The Effectiveness of the Power of Two Method on Mathematical Problem Solving Ability of Class XI MA Attarbiah Islamiah Kolaka Students

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Abstrak

Penelitian ini adalah penelitian eksperimen, dengan tujuan untuk mengetahui: (1) bagaimana kemampuan pemecahan masalah matematis siswa sebelum penerapan metode the Power of Two; (2) bagaimana kemampuan pemecahan masalah matematis siswa sesudah penerapan metode the Power of Two; (3) apakah metode the Power of Two efektif terhadap kemampuan pemecahan masalah matematis siswa. Populasi dalam penelitian ini adalah seluruh siswa kelas XI MA Attarbiah Islamiah Kolaka pada tahun ajaran 2020-2021 yang terdiri dari 1 kelas dengan jumlah sebanyak 30 siswa. Pengambilan sampel dilakukan dengan menggunakan sensus atau sampling total. Pengambilan sampel dilakukan dengan cara menggunakan sensus atau sampling total. Analisis yang digunakan adalah analisis deskriptif dan analisis inferensial. Selanjutnya hasil berdasarkan pengujian hipotesis: dilakukan statistik uji-t (one sampel t-test) diperoleh thitung = -8,53 dengan ttabel = -1,67. Terima H0 jika -1,67 ≤ thitung ≤ 1,67 karena thitung = -8,53 terletak diluar interval penerimaan H0 maka H0 ditolak dan H1 diterima. Dengan demikian terdapat perbedaan yang signifikan antara nilai kemampuan pemecahan masalah matematis siswa sebelum menggunakan metode the Power of Two dan setelah menggunakan metode the Power of Two.

Kata Kunci: Efektivitas, Metode, Kemampuan Pemecahan Masalah Matematis
A. Introduction

One of the educational materials in schools that teach students to think critically and logically is mathematics. Students' mathematics education is not only taught to memorize mathematical formulas, but students must also be able to use mathematics to solve mathematical problems that exist around them. Mathematical problems related to everyday life in mathematics subjects will make students understand and understand the benefits and knowledge they learn (Sa'adah, 2010: 1).

Mathematics is one of the basic sciences that must be studied because of its important role in the development of science and technology, as well as the power of human thought. According to Gaus (in Arifin, 2010:10) mathematics is often said to be mathematics is the queen of sciences. Thus, mathematics is one of the compulsory subjects that must be taught in all schools, starting from SD/MI, SMP/MTs, SMA/SMK/MA even in universities (Munawaroh, Surahmat, and Fathani, 2019: 91).

Studying mathematics is not only learning the concepts or procedures, but many things can emerge from the results of the mathematics learning process. Significance in learning mathematics is characterized by awareness of what is done, what is understood and what is not understood by students about facts, concepts, relations, and mathematical procedures. According to Afgani (2011), meaningfulness in learning mathematics contains the standards of the mathematics learning process, namely understanding, reasoning, communication, connection, problem solving, and representation in accordance with one of the objectives of mathematics subjects in secondary schools according to the National Standards Agency (BSNP, 2006:120) education is that students have problem-solving skills which include the ability to understand problems, complete models, and interpret solutions obtained (Mawaddah and Anisa, 2015:166).

The meaningfulness in learning mathematics is emphasized by Wetheimer (Afgani, 2011) that the problem solving obtained occurs because of the discovery of various ways of solving a problem. The method of solving problems obtained by students is the result of knowledge and therefore teachers must be able to help students give meaning to learning mathematics by building students' mathematical problem solving abilities to deepen students' understanding of mathematics (Mawaddah and Anisa, 2015:167).

One of the difficulties for students in learning mathematics is when working on story problems. Students have difficulty understanding what is the problem with the story. So that students' mathematical problem solving abilities are less than optimal. In addition, the problem-solving approach is a focus in learning mathematics which includes closed problems with a single solution, open problems with non-single solutions, and problems with various solutions (BSNP, 2006:123). Indicators of mathematical problem solving are: (1) understanding the
problem and planning problem solving; (2) create a problem solving process; (3) explain or interpret the original problem, and check the correctness of the answers (Sumartini, 2016:152).

