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THE EFFECTIVENESS OF THE RME METHOD TO IMPROVE STUDENTS' UNDERSTANDING OF THE CONCEPT OF A SQUARE Abdul hakim Ma'ruf1, Ageng Triyono2*, Teguh Wibowo3 1,2STKIP Kusumanegara, Jl. Raya Bogor Km 24, Cijantung, Jakarta, Indonesia, 13770 3Universitas Muhammadiyah Purworejo, Jl. K.H. Ahamad Dahlan No. 3&6, Purworejo, Jawa Tengah, Indonesia, 54111 *ageng@stkipkusumanegara.ac.id ARTICLE INFO _ABSTRACT (10 PT) _ _Article history Received: Revised: Accepted: Keywords persegi, pendidikan matematika realisitik, ekspositori, quasi ekperimen Square, realistic mathematics education, expository, quasi-experimental _Siswa kelas VII masih mengalami kesulitan dalam menyelesaikan masalah kontekstual yang berkaitan dengan konsep persegi.

Melalui penelitian akan ditunjukkan bahwa Realistic Mathematics Education (RME) dan ekspositori lebih efektif jika didasarkan pada hasil post-test siswa setelah mempelajari konsep persegi. Tujuan penelitian dicapai dengan menggunakan metode eksperimen semu yang melibatkan 2 kelompok subjek, yaitu kelompok eksperimen sebanyak 33 siswa dan kelompok kontrol sebanyak 34 siswa. Kelompok subjek berasal dari populasi kelas VII di salah satu SMP di Kebumen.

Data yang dianalisis berupa hasil ujian akhir semester dan hasil posttest yang dikumpulkan dengan menggunakan instrumen tes berupa 10 soal pilihan ganda. Data dianalisis menggunakan uji keseimbangan, uji normalitas, uji homogenitas, dan uji efektivitas. Berdasarkan hasil uji-t dan hipotesis yang ditetapkan peneliti dapat ditunjukkan bahwa penerapan metode Realistic Mathematics Education (RME) lebih efektif dibandingkan dengan metode ekspositori. Kesimpulan tersebut juga diperkuat dengan nilai mean kelompok eksperimen yang lebih tinggi dibandingkan kelompok kontrol.

_ _ _Students in class VII still have difficulty solving contextual problems related to the concept of a square. Through research, it will be shown that Realistic Mathematics Education (RME) and expository are more effective if it is based on students' post-test results after studying the concept of a square.

The research objectives were achieved using a quasi-experimental method involving 2 groups of subjects, namely an experimental group of 33 students and a control group of 34 students. The subject group came from the class VII population at one of the junior high schools in Kebumen. The data analyzed is in the form of final semester exam results and posttest results collected using a test instrument in the form of 10 multiple choice questions.

The data were analyzed using balance tests, normality tests, homogeneity tests, and effectiveness tests. Based on the results of the t-test and the hypothesis determined by the researcher, it can be shown that the application of the Realistic Mathematics Education (RME) method is more effective than the expository method.

This conclusion is also strengthened by the mean value of the experimental group which is higher than the control group.  _ _How to Cite: Ma'ruh, A.H., Triyono, A. & Wibowo, T. (2024). The Effectiveness of The RME Method To Improve Students' Understanding of The Concept of a Square.

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https://doi.org/10.37058/jarme.v3i1.xxxx _ _ INTRODUCTION Geometry learning for elementary and middle level students in Indonesia focuses more on learning about shapes, sizes and positions. Geometry is taught in schools because it can bring positive benefits if studied by students (Kutluca, 2013).

Students' abilities in solving everyday problems related to geometry and room reasoning, as well as spatial thinking abilities at least increase after taking part in geometry lessons (Budiarto & Artiono, 2019; Suwito, 2018). Some of these benefits are the reason why geometry material is used as material that dominates mathematics lessons in the curriculum in Indonesia, which is around 42% of all mathematics material taught at junior high school level (Suwito, 2018).

