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The Effect of the Write Pair Switch Method on Student's Reasoning Ability Based on Initial Ability

Madaling[1], Rissa Megavitry[2], Mas'ud Muhammadiah[3]

[1]Universitas Muhammadiyah Sidenreng Rappang, Maccorawalie, Kec. Panca Rijang, Kabupaten Sidenreng Rappang, Sulawesi Selatan
[2]Universitas Negeri Makassar, Jl. A. P. Pettarani, Tidung, Kec. Rappocini, Kota **Makassar**, Sulawesi Selatan
[3]Universitas Bosowa, Jl. Urip Sumoharjo No.Km.4, Sinrijala, Kec. Panakkukang, Kota Makassar, Sulawesi Selatan
madalingsyarif@gmail.com

Abstract

This study's goal was to determine the effect of the write-pair-switch method on the mathematical reasoning abilities of students who studied with conventional methods and those who studied with the write-pair-switch method. This study was carried out at one of the public high schools for the 2022–2023 academic year. A posttest-only control design was used in the quasi-experimental research methodology. The study sample consisted of 85 students, consisting of 43 control class students and 42 experimental class students. Each class is subdivided into 3 levels based on their initial mathematical ability, namely low, medium, and high levels. Two-way ANOVA is the method of data analysis employed. The findings indicated that students' mathematical reasoning skills were impacted by the learning strategies used. The degree of a student's initial mathematical proficiency affects their capacity for mathematical reasoning. There is no relationship between learning strategies and the degree of pupils' innate mathematical competence in terms of their capacity for mathematical reasoning.
Keywords: Write Pair Switch, Students' Mathematical Reasoning Ability, Early Mathematical Ability

Abstrak

Tujuan penelitian ini adalah untuk mengetahui pengaruh metode write-pair-switch terhadap kemampuan penalaran matematis siswa yang belajar dengan metode konvensional dan siswa yang belajar dengan metode write-pair-switch. Penelitian ini dilaksanakan di salah satu sekolah menengah negeri tahun ajaran 2022–2023. Sebuah desain kontrol posttest-only digunakan dalam metodologi penelitian kuasi-eksperimental. Sampel penelitian terdiri dari 85 siswa, terdiri dari 43 siswa kelas kontrol dan 42 siswa kelas eksperimen. Setiap kelas dibagi lagi menjadi 3 level berdasarkan kemampuan matematika awal mereka, yaitu level rendah, sedang, dan tinggi. ANOVA dua arah adalah metode analisis data yang digunakan. Hasil temuan menunjukkan bahwa kemampuan penalaran matematis siswa dipengaruhi oleh strategi pembelajaran yang digunakan. Tingkat kemahiran matematis awal seorang siswa mempengaruhi kapasitas mereka untuk penalaran matematis. Tidak ada hubungan antara strategi pembelajaran dan tingkat kompetensi matematika bawaan siswa dalam hal kapasitas penalaran matematis mereka.
Kata Kunci: Write Pair Switch, Kemampuan Penalaran Matematis Siswa, Kemampuan Awal Matematik

Corresponding author: Madaling
Email Address: madalingsyarif@gmail.com (Sidenreng Rappang, Maccorawalie, Kec. Panca Rijang)
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INTRODUCTION

The COVID-19 pandemic has affected Indonesia during the past two years. There are two settings in which learning takes place: remote learning (PJJ) and limited face-to-face learning (PTMT). This greatly limits the course of the learning process for students and teachers in receiving and conveying material to the fullest. With the enactment of PTMT and PJJ, students are looser and are not supervised while studying. PJJ typically uses Zoom or Google Meet for video conferencing. Only a portion of the body is visible during a video chat, namely the face, is visible. This makes it

difficult for teachers to see the readiness of students to learn. In addition, there is freedom in using the internet. This freedom also makes it easier for students to get materials and even answers to questions given by the teacher. These laxities make students reluctant to develop their mathematical abilities (Astuti et al., 2023).

The ease with which students access the internet during online learning also affects the improvement of their mathematical reasoning abilities (Muhammadiah et al., 2022; Kamaruddin et al., 2023)). Almost every problem posed can be solved instantly through the math app or web. This makes students unable to draw logical conclusions according to their understanding (Jacobs, 2004). The ease of communication between students, which is difficult to supervise by the teacher, is another factor contributing to kids' reluctance to develop their mathematical thinking skills (Sulistiawati, 2015; Muliadi et al., 2022). This makes students easily exchange answers without any self-understanding from each student. Most students who have systematic reasoning abilities are relatively fast, but they usually feel embarrassed to disclose the results of problem solving to teachers and peers because they feel unsure about the results obtained (Sumartini, 2015). There are a number of standards for mathematical thinking that students must meet in order to meet the NCTM's (National Council of Teachers of Mathematics) goal of using it in mathematics teaching. His capabilities include those related to reasoning, establishing connections, connecting disparate concepts, and communicating (Irwan et al., 2020).

