability and Mathematical Disposition on Team Assisted Individualization Learning with RME Approach and Recitation

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Abstract

This study aims to (1) determine the quality of Team Assisted Individualization learning with RME approach recitation on students' mathematical literacy abilities; and (2) describe the mathematical literacy abilities viewed from students' mathematical dispositions. This study applied a mixed method research type with concurrent embedded designs. Subjects in this study were determined based on the score of the mathematical disposition questionnaire of students in grade VIIB SMP N 40 Semarang in the academic year of 2017/ 2018. The data collection techniques were observation, tests and interviews. The results of the study showed that (1) Team Assisted Individualization learning with RME approach recitation has good quality; (2) students with high mathematical dispositions master the components of communication, mathematising, reasoning & argument, and devising strategies very well, the components of using symbolic, formal, and technical language and operation were well mastered, and the other two components are quite well mastered. Students with medium mathematical dispositions mastering well the components of communicaton, mathematising, and devising strategies for solving problems, the components of reasoning and argumentation and using symbolic, formal, and technical language and operation were mastered quite well but they have not been able to master the other two components. Students with low mathematical dispositions can only mastered three components quite well, they are communication, mathematising, and mathematics tools, while the other four have not been able to be mastered.

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INTRODUCTION

Entering the 21st century, every citizen is facing a rapidly growing global life. Students as seed of human resources need mathematical literacy skills to support this very competitive life. If a student has mathematical literacy skills, therefore this student can prepare himself/herself to live, understand, and act critically in relationships of modern society, since mathematics is not only seen as a scientific discipline, but how students can apply that knowledge to real world problems or daily life (Yore, Pimm, & Tuan, 2007).

Mathematical literacy is the ability to find out, connect, use, and apply basic mathematics in daily life situations or in reverse (Spangenberg, 2012; Gal. 2013). According to OECD (2013) mathematical literacy means a person's ability to formulate, apply, and interpret mathematics in various contexts, including the ability to do reasonable thinking mathematically and using concepts, procedures and facts to describe, explain, or estimate phenomena or incidents.

The PISA assessments' result on the Indonesian students' achievement in mathematics are still low. The 2015 PISA report showed Indonesia's position is number 63 out of 69 participating countries with an average score of 386. (OECD, 2016). Wijaya, Doorman, & Robitzsch (2014) imply that most students are still facing difficulties in the initial stages of completing context-based mathematical tasks, such as understanding real-world problems and turning them into mathematical problems. The observations' result at SMP N 40 Semarang showed that 43% of students had not been able to do math literacy problems correctly.

One of PISA's recommendations for Indonesia based on the results of that assessment is to improve the learning process in schools by increasing the portion of reasoning, problem solving, arguing and communicating (Wardani & Rumiati, 2011). To strengthen problem-solving ability, it is necessary to utilize real problems as the beginning of learning which will then be utilized in the mathematical process and the development of mathematical models (Sugiman & Kusumah, 2010).

In learning mathematics, aspect of students' attitudes or dispositions towards mathematics requires attention (Moenikia & Babelan, 2010). The National Council of Teachers of Mathematics (NCTM) (2000) describes the disposition of mathematics as a tendency to think and act positively reflected in students' interests and beliefs in learning mathematics and the willingness to reflect their own thoughts. Mathematical disposition is a productive attitude or positive attitude and habit to see mathematics as something logical, useful, and useful (Kilpatrick, Swafford, & Findell, 2001). Mathematical disposition relates to how students solve mathematical problems; whether they are confident, diligent, interested, and flexibly thinking to explore various alternative solutions to problems (Katz, 2009).

Characteristics of mathematical literacy related to contextual problems are appropriate if they are applied with Realistic Mathematic Education (RME) learning. One of the advantages of RME is that the concept is in line with the Indonesian way of thinking about mathematics learning that emphasizes active learning, problem solving and the application of mathematics. (Sembiring, Hadi, & Dolk, 2008). Developing mathematical concepts from real experience or through problem solving increases students' interest and confident in doing mathematics (Atallah, Bryant, & Dada, 2010). MacMath, Wallace, & Chi (2009) stated that the key components in mathematics learning based on RME are (a) students work in small groups, (b) students-centered learning, (c) educators act as facilitators, and (d) use real problems in daily life as a focus in the learning.