Geometry material for beginners taught to class VII students includes lines and angles, as well as quadrilaterals and triangles. These basic geometric concepts should be easier for students at this level to understand. However, several research results conclude that

there are still many mistakes made by students in solving contextual geometry problems, especially in quadrilaterals with the topic of squares and rectangles (Afifah et al., 2022; Elsa et al., 2022; Elsa & Suhendra, 2022; Laviona et al., 2022; Prasetyo & Masduki, 2023).

One example of student error is shown by Elsa & Suhendra (2022) through Figure 1: Figure 1. Examples of Student Mistakes (from research by Elsa & Suhendra (2022)) Figure 1. Examples of Student Mistakes (from research by Elsa & Suhendra, 2022) Figure 1 shows a student error in the process of changing length units before calculating the area of ??a ceramic floor with a square shape. Another mistake that often occurs is when they make a settlement plan and complete the plan.

It is very likely that this is because they do not understand the concept and properties of squares well. The above conditions are the reason for researchers to conduct a study on ways to teach geometry material more effectively for junior high school level students, especially on the topic of squares. The results of this research can later be recommended to mathematics teachers to improve the geometry learning process in schools.

According to Kim et al., (2019), teachers who will teach must think about the quality learning process and the learning outcomes they want to achieve. And of course there have been many opinions that strengthen the conclusion that the use of certain learning methods that are in accordance with the learning objectives to be achieved will be able to improve students' understanding of concepts and learning outcomes (Alifah, 2019; Fahrurrozi et al., 2021; Khoerunnisa et al.,

2020; Warsita, 2018). Based on this opinion, this research will focus on the aim of testing the effectiveness of certain learning methods which are assumed to improve students' understanding of the concept of a square.

The results of the literature review show that one learning method that can provide more encouragement for students to actively contribute to constructing mathematical concepts is the Realistic Mathematics Education(RME) method (Jannah & Prahmana, 2019; Meryansumayeka et al., 2018; Putri, 2015; Saefudin, 2012). Through this learning method, students are trained to construct their mathematical understanding through contextual problems provided by the teacher (Maisyarah & Prahmana, 2020).

Next, the researcher will test the application of the Realistic Mathematics Education(RME) method with the initial assumption that this method is effective in increasing understanding of the concept of squares for class VII students. Another

consideration is based on several previous research results which concluded that there was an increase in student geometry learning outcomes after teachers implemented the Realistic Mathematics Education(RME) method. Like the research results of Kedhi et al.,

(2024), who concluded that the use of the Realistic Mathematics Education(RME) method can improve the understanding of the concept of rectangles for fourth grade students. The development of student worksheets which integrate realistic mathematics learning steps by Purba et al., (2022)has also been proven to have a positive impact on improving the learning outcomes of class IX students on the topic of building space.

Maisyarah & Prahmana (2020) who examined the learning process using the Realistic Mathematics Education(RME) method on the surface area of the flat side of geometric figures in class VIII also concluded that there was an increase in student learning outcomes as a positive impact of using this learning method. The questions that will be answered in this research are; Are the learning steps in the Realistic Mathematics Education(RME) method effective in increasing students' understanding of the concept of a square? Increased student understanding will be shown by the increase in learning outcomes they achieve after following learning using this method. This research certainly has differences from previous studies.

The choice of learning topic, namely square, and research subject, namely class VII, is different from previous research, as well as being one of the novelties of this research. The benefits of this research are that teachers will get an overview of the Realistic Mathematics Education(RME) learning process which is effective for increasing understanding of the concept of squares for class VII students.

METHOD This research aims to determine the effectiveness of applying the Realistic Mathematics Education(RME) method to increase understanding of the square concept for class VII students. The effectiveness of this method can be known after comparing it with other methods, namely the expository method, which has been applied by teachers in schools.

Therefore, this research will involve 2 groups, namely the experimental group which carries out learning using the Realistic Mathematics Education(RME) method and the control group which carries out learning using the expository method. The appropriate research method to achieve research objectives is the quasi-experimental method.

