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LAPS-HEURISTIC Learning Model Improves Mathematical Problem-Solving Ability

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ABSTRAK

Pembelajaran matematika masih menunjukkan hasil yang kurang maksimal. Hasil analisis data ditemukan bahwa sekitar 10% dari total siswa di bawah KKM. Tujuan penelitian ini yaitu menganalisis penerapan model pembelajaran LAPS terhadap kemampuan pemecahan masalah pada siswa Kelas V SD. Jenis penelitian ini yaitu penelitian kuantitatif. Desain yang digunakan yaitu quasi eksperiment. Desain eksperimen yang digunakan yaitu Nonequivalent Control Group Desain. Populasi pada penelitian ini yaitu kelas V di SD sebanyak 126 siswa. Teknik pengambilan sampel menggunakan simple random sampling. Jumlah sampel yaitu 28 siswa. Metode mengumpulkan data yaitu tes. Instrument pengumpulan data yaitu soal tes berbentuk essay. Teknik analisis data yang digunakan yaitu analisis deskriptif dan statistic inferensial. Hasil penelitian yaitu terdapat pengaruh yang signifikan model pembelajaran LAPS-Heuristic terhadap kemampuan pemecahan masalah matematika siswa kelas V SD. Disimpulkan bahwa model pembelajaran LAPS-Heuristic dapat meningkatkan kemampuan pemecahan masalah matematika siswa kelas V SD. Implikasi penelitian ini yaitu penggunakan model pembelajaran LAPS-Heuristic membuat siswa merasa senang dalam belajar matematika sehingga berdampak pada pemahaman dan kemampuan pemecahan masalah siswa menjadi meningkat.

ABSTRACT

Mathematics learning still needs to show more optimal results. The results of the data analysis found that around 10% of the total students were below the KKM. This research aims to analyze the application of the LAPS learning model to the problem-solving abilities of fifth-grade elementary school students. This type of research is quantitative research. The design used is a quasi-experiment. The experimental design used is the Nonequivalent Control Group Design. The population in this study is class V in elementary school, with as many as 126 students. The sampling technique uses simple random sampling. The number of samples is 28 students. The method of collecting data is a test. The data collection instrument was a test in the form of an essay. The data analysis technique used is descriptive analysis and inferential statistics. The research results are that the LAPS-Heuristic learning model significantly affects the math problem-solving abilities of fifth-grade elementary school students. It was concluded that the LAPS-Heuristic learning model could improve the math problem-solving abilities of fifth-grade elementary school students. This research implies that using the LAPS-Heuristic learning model makes students feel happy in learning mathematics, so it has an impact on students' understanding and problem-solving abilities to increase.

1. INTRODUCTION

The implementation of quality education in Indonesia aims to fulfill its full potential so that it has noble and knowledgeable morals and becomes responsible citizen. In creating quality learning activities, a good curriculum is needed (Azizah et al., 2018; Baumfalk et al., 2019). The curriculum guides achieving goals and strategies that can be applied to learning activities (Fauzan & Latip, 2016; Han et al., 2021). In addition, the curriculum can also be used as a guideline for developing teaching materials and applying learning techniques that are still appropriate to the curriculum and field conditions. It is why the role of the curriculum is so important, that it can achieve educational goals in a structured way (Rajagukguk et al., 2022; Wardoyo et al., 2020). Good curriculum management is needed as management in learning activities so that it is effective and efficient. Curriculum changes in Indonesia are currently still implementing the 2013 curriculum. The 2013 curriculum is a development of the previous curriculum, which aims to improve the quality of Indonesian education (Hamriana, 2021; Tiara & Sari, 2019).