Based on the key components above, the Team Assisted Individualization (TAI) model is suitable to be integrated with RME learning. According to Slavin (2005), the TAI learning model characterized by group work will make students active, not bored and develope individuals in the group. The TAI model is better in improving mathematics learning achievement and character compared to other cooperative models (Tarim & Akdenis, 2007). Students prefer learning mathematics that provides opportunities to share knowledge and make them feel effective in group work (Hossain & Tarmizi, 2013).

The success of TAI learning can be supported by recitation, which is the method of teaching by giving assignments to students, in form of group assignments, then reporting the results (Jasmanidar, 2013). The recitation method has a positive influence on the ability to understand students' mathematical

concepts (Sodikin & Hartatiana, 2015). This can be a provision for the process of mathematical literacy, especially in making strategies and reasoning to solve problems.

The learning used was TAI with RME approached recitation where the learning was carried out using TAI steps by integrating the RME approach and recitation method to support the improvement of mathematical literacy. The formulation of the problem in this study were (1) how is the quality of TAI learning with RME-related recitation towards students' mathematical literacy skills; and (2) how is the students 'mathematical literacy ability viewed from students' mathematical disposition.

METHOD

This study was a mixed method type of research with concurrent embedded design, which use quasi experiment as the quantitative research design. This study was started by conducting a preliminary study, collecting both quantitative and qualitative data, then analyzing and interpreting data. The study was conducted at SMP N 40 Semarang in April to May 2018 with the study population of all students in grade VII in the academic year of 20017/ 2018. Two classes were chosen out of 7 classes as the sample of the study. The two selected sample classes would be tested for their homogenity and average similarity to ensure both classes have the same initial ability. One class was chosen as the experimental class with TAI learning with RME approach recitation and the other one was chosen as the control class with Problem Based Learning (PBL) model.

The subjects of the study were selected based on the results of students' mathematical disposition questionnaires. The subject of the study was taken by considering the ability of students in expressing what they were thinking, so that the disclosure of the literacy process could be done well. The result of the grouping of mathematical dispositions in this study is presented in the following Table 1.

Table 1. The Grouping of Students' Mathematical Disposition

Category	Number of students	Percentage
High	13	39.4
Medium	17	51.5
Low	3	9.1
Total	33	100

Based on table 1, there are 13 students with a percentage of 39,4% having a high mathematical disposition, 17 students with a percentage of 51,5% having a medium mathematical disposition, and 3 students with a percentage of 9,1% having a low mathematical disposition. 6 selected students were divided into 2 students with high category of mathematical dispositions, 2 students with medium category of mathematical dispositions, and 2 students with low category of mathematical dispositions. Data sources in this study were students obtained from the results of the mathematics literacy ability test (TKLM), the results of the mathematical disposition questionnaire, the learning process achievement sheet, and the results sheet of the mathematics literacy skills interview. TKLM result was used as a quantitative research data source, while the qualitative ones were the students' TKLM answer sheets, the results of mathematical disposition questionaires, and the result of interviews on mathematical literacy ability. The quantitative data were tested by using normality test, homogeneity test, average similarity test, average test, classical completeness test, average difference test, and proportion difference test. While the qualitative data analysis was using data validity, data reduction, data presentation, and verification.

RESULTS AND DISCUSSION

The quality of learning

The measure of the quality of learning is seen from three stages: the planning stage, the implementation phase, and the evaluation stage. At the planning stage, validation of research instruments and learning tools has been carried out. The following table shows the details of validation scores for learning tools and the instruments of the study.

Table 2. The Result of Validation of Tools and Instruments

Tools/ instrument	Average	Criteria
Syllabus	4.35	Very good
Lesson plan	4.29	Very good
Student worksheets	4.17	Good
Teaching material	4.38	Very good
TKLM items	4.35	Very good
Completeness sheet learning process	4.30	Very good
Interview guide	4.42	Very good
Mathematics disposition questionnaire	4.25	Very good

From the results above, it can be concluded that the learning tools and research instruments are in the category of good and very good. Student worksheets are included in the good category because most assessment indicators get a score of 4. All devices and instruments meet the criteria so that they are proper to use.

At the implementation stage of the learning process, the learning carried out in this study is in good category. Based on the results of observations that have been made, the results of the average achievement score is 81.15%. Based on the researcher's observations, the students showed an increasing enthusiasm in the classroom activity. In discussing worksheets, students showed good interaction with group mates and teachers. This confirms the opinion of Nichols & Hall (1995) that group work carried out in cooperative groups encourages interaction among students. This is an indication that students are encouraged to reflect and describe the knowledge they have with their peers. This interaction encourages them to actively consider the processes they use in solving problems.