Using the quasi-experimental method, researchers will provide treatment to certain groups of subjects and observe the changes that occur after the treatment is given. Or in other words, researchers will observe the relationship between variables and clarify

the causes of the relationship between these variables (Sugiyono, 2018). The variables referred to in this research are learning methods as the independent variable and student learning outcomes as the dependent variable.

The research stages used were adapted from research by Triyono et al., (2024), as presented in Figure 2. / Figure 2. Research Stages Using Quasi-Experimental Methods (adapted from Triyono et al., (2024)) From Figure 2, it can be seen that before the two groups of subjects were given learning using predetermined methods, a balance test was first carried out.

The balance test aims to find out whether the experimental group and control group are in the same condition before each treatment is given (Budiyono, 2017) After that, learning will be carried out on square topics in 2 meetings. The control group carried out learning using the expository method following the learning planning steps set by the teacher at school.

The experimental group carried out learning using the Realistic Mathematics Education (RME) method, the steps of which are as presented in Figure 3. Figure 3. Realistic Mathematics Education(RME) Learning Steps (Shoimin, 2019) After both groups completed the entire learning process, they were given posttest questions. The posttest results were collected for further analysis to serve as a basis for drawing conclusions.

Research Subject The research population was all class VII from one of the junior high schools in Kebumen Regency which had 7 classes or groups. The research sample was selected using a stratified cluster random sample, namely by paying attention to the ranking in the population and grouping them into several groups (Sugiyono, 2018). The steps are that the 7 groups of students are sorted first from the highest rank to the lowest rank.

The ranking order is based on the results of the first semester final exam. After that, they are grouped into 3 group units, namely: (1) high group, consisting of classes with an average score of 1-2; (2) medium group, consisting of classes with ranks 3-5, and; (3) low group, consisting of classes with ranks 6-7. Next, one sample group was selected, namely the medium group.

Of the three classes in the medium group, class VII E was selected as the experimental group with a total of 33 students and class VII C as the control group with a total of 34 students. Data Collecting There are 2 data used in this research, namely: (1) final semester I exam results in the current academic year, and: (2) posttest results.

Data in the form of final semester exam results were obtained by researchers in as-is conditions from the school. The data in the form of posttest results were collected using test instruments. The test instrument consists of 10 multiple choice questions containing contextual material with square topics, which have been declared valid.

Data Analysis The data analyzed for the balance test is the final exam results of semester I. The balance test is carried out using t-test statistics, with the following steps: (1) determine the hypothesis, namely H0: μ1 = μ2 (Both groups of students come from populations that have low initial abilities the same), and H1: μ1 ? μ2 (The two groups of students do not come from populations that have the same initial abilities); (2) determine the significance level a=0,05; (3) carry out t-test calculations with the help of Microsoft Excel; (4) determine the Critical Region (DK)= {t|t<-ta/2 atau t> ta/2}, and; (5) determines the test decision, namely: H0 is rejected if t?DK. The data analyzed for the effectiveness test are the posttest results.

The effectiveness test must be preceded by a normality test and a homogeneity test as prerequisite tests. The normality test is carried out to find out whether the sample comes from a population with a normal distribution or not not (Supriadi, 2021). The normality test is carried out using the Liliefors Test(L) with the steps: (1) determining the hypothesis, namely: H0: μ1 = μ2 (the sample group comes from a normally distributed population), and H1: μ1 ? μ2 (the sample group does not come from a normally distributed population); (2) determine the significance level a=0.05; (3) carry out Liliefors Test(L) calculations; (4) determine the Critical Area (DK)= {L| L > La;n } where n is the sample size, and; (5) determines the test decision, namely: H0 is rejected if L?DK.

Next, a homogeneity test is carried out with the aim of finding out whether the groups to be compared have homogeneous variance or not (Budiyono, 2017). The homogeneity test was carried out using the Barlet Test(?2), with the following steps: (1) determining the hypothesis, namely: H0:s12 = s22 (the population variance of the two groups' data is homogeneous), and H1:s12 ? s22 (the population variance of the two groups' data is not homogeneous); (2) determine the significance level a=0.05; (3) calculate the Barlet test (?2) with the help of Microsoft Excel (4) determine the Critical Area (DK)={ ?2|?2 > ?2a;k-1}, and; (5) determine the test decision, namely H0 is rejected if ?2?DK.

