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Effectiveness of team assisted individualisation-based realistic mathematics education

Inggri Ramadhani Widigda [1, a, *], Ali Mahmudi [2, b]

[1] Program Studi Magister Pendidikan Matematika, Universitas Negeri Yogyakarta
Jl. Colombo No 1, Karangmalang, Yogyakarta 55281, Indonesia
[2] Jurusan Pendidikan Matematika, Universitas Negeri Yogyakarta, Indonesia Afiliasi Penulis Pertama
Jl. Colombo No 1, Karangmalang, Yogyakarta 55281, Indonesia
E-mail: [a]inggriramadhani.2018@student.uny.ac.id, [b]alimahmudi@uny.ac.id
* Corresponding Author

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ABSTRACT

Penelitian ini bertujuan untuk mendeskripsikan perbedaan keefektifan pendekatan *realistic mathematics education* dengan setting *team assisted individualization* dan pendekatan *realistic mathematics education* ditinjau dari kemampuan pemecahan masalah dan motivasi belajar matematika siswa. Jenis penelitian yang digunakan adalah *quasi experiment.* Populasi penelitian ini adalah seluruh siswa kelas VIII SMP Negeri di Yogyakarta dan diambil dua kelas secara acak. Instrumen yang digunakan untuk mengumpulkan data adalah soal tes pemecahan masalah dan angket motivasi belajar matematika. Hasil penelitian menunjukkan: (1) pendekatan *realistic mathematics education* dengan setting *team assisted individualization* efektif ditinjau dari kemampuan pemecahan masalah dan motivasi belajar matematika siswa, (2) pendekatan *realistic mathematics education* efektif ditinjau dari kemampuan pemecahan masalah dan motivasi belajar matematika siswa, dan (3) terdapat perbedaan keefektifan antara pendekatan *realistic mathematics education* dengan setting *team assisted individualization* dan pendekatan *realistic mathematics education* ditinjau dari kemampuan pemecahan masalah dan motivasi belajar matematika siswa secara bersamaan.

This study aims to describe the differences in the effectiveness of the realistic mathematics education approach with team assisted individualization settings and the realistic mathematics education approach in terms of problem solving abilities and students' motivation to learn mathematics. The type of research used is quasi-experimental. The population of this study was all eighth grade students of Junior High School Negeri di Yogyakarta and two classes were taken randomly. The instruments used to collect data are problem solving test questions and a motivational questionnaire for learning mathematics. The results showed: (1) the realistic mathematics education approach with team assisted individualization settings was effective in terms of problem solving abilities and students' mathematics learning motivation, (2) the realistic mathematics education approach was effective in terms of problem solving abilities and students' mathematics learning motivation, and (3) there is a difference in effectiveness between the realistic mathematics education approach and the team assisted individualization setting and the realistic mathematics education approach in terms of problem solving abilities and students' motivation to learn mathematics simultaneously.