The implementation of recitation in form of group assignments outside the classroom was also proven increasing students' readiness in learning. This is seen when questions given in a classical way, students can answer questions from the teacher. Students are also ready to present the material of their group learning outcomes. This is in agreeing Mireles et al., (2013) that the initial task becomes a proper tool to make students preparing their class.

The quality of the assessment phase was seen from the effectiveness of TAI learning with RME approach recitation towards students' mathematical literacy abilities. Before testing the effectiveness, the initial data was tested at first. The results of the analysis showed that the data taken were distributed normally and had the same variance and there was no average difference from the two samples, this means the two sample classes that will be used in the study had the same literacy abilities. The final result of TKLM after learning was distributed normally and homogeneous. The final results of TKLM data are presented in the following table 3.

Table 3. The Recapitulation of Final Data of Students' TKLM

Aspects	Experimental Class	Control Class
Number of students	33	32
Average scores	75.82	71.69
Maximum score	93.00	86.00
Minimum score	60.00	62.00
Varians	63.53	43.51
Standard Deviation	7.97	6.60

The effectiveness of learning was basically determined on the results of the average test calculation, classical completeness test, average difference test, and proportion difference test. In calculating the completeness test and different test, the significant level or (a) used is 0,05. The average test was used to determine the average achievement of students' mathematical literacy abilities viewed from the number of students who have literacy ability test results exceeding the KKM score of 68. From the results of the average test of students' mathematical literacy ability using the one sample *t-test* of one side in the SPSS 16.0 program, obtained significance value of $(a) = 0{,}000 < 0{,}05$. This means that the average grade of mathematics literacy ability of the

experimental class students reaches the minimum completeness criteria (KKM).

The classical completeness test is a test to determine the proportion of students in the experimental class wether it is exceeds 75% or not. From the calculation of the proportion test, obatined the value of $z_{count} = 1{,}71$. The value of $z_{0,5-\alpha} = z_{0,5-0,05} = 1{,}64$. The value of $z = 1{,}71 > z_{0,45} = 1{,}64$, which means that the completeness proportion of students taught using the TAI learning model with RME approach recitation is more than 75%.

The average difference test was used to find out whether there are differences in students 'abilities in the class with the TAI learning model with RME approach recitation and students' ability in the class with PBL learning models. From the calculation of the average difference test using SPSS assistance, the Independent Sample T-Test obtained a significance value of $0{,}026 < 0{,}05$, which means that the average mathematics literacy ability of students in the class with the TAI learning model with RME approach recitation is more than the average students' mathematical literacy ability in class with PBL learning models.

Proportion difference test was used to determine whether there is a difference in the completeness proportion of students 'ability in the class with the TAI learning model with RME approached recitation and students' ability in the class with PBL learning models. From the calculation using the formula of proportion different test on final test of TKLM in the experimental class and control class, obtained values of $z = 1{,}338$. The value of $z = 1{,}338 > z_{0,05} = 0{,}12$, which means that the completeness proportion of students 'mathematics literacy ability in the class with the TAI learning model with RME approach recitation was more than the completeness proportion of students' mathematics literacy ability in the classroom with PBL learning models.

Based on the four test results above, it can be stated that TAI learning with RME approach recitation is effective on the students' mathematical literacy abilities. This finding supported some results of the previous studies. Findings of Ibadi, Mariani, & Waluya (2014) TAI cooperative learning with a character based concept mapping approach is effective to improve students' mathematical literacy ability. Rohman, Mulyono, & Dwidayati (2016) stated that TAI learning with a scientific approach is effective to improve students' algebraic abilities. RME learning has been proven effective for students' mathematical literacy (Karyadi, Suyitno, & Dwidayati, 2018). Wardono & Mariani (2018) stated that the mathematical process capability of students who use a realistic approach is better than those who use the scientific approach. RME can also grow the communication skills of junior high school students (Asikin & Junaedi, 2013). In addition, these results are also consistent with Sodikin & Hartatiana (2015) that the recitation method has a significant positive effect on students' understanding of mathematical concepts. The results of Santoso's research (2013) also stated that learning with pre-learning recitation methods can improve learning activities and learning outcomes.

It has been shown that at the preparation stage, the learning tools and research instruments are in good or very good category so that they are suitable for use. At the implementation stage, the learning process carried out in research is in good category. And at the assessment stage, TAI learning with RME approach recitation was declared effective. Then the TAI learning with RME approached recitation can be declared to be qualified on the ability of mathematical literacy.