Of course, It is necessary to use the right strategies to engage students' reasoning in order to improve their mathematical reasoning abilities. The write-pair-switch (WPS) method will be applied in this study (Muplihah, 2016). The purpose of Write-Pair-Switch (WPS) is to develop a cooperative learning model that can facilitate and provide assistance to educators in developing students' mathematical reasoning (Nugroho et al., 2023). According to Filsaime, through the process of cooperative learning, Students are able to understand different points of view, evaluate claims and evidence, and explain and support their arguments (Parinussa et al., 2023). In this study, cooperative learning with the WPS technique was employed to enhance students' mathematical reasoning skills in accordance with prior theories (Zulkarnain, 2020).

METHOD

The experimental research design was adopted in this study. The sample consists of two different classes, which will later receive learning using different methods. The write-pair-switch approach will be taught to the experimental class, whereas the traditional method will be taught to the control class. Samples were taken for two classes using the cluster random sampling technique, namely taking classes randomly. The method of gathering data for this study is through test results.

RESULT AND DISCUSSION

The data's sign value, as determined by hypothesis testing, is 0.008 < 0.05. H0 is disregarded based on the two-way ANOVA test's significance threshold. This indicates that the method has an impact on a person's capacity for mathematical reasoning. According to the previous explanation and the test results for mathematical reasoning ability, it can be stated that students' mathematical reasoning abilities employing the WPS method are better than those applying conventional methods. The sign value has an influence on the level of initial ability in mathematical reasoning ability, namely 0.000 < 0.05. With these results, H0 is rejected. This indicates that pupils' initial levels of aptitude have an impact on their capacity for mathematical reasoning. With this H1, as opposed to the preceding test, the sign value must be less than 0.00550. The effect of technique interaction and initial ability level has a sign value of 0.086 > 0.005 in data table 4.11. This indicates that H0 is disapproved. At the level of beginning ability, it can be argued that there is no interaction impact between the two approaches on mathematical reasoning skills. The significance value between the three groups of high KAM, medium KAM, and low KAM is 0.000 ≤ 0.005, which means H0 is rejected. This indicates that the high KAM, medium KAM, and low KAM groups of students in both classes had varying average levels of mathematical reasoning ability. All KAM levels receive a significance value of 0.000, indicating that there is a substantial variation in the mathematical reasoning skills of average pupils across all KAM levels.

As a result, there is a substantial gap in the mathematical reasoning skills between the experimental class utilizing the WPS approach and the control class using the conventional way. This study also showed that there was a relationship between starting ability level and mathematical thinking skills. Higher reasoning test scores are obtained by pupils with high initial ability levels compared to those with medium or low initial ability levels. So, it means the influence of early mathematical ability on mathematical reasoning ability. Evidenced again by the results of statistical tests using two-way ANOVA analysis. where the effect of initial ability receives a significance value of 0.000 and the influence of the approach receives a significance value of 0.008. The value is smaller than the two-way ANOVA test's 0.05 significant level, which indicates that both have an impact on a person's capacity for mathematical reasoning. According to Asih's research from 2019, high KAM has a significant impact on students' critical mathematical thinking patterns and that early mathematical talents affect students' mathematical critical thinking abilities. It was determined through assessing whether the method and innate mathematical prowess interacted that there was no interaction because the significance value for the test was 0.086 > 0.05. In line with previous research, which explained that there was no interaction effect on the application of the method.

Students are free to create their own ideas in classes using the WPS technique since they are acquiring their mathematical reasoning skills more quickly than students using conventional methods. Descriptively, students utilizing the WPS technique scored higher than those using the traditional

method on the average test of their mathematical reasoning skills, with scores of 64.29 and 57.87 respectively. The results of the hypothesis testing also indicate that the WPS approach has an impact on one's capacity for mathematical reasoning, with a significance value of 0.008 > 0.005. It can be argued that students' mathematical reasoning skills are better when using the WPS method than when using traditional techniques.