The next research stage is an effectiveness test to find out whether the application of the Realistic Mathematics Education (RME) method is more effective than the expository learning method or not. t with the steps: (1) determine the hypothesis, namely H0: μ1=μ2 (RME method is not better than expository method in improving student learning outcomes on square topics), and H1: μ1>μ2 (RME method is better than expository in improving student learning outcomes on square topics); (2) determine the

significance level a=0.05; (3) carry out t-test calculations using Microsoft Excel; (4) determine the Critical Region (DK)={t|t > ta}, and; (5) determines the test decision, namely H0 is rejected if t?DK. The results of the test decisions are the most important conclusions from all stages of this research.

RESULT AND DISCUSSION Result Balance Test Results A balance test was carried out on the first semester final exam results data using a t-test assisted by Microsoft Excel. The calculation results show the t-test value (tobs) of 0,7684. With a significance level of a=0,05, the value of ttable = t0.025;65 =1,960 is obtained. Next, the Critical Area(DK) = {t|t < -1,960 or t > 1,960} can be determined. Based on the DK, tobs = 0,7684 ? DK. The test decision is that H0 is rejected if t?DK.

With the results of the calculation above, the opposite applies, namely H0 is accepted. Thus, it was concluded that the two groups of research subjects came from populations that had the same initial abilities. The next stage of research is the implementation of trials of learning methods that have been determined.

Learning Process Results Learning was carried out in 2 meetings. The material at the first meeting was the definition of a square and the perimeter of a square. The material at the second meeting was the area of ??a square and also the implementation of the posttest. The control group carried out direct or expository learning according to the learning plan determined by the school.

The following is a general description of the application of the Realistic Mathematics Education(RME) method in experimental groups. First, the teacher asks questions about what contextual problems the students already know related to the square topic. Second, the teacher provides an explanation of several contextual problems related to squares. Third, the teacher forms groups.

Fourth, students solve contextual problems given by the teacher in groups. Examples of contextual problems that students must solve are presented in Figure 4. Figure 4. Example of a contextual problem with a square topic Fifth, students make presentations, while comparing answers between groups and discussing the most appropriate alternative answers. Sixth, the teacher guides students to conclude the results of the discussion.

After the series of learning processes were completed, the two sample groups were given posttest questions. A summary of the posttest results is presented in Table 1. Table 1. Post test Results for Experimental Group and Control Group Group _Number of Samples (N) _Average Posttest Result _Standard Deviation _ _Learning using RME

method _33 _72,7273 _14,2286 _ _Learning using ekspository method _34 _66,2353 _15,2932 _ _Table 1 shows that the average learning outcome value for the experimental group is greater than the learning outcome for the control group, namely 72,7273 compared to 66,2353.

However, these results cannot be used as a basis for drawing conclusions which state that the application of the Realistic Mathematics Education(RME) method is more effective in improving learning outcomes or students' conceptual understanding of the topic of squares. This conclusion can only be drawn after an effectiveness test has been carried out.

Effectiveness Test Results The normality test and homogeneity test are carried out first as a prerequisite for the effectiveness test. The normality test in this study was carried out using the Liliefors Test(L) following established procedures with the help of Microsoft Excel. A summary of the normality test results is presented in Table 2. Table 2.

Summary of Normality Test Results of Student Learning Results Data Group _Lcount _N _Ltable _Test Decision _Information _ _Learning using RME method _0,0935 _33 _0,1518 _H0 accepted _Normal _ _Learning using ekspository method _0,1030 _34 _0,1497 _H0 accepted _Normal _ _Table 2. shows that the value of Lcount < Ltable, which means that at the significance level a = 0,05, the data on student learning outcomes in the experimental group and control group come from a normally distributed population. Next, a homogeneity test can be carried out.