To improve problem solving skills, it is necessary to understand problems, create mathematical models, solve problems by applying mathematical models that have been compiled, and draw conclusions. The use of LKS or Student Worksheets will improve students' ability to solve mathematical problems. In accordance with the problem-solving strategy according to George Polya, the problem-solving strategy is adopted by the following steps: (1) understanding the problem; (2) make a settlement plan; (3) implement the plan; (4) double-check the answers. From the four strategies, students are expected to be able to work on story problems by going through 4 stages: (1) knowing, including information about questions; (2) being asked, knowing the problem; (3) answered, planned and worked on the questions and drew conclusions about the final results of the story questions. (4) carefully re-examine the results or answers. The four stages of working on story problems will be given a score for each stage to measure students' understanding of problem solving in math story problems.

Based on the results of observations and initial discussions with the mathematics teacher at MA Attarbiah Islamiah Kolaka, information was obtained that the curriculum used was the 2013 revision of 2016, with the lecture learning method. However, students’ mathematical problem solving abilities are still lacking, this is indicated by when given story questions students still have difficulty working on the problems, because they do not understand what is the problem in story problems.

The results of the discussion above are supported by the initial test given by the researcher to class XI MA Attarbiah Islamiah Kolaka students. The test instrument was made based on indicators of students' mathematical problem solving abilities. The test was followed by 38 students with an average score of 64.27 below the KKM set by the school, which is 70. According to the Minister of National Education number 20 (2007:4) KKM is the criteria for learning completeness of each educational unit by considering certain things in its determination. KKM shows the percentage level of competency achievement so that it is expressed in a maximum number of 100 (Ediza, Saam, and Yakub, 2014:3).

The Power of Two learning method is a cooperative learning activity and reinforces the importance and benefits of the synergy of two people. This method has the principle that thinking together is much better than thinking alone. Learning activities with the power of two people are used to enhance learning and emphasize the benefits of synergy, namely that two heads are better than one (Naida, 2018:851).

One of the efforts that can be done by teachers is to use a method that can build students' mathematical problem solving abilities, namely one of the Power of Two learning methods in the learning process at school as an alternative learning that can improve students' mathematical problem solving abilities. XI MA Attarbiah Islamiah Kolaka.

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The steps of the Power of Two learning method are: 1) The first step, the teacher gives students questions or questions that require reflection of thought; 2) The second step, the teacher asks students to reflect and think about their own questions; 3) The third step, the teacher divides the students into pairs. Pairs of groups can be according to the absent list and can also be randomized, in the learning process after all students have completed their answers, form them into pairs and ask to share answers with others; 4) The fourth step, the teacher asks the pair to discuss looking for new answers. In the learning process, the teacher asks students to make new answers to each question by improving the responses of each individual; 5) The fifth step, the teacher asks students to present the results of their discussion. In the learning process, students are invited to discuss classically to discuss issues that are not clear or that are not understood, all pairs compare the answers from each pair to another pair. To end the teacher with the students conclude the right answer (Nurhuda, 2014:24).

Therefore, through the Power of Two learning method, students are expected to be able to formulate their own questions that are not much different from the questions given by the
teacher as well as from existing situations so that students are accustomed to solving problems and feelings can be resolved in the hope of increasing their abilities. students' mathematical problem solving. The Power of Two method can be said to be effective.

Learning activities in the classroom take place cooperatively, namely teaching designed to educate group cooperation, interaction between students, and a better learning experience from the teacher and from their group friends. Thus, based on the description above, the authors are interested in conducting research with the title "The Effectiveness of The Power of Two Method Against Mathematical Problem Solving Ability of Class XI Students of MA Attarbiah Islamiah Kolaka".

B. Methodology

The approach used in this study is a quantitative approach to the type of experimental research, this research includes Pre-Experimental design research. This research was conducted on November 6, 2020 to November 26, 2020 for the 2019/2020 academic year at MA Attarbiah Islamiah Kolaka. The population in this study were all students of class XI MAS Attarbiah Kolaka for the academic year 2019/2020 which consisted of 1 class with a total of 30 students. Determination of the sample in this study using the census or total sampling, census or total sampling is a sampling technique where all members of the population are all sampled. The design used in this study is a research design with One-Group Pre-test Post-test Design.