The outcomes of the students' capacity for mathematical thinking tests obtained the average value of each indicator of mathematical reasoning in the class with the WPS method at 64.29, while the average in the class with the conventional method was 57.85. It is clear that pupils who used the WPS method had higher scores than those who used the traditional approach. This is consistent with the outcomes of statistical comparisons between the WPS approach and the conventional method using the two-way ANOVA test, which indicate a significant value of 0.008 0.05. This indicates that the WPS method outperforms the traditional method in terms of yield value. According to the explanation above, the WPS approach has a favorable impact on how students' mathematical reasoning skills develop. as a result of the WPS method's phases, which allow students to develop original ideas. Based on the findings of the indicator-based display of student responses, students using the WPS method can construct their ideas better than students using conventional methods. Judging from the answers of students with the WPS method, which brings up more ideas and steps in solving a problem. In contrast, almost all students using the conventional method answered problems only with numbers without an explanation of each step they took. From these answers, we know that students with conventional methods only imitate what is exemplified without adding new ideas to the completion process.

According to the study's findings, the indicator of estimating solutions has the class's highest average score when employing traditional approaches. This shows that students using the WPS method are able to predict the correct solution. In contrast to the WPS method class, the highest average score is obtained on the indicator of constructing valid arguments. This is because students with the WPS method learn by coming up with their own ideas. That way, students understand more deeply what is being learned, so that students can compile valid arguments when asked to work on problems with these indicators. The best students' mathematical reasoning abilities with the WPS method are found in their indicators of making valid arguments. Shown by the highest average value of students' mathematical reasoning abilities, namely 71.43. The difference in value between the class using the WPS method and the class using the conventional method is quite large, namely 13.87. This is because in the WPS method, the students themselves build arguments, so that in the indicators of compiling valid arguments, students with the WPS method will find it easier to solve questions. Meanwhile, in the conventional method, it is difficult for students to construct valid arguments.

In the indicators of drawing logical conclusions, both classes using the WPS method and classes using conventional methods both obtained quite low scores, namely 48.81 and 47.09. Many were found on the answer sheets of students who worked on questions on this indicator that had not

been completely resolved. Most students succeeded in working on the questions to the completion stage, not yet drawing conclusions from what was done in accordance with the indicators to draw logical conclusions. This is probably because the indicator of drawing logical conclusions is in the last number, and many students are more focused on working on the questions in the first number first without taking into account the time allotted.

It was discovered that students' initial mathematical aptitude (KAM) got a significant value of 0.000 < 0.05 in the two-way ANOVA test, indicating that KAM also has an impact on mathematical reasoning skills. Each level of KAM has an impact on the results of students' mathematical reasoning abilities when they are presented alongside previous KAM. It can be said that pupils' ability to reason mathematically will increase in direct proportion to their beginning mathematical proficiency level. The results of a study by Laila Munawaroh et al., which discovered a connection between pupils' early mathematical proficiency and their aptitude for mathematical thinking, are in agreement with these ones. The interaction effect between the WPS and KAM approaches is investigated in the third two-way ANOVA test. A significant value of 0.085 > 0.05 is calculated using the two-way ANOVA test, indicating that there is no interaction between the method and KAM on the ability to reason mathematically. According to the study's findings, there is no interaction between the two variables the WPS and KAM methods or that they have no bearing on one another. This can be seen from the value obtained by the WPS method, which is always higher at each level of KAM compared to the conventional method.

CONCLUSION

These inferences are made in light of the research's findings: Learning strategies have an impact on pupils' capacity for mathematical thinking. This is obtained from the results of empirical testing with a two-way ANOVA test. As a result, students who apply the WPS method have higher mathematical reasoning abilities than students who apply conventional methods. It is also known that kids using the WPS technique have higher average scores on mathematical reasoning tests than students using the traditional method. The impact is also known based on the outcomes of the test of reasoning aptitude and the indications of developing strong arguments. In the indicator of constructing valid arguments, students with conventional methods get results that are far below those of students with the WPS method. This demonstrates that the approach has an impact on one's capacity for mathematical reasoning. The initial degree of mathematical aptitude has an impact on mathematical reasoning abilities. Because of this, pupils start out with strong mathematical skills, and their average score on tests of mathematical reasoning is higher than that of children who start out with weak skills. The method's interaction with a student's baseline level of mathematical aptitude has no impact on their capacity for mathematical thinking. Based on the outcomes of the two-way ANOVA test, this was decided. As a result, if the degree of initial ability is high, the control and experimental classes' reasoning abilities are also increasing. Whether or not the control and experimental classes' capacities

for reasoning are different, the results of the application of the WPS technique are the same in light of the students' pre-existing starting points.

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