The homogeneity test was carried out using the Barlet Test(?2) according to established procedures with the help of Microsoft Excel. A summary of the results of the Barlet Test (?2) is presented in Table 3. Table 3. Summary of Homogeneity Test Results Group _?2obs _?2table _Test Decision _Conclusion _ _Learning using RME and Expository methods _0,2352 _3,841 _H0 Accepted _Both classes have the same variance _ _The results of the homogeneity test in Table 3.

show that the value of ?2obs < ?2table, which means that at the significance level a = 0,05, the variance in the data population of the two sample groups is homogeneous. Next, an effectiveness test can be carried out. The effectiveness test using the t-test was carried out according to established procedures with the help of Microsoft Excel.

A summary of the effectiveness test results is presented in Table 4. Table 4. Summary of Effectiveness Test Results (t-Test) Group _Average Learning Outcomes _Standard Deviation _t-Test _ _ _ _ _tobs _ttable _ _Learning using the RME method _72,7273 _14,2286 _ 1,7976 _ 1,6450 _ _Learning using the expository method _66,2353 _15,2932 _

_ _ _The results of the effectiveness test calculations in Table 4. show the value of tobs = 1,7976. With a significance level of a = 0,05, the value of ttable = 1,6450. Next, we can determine the Critical Area(DK)= {t| t > 1,6450}.

Based on the DK tobs > ttable, then H0 is rejected and H1 is accepted, which means the Realistic Mathematics Education(RME) method is better than the expository method in improving student learning outcomes in class VII, especially on square topics. Discussion Based on the results of data analysis, researchers were able to show that the two sample groups were in the same initial condition, this was known from the results of the balance test.

Furthermore, a trial of learning methods was carried out according to the stages determined in this research, namely the experimental group carried out learning by following the steps in the Realistic Mathematics Education(RME) method, and the control group carried out learning following expository steps. In general, the implementation of the learning method trial in question went well according to the research plan.

At the end of the learning session, students carry out a posttest. The posttest results showed that the experimental group's mean score was better than the control group's mean score. The results of the posttest data analysis show that the data is normally distributed and the two population variances are the same (homogeneous), so that effectiveness can be directly tested using the t-test.

Based on the results of the t-test, it can be concluded that the Realistic Mathematics Education(RME) method is better than the expository method in improving the learning outcomes of class VII students, especially on the topic of squares. These better learning outcomes are possible because students: (1) build their own knowledge regarding the concepts of perimeter and area of ??a square, so that they do not easily forget these concepts; (2) feel more interested when asked to solve problems that fit the realities of everyday life; (3) their activity increases because they feel appreciated during discussion sessions and comparing answers between groups.

The conclusions of this study are in line with several previous research results. Among these are the conclusions obtained by Wulandari et al., (2016) after researching the application of Realistic Mathematics Education(RME) learning on the topic of building space in class V, which stated that there was an increase in student activity and learning outcomes. The research results of Kedhi et al.,

(2024) also show results that strengthen the opinion that the application of Realistic

Mathematics Education(RME) on the topic of rectangles can improve the numeracy skills of class IV students. The development of teaching tools and the development of learning media which includes the Realistic Mathematics Education(RME) method approach has also been proven to have a positive impact on improving student mathematics learning outcomes (Mei et al., 2020; Purba et al., 2022).

If based on the results of this research and the conclusions of previous research, the researcher suggests mathematics teachers to use the Realistic Mathematics Education(RME) method as an alternative in an effort to improve students' mathematics learning outcomes. CONSLUSION Based on the results of data analysis and discussion, it can be concluded that the application of the Realistic Mathematics Education(RME) method is more effective in improving learning outcomes and students' understanding of concepts regarding square topics, when compared to expository learning methods.

Several activities in the Realistic Mathematics Education(RME) method have a positive impact on increasing: students' ability to build their own knowledge; systematicity to solve contextual problems, and; students' self-confidence because they feel appreciated. Based on the results of this research, researchers recommend using the Realistic Mathematics Education(RME) method more to improve student mathematics learning outcomes REFERENCE Afifah, A. H., Susanto, & Lestari, N. D. S. (2022). Geometric reasoning of analysis level students in classifying quadrilateral.

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