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INTRODUCTION

Education as an investment that supports future development is education that can develop students' potential and interests, so that they are able to face and solve life's problems they face. This is needed when students enter life in the world of work and society, because of the demand for the ability to apply what is faced in everyday life or in the future. In formal education, the learning process in the classroom is carried out through interactions between teachers, students and also effective learning resources. Permendikbud Number 22 of 2016 concerning Elementary and Secondary Education Process Standards states that the learning process in educational units is carried out interactively, inspiringly, fun, challenging, motivating students to actively participate, and providing sufficient space for initiative, creativity, and independence according to the talents, interests, and physical and psychological development of students. For this reason, each educational unit carries out learning planning, implementation of the learning process and assessment of the learning process to increase the efficiency and effectiveness of achieving graduate competencies. Permendikbud Number 21 of 2016 states that mathematics is one of the compulsory subjects taught at every level of education in Indonesia, both at elementary and secondary levels for public schools or for vocational and special needs schools. One of the competencies of elementary education levels for seventh to nineth grades is showing a logical, critical, analytical, careful and precise, responsible, responsive and persistent attitude in solving problems. So, it is undeniable that mathematics is a very important subject to learn and plays a role in education. The achievement of good mathematics learning in class is certainly a great hope that in a learning activity planned by educators. Students who initially do not understand or even do not know a mathematical material are expected to know and understand the material they are studying through the learning process planned by educators. Students who initially do not understand or even do not know a mathematical material are expected to know and understand the material they are studying through the learning process planned by educators. This opinion is based on the view of Nitko, A. J., & Brookhart (2011:18) which states that classroom learning in general is a form of communication by educators in organizing their students with the intention of directing them to achieve optimal learning goals. The success of students in following the mathematics learning process in general can indeed be described in the learning outcomes they achieve. One of the aims of learning mathematics is to enable students to have good problem-solving skills Kunter, M., Klusmann, U., Baumert, J., Richter, D., Voss, T., & Hachfeld (2013) and Roza, N., Arnawa, I., & Yerizon (2018). This is in line with the principles and standards of school mathematics from the National Council of Teacher of Mathematics (NCTM 2000: 21) which states "Problem Solving is an integral part of all mathematics learning" which means problem solving is an important part of mathematics learning. To achieve much success, students must learn how to select information, analyze it, and use problem-solving skills to make a discovery (Retnawati, H., Djidu, H., Kartianom, A., & Anazifa, 2018). When students learn to select relevant information, analyze it, and check the results, they will gain intellectual satisfaction. Their intellectual potential will grow, and they will learn to make discoveries. This is why problem solving is an important part of learning mathematics.

The government continues to strive to improve and advance mathematics education in Indonesia, but until now the quality of education in Indonesia cannot be categorized as good, especially in relation to students' problem-solving abilities. This is supported by the results of the Programme for International Student Assessment (PISA) which shows that Indonesian students' problem-solving skills are still not good. The results of the 2018 survey (OECD 2019:20) for mathematics, Indonesian students were ranked 75th out of 79 participating countries. (Soedjadi, 2000) said that students' skills in completing problem-solving questions depend on the description of the concepts that students have. Students are able to obtain good concepts if the education they receive is meaningful. However, mathematics teaching usually only emphasizes problems that use simple formulas. The impact is that the concepts obtained by students are not so strong, so that when students are faced with problem-solving questions they are still overwhelmed. Therefore, an education is needed that can make students understand concepts strongly and meaningfully in order to support student success in solving problems. One of the variables that plays an important role in supporting the success of mathematics learning activities is learning motivation.

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Motivation is the driving force of a person to do something in order to achieve a goal (Winkel, 1996). Students who have learning motivation will actively participate in class activities. Good learning motivation will produce good learning outcomes. The low ranking of PISA Indonesia in this case the low ability of students to solve mathematical problems can be influenced by the lack of motivation to learn mathematics of Indonesian students.

Schunk (2012) stated that making learning interesting, linking the material being studied with everyday life or student hobbies, involving students in determining learning goals and observing the progress of achieving the goals that have been set, and emphasizing the meaningfulness of learning are things that can arouse students' learning motivation. Furthermore (Suherman 2003: 26) explains what teachers must do so that their students have good motivation in learning mathematics, namely teachers must use various techniques, methods, and approaches in mathematics learning activities so that learning is more varied and not boring. Meaningful mathematics learning activities must continue to be developed in order to maximize students' learning motivation so that students' understanding of concepts and problem-solving skills can increase, learning that is close to students' daily or real lives is very appropriate. Therefore, in an effort to create a meaningful activity, a teacher must be skilled in choosing what mathematics learning approach is suitable, because this is a very important matter in a learning activity. In general, learning in schools requires teachers to be able to train students' ways of thinking and reasoning. So that in a learning process, students are required to be active while the teacher acts as a facilitator. The RME learning approach is one type of learning approach that feels very suitable to use, because realistic mathematical education or more often known as Realistic Mathematics Education (RME) is related to human activities and is related to reality, therefore a learning activity will certainly be more meaningful, because there is a relationship between real life and mathematics (Gravemeijer 1994: 182). The characteristics of RME itself also strengthen why RME is one of the right choices. According to (Palinussa 2013: 79) there are 5 special characteristics of RME, namely: using meaningful contexts, developing models to support progressive mathematization processes, student construction activities, interconnectedness and interactivity.