The research instruments in this study were test questions, observation sheets and documentation. Test questions are used to determine students' mathematical problem solving abilities. The test questions were given to class XI students at MAS Attarbiah Islamiah Kolaka at the beginning and end of the lesson. The results of this test are used to determine the effectiveness of the Power of Two Method on the mathematical problem solving ability of students in class XI MA Attarbiah Islamiah Kolaka. Observation sheets were used to obtain data on student activities during the learning process and data on teacher activities in managing class XI MA Attarbiah Islamiah Kolaka. Data collection was carried out during the learning process with the help of an observer. The documentation sheets used in this study were lesson plans, syllabus, test results, teacher and student observation sheets during the learning activities.

The types of data in this study are qualitative and quantitative data, where qualitative data is obtained from observations and quantitative data is data obtained from test results. The data obtained from the mathematical problem solving ability test are student learning outcomes. The data obtained at the end of the learning process. The test used in this research is in the form of an essay test. Observation sheets are used to obtain an overview of social life that is difficult to obtain by other methods, observations are made to examine so that exploitation functions, from the results of observations we will get a clear picture of the problem and perhaps instructions on how to solve it, so it is clear that the purpose of observation is to obtain various data from the ongoing learning process using the Power of Two method in class XI MA Attarbiah Islamiah Kolaka. Documentation technique according to Sugiyono (2015: 329) is a method used to obtain data and information in the form of books, archives, documents, written numbers and pictures in the form of reports and information that can support research.

The data analysis technique used in this study is quantitative and qualitative descriptive statistical analysis. Descriptive analysis in this study is an analysis of the effectiveness of students' mathematical problem solving abilities intended to describe or describe a research result but is not used to make broader conclusions. In this study, descriptive analysis was used to see the description of research data in the form of mathematical problem solving abilities from class XI MA Attarbiah Islamiah Kolaka, namely the Power of Two learning method and the conventional learning method on mathematical problem solving abilities through the mean, variance, and standard deviation values. The variance is a measure of how far a set of numbers or values are spread out from the mean. A high variance value indicates the data set is far from the average, whereas a low variance value indicates the data set is close or inclined to equal the average value. While the standard deviation serves to find out how close the existing values are to the average.

Inferential technique is a series of techniques used to assess, estimate and draw conclusions based on the data obtained, in this study the data used were two groups of related samples, therefore data analysis used t-test for the case of two related samples. Before using the t-test, the data must be tested for normality. The type of normality test used is the Kolmogorov Smirnov test statistic. After determining the normality of the data, the One Sample t-test was
then performed to determine whether there was a significant difference between the pre-test and post-test scores.

The formulation of the hypothesis in this study is $H_0: \mu_2 \leq \mu_1$ against $H_1: \mu_2 > \mu_1$

Information:

$\mu_1$: the average value of students' mathematical problem solving abilities before getting the Power of Two method treatment

$\mu_2$: the average parameter of increasing students' mathematical problem solving abilities after receiving treatment with the Power of Two method

$H_0$: the average mathematical problem solving ability using the Power of Two method is not better.

$H_1$: the Power of Two method is effective on students' mathematical problem solving abilities

C. Finding and Discussion

1. Findings

Analysis of students' mathematical problem solving abilities in arithmetic sequences and series material

Analysis of students' mathematical problem solving abilities in learning mathematics to provide an overview of the characteristics and differences in students' mathematical problem solving abilities before being given the Power of Two learning method treatment and after being given the Power of Two learning method treatment which can be seen through the average value (mean), median, mode, variance, and standard deviation.

The results of descriptive analysis on students' mathematical problem solving abilities, both before being given the Power of Two learning method treatment and after being given the Power of Two learning method treatment can be seen in table 1 below:

<table>
<thead>
<tr>
<th>Descriptive analysis</th>
<th>Before method treatment</th>
<th>After treatment method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>61,33</td>
<td>76,60</td>
</tr>
<tr>
<td>Median</td>
<td>64,00</td>
<td>75,00</td>
</tr>
<tr>
<td>Mode</td>
<td>48,00</td>
<td>74,00</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>8,29</td>
<td>6,65</td>
</tr>
<tr>
<td>Variance</td>
<td>68,78</td>
<td>44,18</td>
</tr>
<tr>
<td>Minimum</td>
<td>48,00</td>
<td>64,00</td>
</tr>
<tr>
<td>Maximum</td>
<td>72,00</td>
<td>90,00</td>
</tr>
</tbody>
</table>

Based on the results of the descriptive analysis in table 1, the average value of students' mathematics learning outcomes before the Power of Two method was used was 61.33 and the average value after the Power of Two method was used was 76.60. Shows that the average mathematical problem solving ability of arithmetic sequences and series is higher after using the Power of Two method than before using the Power of Two method.