During the pandemic, the government also issued a policy regarding an emergency curriculum, making it easy for educational units to manage online learning (Hadjeris, 2021; Lawrence & Fakuade, 2021; Wiryanto, 2020). The independent curriculum is one of the government's efforts to restore learning

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activities that will be launched in 2021. It also impacts learning activities that are fully carried out online (Baharuddin, 2021; Manalu et al., 2022; Rahmadayanti & Hartoyo, 2022). The development of the Merdeka curriculum is more flexible than the previous curriculum and focuses on essential material and developing student character and competence. The main characteristics of this curriculum are project-based learning activities that aim to develop soft skills and character according to the profile of Pancasila students (Evy Ramadina, 2021; Retnaningsih & Khairiyah, 2022). In addition, this curriculum focuses on essential material so that it has sufficient time to study in-depth and optimizes student's literacy and numeracy competencies.

However, previous research findings reveal that the quality of education in Indonesia is the main problem, as the quality of learning still needs to improve (Huda, 2020; Safitri et al., 2020). Other research findings also reveal that the quality of teaching must be emphasized in elementary schools (Biassari et al., 2021; Prabawa & Restami, 2020). Other research findings also reveal that many students still have low math scores (Juliawan et al., 2017; Widiarti et al., 2021). This problem shows that students' understanding of mathematics could be much higher. Besides that, many students also say that mathematics is very boring and very difficult (Suprianingsih & Wulandari, 2020; Wiryanto, 2020). Based on the observations made at the Udayana Gugus III school, it was also found that learning mathematics still needed to show more optimal results. The results of the data analysis found that about 10% of the total students were below the Minimum Mastery Criteria. The results of the interviews also found that the teacher still uses lecture learning so that the teacher dominates learning activities at home, and students only listen and take notes on the material. It causes students to be less fully involved in learning activities, making them less motivated to learn. It will certainly lead to less math problem-solving skills in students.

Based on these problems, we need a learning model that involves active students in constructing knowledge to improve their ability to solve mathematical problems (Juliawan et al., 2017; Widiarti et al., 2021). Problem-solving ability is an important component in learning mathematics. It causes learning activities to require a breakthrough to help students build interest in learning, especially in learning mathematics (Anisah & Lastuti, 2018; Novitasari & Shodikin, 2020). It is necessary so that students do not consider mathematics a difficult subject but rather fun. It also requires an appropriate learning strategy and approach to change students' thinking about fun mathematics (Harefa & La'ia, 2021). It causes teachers to need the right learning model to help students learn.

The learning method in the form of knowledge transfer is needed to support improving the quality of education. It causes the need for a new concept in solving math problems. It is expected to increase student understanding to solve problems systematically, thereby increasing learning achievement in mathematics (Anisah & Lastuti, 2018; Novitasari & Shodikin, 2020). Many things can be done to solve math problems well (Juliawan et al., 2017; Widiarti et al., 2021). One learning model that can be used to solve problems is LAPS (Logan Avenue Problem Solving)-Heuristic. The LAPS (Logan Avenue Problem Solving)-Heuristic learning model uses question words in every problem to stimulate students' problem-solving abilities (Azwardi & Sugiarni, 2019; Rahayu et al., 2019). The LAPS model is a student-centered learning model with a syntax for understanding problems, planning solutions, and checking.

The advantage of LAPS is that it can generate student curiosity and motivation in learning to increase knowledge (Novitasari & Shodikin, 2020; Suryani & Iqbal, 2018). Apart from that, other advantages are that it can increase the application of knowledge obtained by students and invites students to have procedures for solving problems. Previous research findings also reveal that learning models can help students improve problem-solving skills and student learning outcomes (Jayadiningrat & Ati, 2018; Juliawan et al., 2017). Other research findings also state that the LAPS learning model can improve student enthusiasm and learning outcomes (Purba & Sirait, 2017; Suryani & Iqbal, 2018). Based on this, it can be concluded that teachers solving math problems can use the LAPS learning model. This study aimed to analyze the application of the LAPS learning model to the problem-solving abilities of fifth-grade students at SD Negeri Gugus III Udayana.