In addition to theoretically, empirically it has also been proven that mathematics learning using the RME approach is proven to be effective when viewed from problem-solving abilities (Mulyati (2017); Noviyana, H and Fitriani (2019); Malay (2020)). Based on the research results of Wahyuni & Jailani (2017), Lestari, KE, & Yudhanegara (2015) and Tusdia (2019:161) RME has also been proven to be effective in increasing students' learning motivation. Another important factor in learning is the selection of learning models. The Team Assisted Individualization (TAI) learning model can be used as one option to support the development of mathematical problem-solving abilities followed by good learning motivation. This is supported by the results of research conducted by Yundiana, Nurdiana, & Hestinova (2020) and Karim & Anshariyah (2016) which prove that learning with TAI is effective when viewed from students' abilities in solving mathematical problems and based on the results of research by Putri (2018) and Mawit & Harini (2011) it is proven that learning with TAI is effective when viewed from student motivation. The advantages of learning using TAI are that it is able to encourage students' interest in wanting to learn continuously wherever and whenever. In addition, it is also able to carry out student learning activities, which is because students are required to solve a problem. The TAI learning model aims to overcome students' difficulties in learning individually. Learning activities are used more for problem solving, the characteristic of the TAI type is that each student individually learns learning materials that have been prepared by the teacher. Individual learning outcomes are brought to groups to be discussed and discussed by group members and all group members are responsible for the overall answer as a shared responsibility. This can also certainly increase students' learning motivation because students are required to maintain their team, therefore each group member has a contribution to their group.

Based on the explanation above, it is clear that the RME approach and the TAI model are effective when viewed from the perspective of problem-solving abilities and learning motivation. because RME and TAI both allow students to be active in the learning activities they are going through (student centered) and support the creation of realistic and memorable learning activities for students, in this study learning using the RME approach is combined with the TAI model to obtain more effective learning.

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This is in line with research conducted by Darwis and Akib (2017) which states that the TAI learning model is effective when combined with a realistic mathematics approach, only the comparison class in the research they have done is a class with conventional learning. Meanwhile, in this study, the effectiveness of learning using a combination of the RME approach and the TAI model is compared to the RME class, which is what distinguishes this study from most similar studies in general, besides the selection of geometry material as one of the materials closest to students' real lives also clarifies the position of this study. Geometry is an important component of mathematics learning because it allows students to analyze and interpret objects around them and equips students with knowledge that can be applied in other fields of mathematics. Through geometry learning, students can develop their spatial abilities and can use their thinking about the relationships between the knowledge they already have with everyday life problems. Therefore, students need to build an understanding of geometric concepts and gain adequate skills related to geometry learning.

The facts found in the field are not in line with what is expected, there are still many students who have difficulty understanding and solving problems related to geometry topics even though geometry is one of the mathematical materials that is closest to students' real lives. Based on the results of the 2019 National Examination at the middle school level presented in Table 1. it is clear that the topic of geometry material is the topic of material with the lowest value, especially in the province of D.I. Yogyakarta when compared to other material topics such as Numbers, Algebra and Statistics, which shows that the topic of geometry material still needs more attention and is the reason it was chosen as the material studied in this study.

Table 1. Percentage of students who answered the 2019 national exam at middle school level correctly

No.	Material	Province	District
1.	Number	56,39	65,34
2.	Algebra	64,62	72,05
3.	Geometry	56,11	64,99
4.	Statistics	70,16	76,18

Data collection at the beginning before starting the research at a Middle School in Yogyakarta obtained information that students' problem-solving abilities were still lacking, based on the results of the pre-test, the average student score was 45.3, which had not been able to reach the minimum completeness standard or criteria of 70. Most students were not able to understand online learning activities as indicated by the problem-solving ability test. In addition, students were given practical formulas and teachers gave examples by working on a problem or question. This was acceptable to some students, but also caused difficulties for other students. When students were given a problem, many students could not do it. Regarding student motivation, when teachers share math problems with students that are found in learning resources such as books and often have no connection to real life and cannot be imagined by students, while the use of contexts that match students' daily lives can stimulate students' enthusiasm for learning. Most students attend online learning to listen to the teacher's explanation but very few students ask questions or respond. There are still some students who are absent from online learning. This shows that students' motivation to learn mathematics is lacking. This is supported by the pre-test results which show that only 23% of students have learning motivation that is included in the high category while the rest are in the low to moderate category. Based on the previous discussion, it is clear that the Realistic Mathematics Education (RME) approach and the TAI model are effective in terms of students' mathematical problem-solving abilities and learning motivation. Furthermore, it is known that the RME approach is effective when combined with the TAI model so that it is expected to be able to improve problem-solving abilities and increase student motivation. Therefore, it is necessary to describe the differences in the effectiveness of the realistic mathematics education approach with the team assisted individualization setting and the realistic mathematics education approach in terms of students' problem-solving abilities and mathematics learning motivation.