With a variance value of 68.78 before treatment, it was higher than the value after treatment with a value of 44.18, which means that the small variance value after treatment is close to the average value. So the smaller the value of the variance, the better the results. While the standard deviation serves to find out how close the existing values are to the average. The smaller the standard deviation value, the closer these values are to the average in this case the average student score is 74.00. The data above shows that the standard deviation value in the class after treatment is 6.65 lower than before treatment, namely 8.29 which means it is close to the average so that the smaller the standard deviation value, the better the results.

Analysis of teacher activity observation sheets

The teacher's activity observation sheet is used to determine the teacher's ability to manage the class on the suitability of the learning process with the principles that exist in the
Power of Two learning method, the results of the teacher’s observations can be seen in Figure 1 below:

![Figure 1. Results of Teacher Activity Observation Sheet Analysis Using the Power of Two Method](image)

Based on the analysis of the teacher activity observation sheet in Figure 1 above, it can be seen that the percentage of the value of teacher activity in the learning process using the Power of Two learning model has increased, this shows that the teacher is active in the learning process and has followed the syntax and steps of the learning process. Power of Two according to the procedure.

*Analysis of student activity observation sheets*

Student activity observation sheets are used to determine student activity in the learning process. The results of these observations can be seen in Figure 2 below:

![Figure 2. Results of Analysis of Student Activity Observation Sheets Using the Power of Two Method](image)

Based on the results of the analysis of student activities in Figure 2 above, it can be seen that the percentage of student activity continues to increase with the Power of Two learning model. This shows that students are active during the learning process.

Inferential analysis is intended to test different hypotheses regarding students’ mathematical problem solving abilities before using the Power of Two method and after using the Power of Two method. Before we carry out the inferential test to test the hypothesis that has been proposed, the analysis prerequisite test is carried out first:

*Normality test*

The results of the normality test in this study used the Kolmogorov-Smirnov statistic for calculations manually or using the SPSS program using a significant level of 5% with the following conditions:
If \( D \leq D_k \) then the tested data is normally distributed. On the other hand, if \( D > D_k \) then the data is not normally distributed.

<table>
<thead>
<tr>
<th>Class</th>
<th>N</th>
<th>Statistic</th>
<th>Manual</th>
<th>( D )</th>
<th>( D_k )</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>XI</td>
<td>30</td>
<td>0.152</td>
<td>0.152</td>
<td>0.242</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>0.159</td>
<td>0.159</td>
<td>0.242</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>
Based on table 4.2 shows that in class XI MA Attarbiah Islamiah Kolaka using the power of two method, the value of $D = 0.152 \leq D_k = 0.242$ and before using the power of two method the value of $D = 0.159 \leq D_k = 0.242$, it can be concluded that, in class XI MA Attarbiah Islamiah Kolaka before and after using the power of two method with normal distribution.

**Hypothesis testing**

The following presents the results of data analysis using the one sample t-test on the significant increase in students' mathematical problem solving abilities before using the power of two method and after using the power of two method. With the test criteria "accept $H_0$ if: $-t_{table} \leq t_{count} \leq t_{table}$ in this case $H_1$ is accepted if $t_{count}$ is outside the $t_{table} \leq t_{count} \leq t_{table}$ with a significant level of 5%".

Table 3. Significance Test Analysis Results for Increasing Students' Mathematical Problem Solving Ability in Class Using the Power of Two Method

<table>
<thead>
<tr>
<th>$t_{count}$</th>
<th>$t_{table}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-7.41</td>
<td>-1.67</td>
</tr>
</tbody>
</table>

Based on table 4.1, it is obtained that $t_{table} = -1.67$ and $t_{count} = -7.41$ which means, accept $H_0$ if: $-1.67 \leq t_{count} \leq 1.67$ because $t_{count} = -7.41$ is located outside the $t_{table} \leq t_{count} \leq t_{table}$ interval then $H_0$ is rejected $H_1$ is accepted. Thus there is a significant difference between the value of students’ mathematical problem solving abilities before using the power of two method and after using the power of two method.