The Description of Mathematical Literacy Ability Viewed from Mathematical Disposition

In this study, the notion of mathematical literacy ability viewed from mathematical disposition was to describe the mathematical abilities of students based on mathematical disposition categories which are grouped into 3 categories: high, medium and low mathematical dispositions. The description of mathematical literacy abilities from seven components of the mathematical literacy process based on the results of tests and interviews. The following is the description of mathematical literacy abilities viewed from the students' mathematical dispositions.

Generally, students included in a group of high mathematical dispositions have excellent mathematical literacy ability. Students with high mathematical dispositions can master four components of mathematical literacy very well, such as components of communication, mathematising, reasoning & argument, and devising strategies.

Another component was well mastered by students, which are symbolic, formal, and technical language and operation, and the other two components were mastered by some deficiencies which are not so significant are the representation and mathematics tools.

The groups of students who have a medium mathematical disposition were generally showing good mathematical literacy ability. Of the seven components measured, three components were well mastered: communicaton, mathematising, and devising strategies for solving problems. Two components of mathematical literacy were quite well mastered: the components of reasoning and argument, and using symbolic, formal, and technical language and operation. The other two components: representation and mathematics tools have not been mastered by students well. Students with medium mathematical dispositions solved problems by manipulating mathematical symbolic operations, but did a counting operation error so that the solution was consider incorrect. Students also did not write down units. Some of the obstacles that are oftenly experienced by students with medium mathematical dispositions are being less careful in performing counting operations, students are also still less precise in reasoning and less fluent in giving reasons. Another obstacle is that students are not used to doing problem representation activities in pictures and ignoring the use of rulers correctly.

Students in low mathematical disposition groups show poor literacy ability. Of the seven components of mathematical literacy, only three components were carried out quite well: communication, mathematising, and mathematics tools. In four other components: representation, reasoning & arguments, devising strategies for solving problems, and using symbolic, formal, and technical language and operation, are considered weak. Students with low mathematical dispositions have been able to change everyday problems into mathematical forms but not systematically. Students are also less diligent in working on the questions so that there are several problems that cannot be solved. Students are not careful in interpreting problems. Other than that, students are lack of confidence in communicating ideas and opinions both verbally and in the problem solving process.

Generally, students with high mathematical dispositions show their ability to solve every problem related to mathematical literacy very well. Students with medium mathematical dispositions are able to solve each problem but sometimes the results are not correct, while students with low mathematical dispositions tend to still have difficulties in solving problems correctly. This is consistent with the research of Rahayu & Kartono (2014) that mathematical dispositions have a positive effect on mathematical problem solving abilities. Although mathematics literacy abilities of students with low mathematical dispositions increase compared to the initial abilities, they still have not demonstrated good literacy ability yet. This is as stated by Moenikia and Babelan (2010) that students will find it difficult to get good achievement in learning mathematics if their attitude or disposition towards mathematics is not good.

The descriptions of mathematical literacy ability based on mathematical dispositions indicated that there are differences in the mastery of mathematical literacy ability among students of high mathematical disposition categories with students of medium and low mathematical disposition categories. Students who have high mathematical dispositions tend to have better mathematical literacy ability than students with lower mathematical dispositions. This supports the finding that mathematical dispositions affect student learning outcomes (Lestari, Suharto, Fatahillah, 2016). This finding is also consistent with the opinion of Moenikia and Babelan (2010) that there is a relationship between mathematic attitudes or dispositions with with the results of learning mathematics. This finding also confirms that mathematical dispositions become very important factors for students to support the activities and learning outcomes of mathematics and become successful in mathematics (Anku, 1996; and Beyers, 2011).

CONCLUSION

Team Assisted individualization learning with RME approached recitation has good quality on the students' mathematical literacy ability. students with high mathematical dispositions master the components of communication, mathematising, reasoning & argument, and devising strategies very well, the components of using symbolic, formal, and

technical language and operation were well mastered, and the other two components are quite well mastered. Students with medium mathematical dispositions mastering well the components of communicaton, mathematising, and devising strategies for solving problems, the components of reasoning and argumentation and using symbolic, formal, and technical language and operation were mastered quite well but they have not been able to master the other two components. Students with low mathematical dispositions can only mastered three components quite well, they are communication, mathematising, and mathematics tools, while the other four have not been able to be mastered.

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