2. METHOD

This type of research is quantitative research. The design used is a quasi-experiment. The experimental design used is the Nonequivalent Control Group Design (Widiantini et al., 2017). This experimental design uses two class groups: those using the LAPS-Heuristic learning model and the second using conventional learning. The location of this research was carried out at SD Negeri Gugus III Udayana, Mendoyo District. The research procedure includes three stages, the preparation stage, the implementation stage, and the end of the experiment. In the preparatory phase, interviews were conducted, and lesson plans and the LAPS-Heuristic model were prepared. At the implementation stage, they treat the experimental and control groups. The treatment was given six times. In the final stage, they analyze data and test hypotheses.

The population in this study was the fifth grade at SD Negeri Gugus III Udayana, with a total of 126 students. The results of the equivalence test obtained a Fcount of 1.74. The calculation results show 1.74 <2.01. It shows that the grade 5 math scores of Udayana Group III have equality. The sample of this research uses the sampling technique using simple random sampling. The equivalence test results showed that all elementary school fifth graders in Gugus III Udayana could become research samples. The results of the draw were obtained at SD N 5 Screening (control group) and SD N 8 Screening (experimental group), totaling 28 students. The method used to collect data is a test. The test method is carried out to obtain data in the form of assignments that students must do. The instrument used in collecting data is test questions in the form of essays. The questionnaire grid is presented in Table 1.

Table 1. Grid of Mathematical Problem-Solving Ability Instruments

No	Basic competencies	Indicator	Problem-Solving Ability Indicator
1	Explain and determine the volume of a geometric shape using volume units (such as unit cubes) and the relationship between cubes and cube roots.	3.5.1 Presenting solutions to problems related to volume cubes using unit cubes 3.5.2 Presenting solutions to problems related to the volume of a cube using volume units	1. Identify known data, questioned data, and data adequacy for problem-solving. 2. Identify strategies that can be pursued. 3. Carry out what has been planned 4. Check the correctness of the solution.
2	Solving problems involving the volume of a geometric shape using a volume unit (such as a unit cube) involves cubes and cube roots.	4.5.1 Solving problems related to the volume of geometric shapes by using volume units 4.5.2 Solving problems related to the volume of geometric shapes by using volume units involving cubes and cube roots	

The results of the instrument validity test using the Gregory formula obtained a result of 1.00, so the criteria are very high. The results of the validity test of the test items using the Product moment correlation formula get the results of 10 questions tested valid. Test the reliability of the items using the Cronbach-Alpha formula. The results obtained a test reliability of 0.74 (very high). The data analysis technique used is descriptive analysis and inferential statistics. Descriptive statistical analysis to test the mean, median, mode, SD, variance, histogram, and PAP scale of five. Inferential statistics to test the effectiveness of the LAPS-Heuristic learning model. The inferential statistics used are parametric analysis which includes normality and homogeneity tests.

3. RESULT AND DISCUSSION

Result

This study examines applying the LAPS-HEURISTIC learning model to improving mathematical problem-solving abilities. The results of this study will describe the data from the experimental group and the description of the data from the control group. The results of learning mathematics in the experimental group were obtained from post-test data on 14 students before being treated with the LAPS-HEURISTIC learning model. The results of the data analysis showed that the highest score was 82.50, and the lowest score was 52.50. The class range score was 31.00, and the number of classes used was 5, with a class length of 7. Based on the results of data analysis, the average score of the experimental group students was 74.14 with the category $74.14 \leq M \leq 100$, so the score learning outcomes are categorized as high. The results of the distribution of the mean, median, and mode in the post-test results of the experimental group are presented in Figure 1.