METHOD

The type of research used is Quasi Experiment research. In this study, the RME approach was used with a cooperative setting of the TAI type and the RME approach. The research design used was the Pretest Posttest Control Group Design.

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The steps taken in this experimental research were selecting two classes that were taken randomly to determine the experimental class and the control class, then giving a pretest at almost the same time. Furthermore, providing learning treatment using the RME approach with TAI settings in the experimental class and the RME approach in the control class. Furthermore, giving a posttest to both classes at relatively the same time to determine students' problem-solving abilities and learning motivation. The questions for the pretest and posttest were almost the same.

This research was conducted from May 2021 to June 2021. The subjects in this study were class VIIIA as the control class and class VIIIE as the experimental class. The variables in this study are the independent variable (free variable) and the dependent variable (dependent variable). The independent variable is the RME approach with TAI settings in the experimental class and the RME approach. The dependent variable is problem-solving ability and learning motivation.

Basically, the learning carried out in the experimental and control classes is almost the same, where both classes use RME as the basic approach to learning in the classroom, only in the experimental class, learning using RME is set with TAI type cooperative learning. So the outline that distinguishes learning activities in the two classes is that if in the control class students study contextual mathematics individually, then in the experimental class students study contextual mathematics in groups. Learning in the experimental and control classes goes through the following stages.

In the introductory stage, after the teacher opens the lesson by greeting, giving students the opportunity to pray, checking student attendance, preparing students to learn, giving apperception to students through question and answer activities, conveying learning objectives and motivation to students, in the experimental class that uses RME learning with TAI settings, the teacher divides students into several groups consisting of 3-4 students, while in the control classes that only use RME learning, the teacher does not place students in study groups, which then before entering the core activities, the teacher distributes student worksheets to each student through the Microsoft Teams application.

The first activity in the core stage is the activity of understanding the problem. At this stage, both students in the experimental and control classes work independently where the teacher asks students in the experimental and control classes to conduct observation activities on the problems that have been presented on the student worksheets, then the teacher guides students to relate things that students have previously known with other elements that students will learn through asking activities in the form of questions asked by students, where the teacher provides the answers needed by students.

The second activity in the core stage is the activity of planning problem solving, in this activity the teacher guides students to organize the knowledge that students have from previous activities by summarizing/collecting information that students have obtained. The next step is to monitor each group in the experimental class and each student in the control class and provide assistance to groups or students who have difficulties and correct when there are conceptual errors.

The third activity in the core stage is the activity of implementing problem solving planning. After the information needed by students is deemed sufficient, the teacher then asks students to reflect by rechecking what students have written in the implementing plan section, at this stage students in the experimental class help each other in checking in groups while students in the control class are required to check independently. Next, the teacher guides students to reflect by giving questions to students, then students in the experimental class discuss the answers with their group members, while in the control class students work independently, but at this stage the teacher still tries to supervise students and provide assistance as needed to students who have difficulty reflecting. In the experimental class, the teacher asks students as representatives of each group to convey the results of their reflections in front of the class, while in the control class the teacher only selects students randomly to display their work in front of the class. Next, the teacher asks students to respond to the results of the reflections submitted by their friends.

The fourth or final stage of the core activity is the stage of interpreting learning outcomes. After going through a series of learning activities, it is time for students to interpret the results of their learning activities. At this stage, the teacher gives students the opportunity to expand their knowledge by working on practice questions in the section on interpreting learning outcomes on the student worksheets that have been given. At this stage, group scores are calculated and group awards are given by the teacher.