2. **Discussion**

**Students' mathematical problem solving skills in arithmetic sequences and series**

Based on the results of the study, it was found that descriptively the mathematical problem solving ability of students consisting of 30 students before using the Power of Two method showed a minimum score of 48, a maximum value of 72, an average (mean) 61.33, median 64, mode 48 with variance 68.78, and standard deviation 8.29. Meanwhile, after students learn to use the Power of Two method, they show a minimum score of 64, a maximum of 90, an average (mean) of 76.6, a median of 75, a mode of 74, a variance of 44.18, and a standard deviation of 6.65. These results indicate that students' mathematical problem solving skills using the Power of Two method are higher than before using the Power of Two method in arithmetic sequences and series.

This difference is caused because when learning to use the Power of Two method students have been trained to work on questions, besides that students are enthusiastic about participating in learning, interacting, and eager to do the exercises given by the teacher So that when working on the Post-Test questions, students do not experience difficulties in doing it.

**Teacher activity observation sheet**

The results of observations of teachers in managing learning classes using the Power of Two method, during 4 meetings showed that the observed aspects were generally well implemented, and succeeded in creating a conducive, comfortable atmosphere and encouraging students to be active in learning. The teacher also shows a friendly, friendly attitude, so that students feel comfortable and students are in a pleasant atmosphere. At the end of each meeting the teacher (researcher) discusses with the observer, in order to improve the appearance at the next meeting by paying attention to aspects that are considered low at the previous meeting.

The average result of the percentage of teacher activities using the Power of Two method is 95.83%. From the average value of the percentage of teacher activities using the Power of two method, it is included in the active category. This shows that in the learning process the teacher is active in following the steps of the Power of Two method in its application.

**Student activities in the learning process**

The observer’s observations on student activities in the learning process after using the Power of Two method, for 4 meetings showed that all aspects observed were generally well implemented. Students are enthusiastic in participating in learning, interacting, and eager to do the exercises given by the teacher. The average value of the percentage of student activities using the Power of Two method is 85.70%. From the average percentage of student activity in learning, it shows that student activities using the Power of Two method are included in the active category.
Learning effectiveness

Based on the results obtained where the students' mathematical problem solving ability before using the Power of Two method is 61.33, and the average mathematical problem solving ability of students after using the Power of Two method is 76.60 higher than the KKM set at school, namely 70. And the average result of the percentage of teacher activity is 95.83% and the average result of student activity is 85.70% has exceeded the minimum criteria of 80% of the implementation of teacher and student activities, so this method is said to be effective.

In other words, the application of the Power of Two method has proven to be effective in improving students' mathematical problem solving skills, especially arithmetic sequences and series in class XI MA Attarbiah Islamiah Kolaka. Therefore, to optimize mathematical problem solving skills, the application of the Power of Two method needs to be done. So it can be concluded that learning by using the Power of Two method is effective in improving the mathematical problem solving ability of XI grade students of MA Attarbiah Islamiah Kolaka.

Some of the limitations in this study are described as follows: 1) Observation of teacher activities in learning and student activities using the Power of Two method only uses 1 observer and is limited to the size of quantitative observations, and does not observe the extent to which the quality of activities and factors that influence the process learning process, so that the results of the observational analysis do not fully describe the class situation. This happened because of the limitations of researchers who did not prepare supporting facilities such as cameras and recording devices to record all student activities in the learning process; 2) Mathematics lessons in this study are only limited to arithmetic sequences and series material for 4 meetings, so that it does not describe the effectiveness of long-term learning for each material, especially sequences and series.

D. Conclusion

The Power of Two method is effective on the mathematical problem solving ability of XI grade students of MA Attarbiah Islamiah Kolaka. It is proven by comparing students' mathematical problem solving abilities. Where the students' mathematical problem solving ability after using the Power of Two method is higher than before using the Power of Two method.

E. References