After all the above activities are carried out, the next closing activity is carried out, where the teacher gives students the opportunity to ask questions if they are still confused or there is something

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that is not clear, directs students to make conclusions by asking questions about the learning that has been done that day and provides reinforcement of correct conceptual understanding, informs the material that will be studied at the next meeting, closes the learning by inviting one of the students as a representative to lead the prayer and say hello.

The data collection technique in the study was a written test in the form of an initial test (pretest) and a final test (posttest). The research instrument used was a descriptive test instrument that measures problem-solving abilities, as well as a questionnaire that measures learning motivation. The test was given to both classes. In compiling the test instrument, the question grid was first compiled. Next, the questions, answer keys, and scoring guidelines for each question item were compiled. Before the test questions were used, the test questions were assessed for validity and reliability.

Validity and estimation of instrument reliability

The test instrument was validated using the expert judgment technique. The test instrument was considered valid and declared suitable for use after being revised. Several items were revised after receiving input from experts. The validity results of each test item were qualified as good. The results of the estimation of the instrument reliability coefficient are presented in Table 2.

Table 2. Instrument reliability

No.	Instrument	Pretest Reliability	Posttest Reliability
1.	Problem Solving Ability Test	0.654	0.666
2.	Learning Motivation Questionnaire	0.946	0.958

The data analysis techniques used were descriptive analysis and inferential analysis. Descriptive analysis aims to determine the general picture of student achievement based on data obtained before and after being given treatment related to problem solving abilities and learning motivation. The data presented consists of the average, maximum score, and minimum score achieved. Meanwhile, inferential analysis aims to draw conclusions from the hypothesis. Inferential analysis is also used to statistically prove the proposed research hypothesis and answer the formulation of the problems set. Mathematics learning with the RME approach with TAI settings and the RME approach is said to be effective in terms of students' problem-solving abilities and learning motivation, based on minimum completeness criteria. Both learning approaches are said to be effective if the average problem-solving ability score reaches 70 and the average student learning motivation questionnaire score is more than 102. The decision criterion with H_0 is rejected if the significance value is less than 5%.

RESULTS AND DISCUSSION

Results

The results of the study showed an increase in students' problem-solving ability (PS) after participating in mathematics learning with the RME approach with TAI settings and in students with the RME approach. Students' problem-solving abilities in both groups are presented in Table 3. Likewise, with students' learning motivation (MS), there was an increase in students' scores after participating in mathematics learning with the RME approach with TAI settings and in students with the RME approach.

Table 3. Problem-Solving Test and Learning Motivation Score

Description	RME TAI				RME			
	Pretest		*Posttest*		*Pretest*		*Posttest*	
	PS	MS	PS	MS	PS	MS	PS	MS
Mean	46.32	97.87	82.45	118.48	44.16	95.55	76.19	109.84
Max Score	59	119	100	149	64	120	100	143
Min Score	30	67	63	100	33	71	31	79

The data analysis used is inferential statistical analysis. The data analyzed in inferential statistical analysis is data obtained before and after treatment. Before treatment, a normality test wascarried out on both groups, namely those using the RME approach with TAI settings and the RME approach. This

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test is carried out to determine whether the data distribution is normally distributed or not. The normality test used is the univariate normality test using the Shapiro-Wilk test with the help of the SPSS program. The results of the normality test can be seen in Table 5.

Table 5. Normality Test Results

Description	RME-TAI		RME	
	Pretest	*postest*	*Pretest*	*postest*
Problem-solving test Ability	0.106	0.167	0.142	0.196
Learning Motivation Questionnaire	0.268	0.053	0.419	0.842

Based on Table 5, the value of $p{-}value$ in the Shapiro-Wilk test of the mathematical problem solving ability test variable and the mathematics learning motivation questionnaire from the RME group with TAI and (RME) settings shows more than a significance value of 0.05, so $H0$ is accepted. This means that the univariate normality assumption in both groups is met.

The homogeneity test is intended to determine whether the data from the two experimental groups have a homogeneous variance matrix or not. The decision criteria used are if the significance value obtained is more than 0.05, then the data is said to meet the univariate homogeneity assumption test. The result of the problem solving ability homogeneity test is 0.512 and the result of the learning motivation homogeneity test is 0.701. This shows that the RME approach class with TAI settings and the RME approach class are homogeneous.

After treatment, a normality test was carried out on both classes. This test was conducted to determine whether the distribution of class data using the RME approach with TAI settings and the RME approach was normally distributed or not. The normality test used was the univariate normality test using the Shapiro-Wilk test with the help of the SPSS program. The results can be seen in Table 5.

Based on Table 5, the $p{-}value$ value in the Shapiro-Wilk test of the mathematical problem-solving ability test variable and the mathematics learning motivation questionnaire from the RME group with TAI and (RME) settings showed more than a significance value of 0.05, so $H0$ was accepted. This means that the univariate normality assumption in both groups is met. Effectiveness of the RME Approach with TAI Type Cooperative Setting in terms of problem-solving ability and learning motivation. To see the effectiveness of the RME approach with TAI Setting in terms of problem-solving ability and learning motivation, a univariate analysis of the one sample t test was carried out with the help of the SPSS program. The results can be seen in Table 6.

Table 6. Results of RME Effectiveness with TAI settings

Description	p-palue
Problem-solving test Ability	0,000
Learning Motivation Questionnaire	0,000

The results of the univariate test of problem-solving ability show that the Sig. (2-tailed) value of 0.000 is less than the significance value of 0.05, so $H0$ is rejected. This means that the average value of students' problem-solving ability in RME with TAI settings reaches 70. The results of the univariate test of learning motivation show that the Sig. (2-tailed) value of 0.000 is less than the significance value of 0.05, so $H0$ is rejected. This means that the average score of students' learning motivation in RME with TAI settings is more than 102. This shows that the RME approach with TAI Settings is effective in terms of students' problem-solving abilities and learning motivation.

Effectiveness of RME in terms of problem-solving abilities and learning motivation

To see the effectiveness of the RME approach in terms of problem-solving abilities and learning motivation, a univariate analysis of the one sample t test was carried out with the help of the SPSS program. The results can be seen in Table 7

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Table 7. Results of RME Effectiveness

Description	p-palue
Problem-solving test Ability	0,044
Learning Motivation Questionnaire	0,009

The results of the univariate test of problem-solving ability show that the Sig. (2-tailed) value of 0.044 is less than the significance value of 0.05, so $H0$ is rejected. This means that the average value of students' problem-solving ability in RME reaches 70. The results of the univariate test of learning motivation show that the Sig. (2-tailed) value of 0.009 is less than the significance value of 0.05, so $H0$ is rejected. This means that the average score of students' learning motivation in RME is more than 102. This shows that the RME approach is effective in terms of students' problem-solving ability and learning motivation.

Differences in the effectiveness of the two learning approaches

The test of differences in the effectiveness of learning approaches in terms of problem-solving ability and learning motivation was carried out using a univariate test with the help of the SPSS program. The results can be seen in Table 8.

Table 8. Results of Differences in Effectiveness

Description	p-palue
Problem-solving test Ability	0,092
Learning Motivation Questionnaire	0,027

Based on the results of the univariate test of problem solving ability, it shows that the Sig. (2-tailed) value of 0.092 is more than the significance value of 0.05, so $H0$ is accepted. This means that the average mathematical problem solving ability in RME with TAI settings is the same as the average mathematical problem solving ability value in RME. The results of the univariate test of learning motivation show that the Sig. (2-tailed) value of 0.027 is less than the significance value of 0.05, so $H0$ is rejected. This means that the average score of student learning motivation in RME with TAI settings is not the same as the average score of student learning motivation in RME.

DISCUSSION

Based on the description of the research data, the average learning outcomes of students with the RME approach with TAI settings tend to be better than the RME approach in terms of problem-solving abilities and learning motivation. This study shows that there is a difference between the RME approach with TAI settings and the RME approach in terms of problem-solving abilities and learning motivation. To see the effectiveness of the RME approach with TAI settings and the RME approach on students' problem-solving abilities and learning motivation, a univariate test was conducted which showed a Sig. (2-tailed) value of 0.092 on problem-solving abilities. This means that there is no difference in the effectiveness of the RME approach with TAI settings and the RME approach on problem-solving abilities and Sig. (2-tailed) of 0.027 on students' learning motivation. This means that there is a difference in the effectiveness of the RME approach with TAI settings and the RME approach on students' learning motivation.

These results indicate that learning the RME approach with TAI settings can improve students' mathematical problem-solving abilities and learning motivation. The results of this study are in line with research (Malay 2020: 18) which shows that the RME approach has an effect on the mathematical problem-solving abilities of junior high school students with an average of 76.895. The RME approach provides students with the opportunity to understand problems, plan solutions, implement plans, and represent the results of their work. The combination of the use of TAI settings in the RME approach can be indirect guidance or assistance from teachers and students to students so that they are able to understand problems, plan solutions and implement plans that are learned and represent the results of work using their own logic or in groups. This indicates that the integration of the RME approach with the TAI setting can help develop students' mathematical problem-solving abilities. The results of this

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study are also in line with research by Yundiana, Nurdiana, and Hestinova (2020: 189) which shows that the learning model using TAI can affect the mathematical problem-solving abilities of junior high school students with an average of 80.17. The results of the descriptive analysis of students' mathematical problem-solving abilities in the RME approach class with TAI settings showed an average increase of 36.85 from a pretest average of 43.58 to 80.41 on the posttest average. Based on students' learning motivation, the RME approach with TAI settings meets both criteria for learning effectiveness that have been determined so that the approach can be said to be effective in terms of students' learning motivation. The results of this study are in line with Tusdia's research (2019: 64) which shows that the RME approach has an effect on junior high school students' mathematics learning motivation. In addition, the results of this study are also in line with the research of Mawit and Harini (2011: 230) which shows that the learning model using TAI can affect junior high school students' mathematics learning motivation. Descriptive analysis of the posttest data on learning motivation in the RME approach learning with TAI settings showed an increase of 20.61 from an average pretest score of 97.87 to 118.48 on the posttest.

Based on the analysis of research data and hypothesis testing, it is known that the RME approach is able to improve students' mathematical problem-solving abilities and learning motivation, because the two criteria for learning effectiveness that have been determined have been met. The results of this study are in line with research (Noviyana, H and Fitriani 2019: 385) which shows that the RME approach has an effect on the mathematical problem-solving abilities of junior high school students with an average of 82.40. The RME approach provides students with the opportunity to understand problems, plan solutions, implement plans, and represent the results of their work using their own logical thinking. This indicates that the integration of the RME approach can help develop students' mathematical problem-solving abilities. The results of the descriptive analysis of students' mathematical problem-solving abilities in the RME class showed an average increase of 35.7 from a pretest average of 41.67 to 77.37 in the posttest average. Based on students' learning motivation, the RME approach meets the criteria for learning effectiveness that have been determined so that the approach can be said to be effective in terms of students' learning motivation. The results of this study are in line with Abdurahim's research (2016: 37) which shows that the RME approach has an effect on students' motivation to learn mathematics. Descriptive analysis of the posttest data on learning motivation in RME learning showed an increase of 14.29 from an average pretest score of 95.55 to 109.84 in the posttest. At the beginning of the learning activities in the RME approach with TAI settings and the RME approach, the same problems were given. Then each class continued with different activity steps according to the approach used. This difference in effectiveness is influenced by many factors that occurred during the study. For example, in the RME approach with TAI settings, there were teams, curriculum materials, group learning, reasoning and communicating. These two different solution flows affect the results of students' problem-solving abilities and learning motivation. In addition, there are also differences in initial abilities and final abilities of learning.

CONCLUSION

Based on the results of data analysis and discussion that have been explained in the previous chapter, three conclusions can be drawn in this study, namely: 1) The RME approach with TAI settings is effective in terms of students' mathematical problem solving abilities and learning motivation; 2) The RME approach is effective in terms of students' mathematical problem solving abilities and learning motivation; 3) The RME approach with TAI settings is more effective than the RME approach in terms of students' mathematical problem solving abilities and learning motivation. Therefore, the RME approach with TAI settings can be used as an alternative learning to improve junior high school students' mathematical problem-solving abilities and learning motivation. As a follow-up to this study, it is necessary to investigate the effectiveness of the RME approach with TAI settings and the RME Approach on other main materials and dependent variables.

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