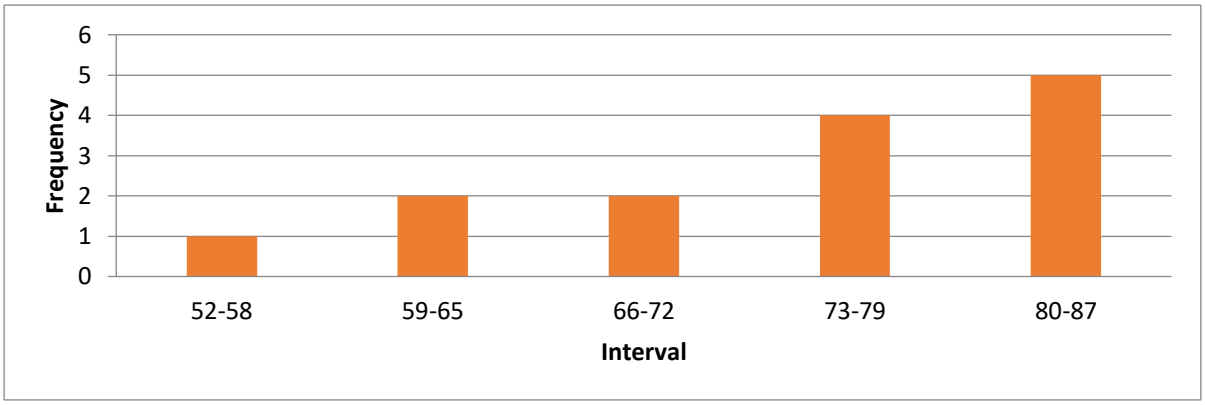

Figure 1. Graph of Experiment Group Data Distribution

Based on the results presented in Figure 1, it is known that the mean is 74.14. The median is 83.00. The mode is 65.5. The graph presents class data intervals for the thematic learning outcomes of the experimental group from 52-58 with a frequency of 1 to intervals of 80-87 with a frequency of 5. The second is a description of the control group data. The thematic learning outcomes of the control group were given to 16 students. The class range in the control group was 31.00. The number of classes used in the control group was 5. Based on the results of data analysis, it was found that the average score of the control group students was 68.78 in the category 58 ≤ M ≤ 75, so the student learning scores were categorized as high. The results of the distribution of the mean, median, and mode in the post-test results of the control group are presented in Figure 2.

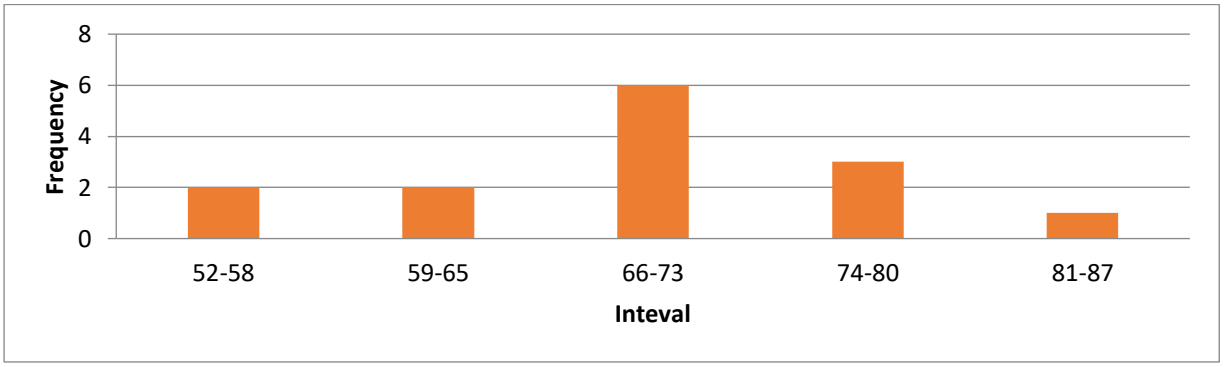

Figure 2. Graph of Control Group Data Distribution

Based on the results presented in Figure 2, it is known that the mean is 68.78. The median is 65.5. The mode is 70.7. The graph presents interval class data for the thematic learning outcomes of the control group from 52 - 58 with a frequency of 2 to class intervals 81 - 87 with a frequency of 1. Then the data is tested for data analysis prerequisites. The test is divided into the normality test, and the homogeneity of the variance carried out in the control and experimental groups. The normality test results are presented in Table 2.

Table 2. Summary of Data Normality Test Results

Group	X^2_{count}	X^2_{table}	Criteria
Experiment	6,77	11,07	Normal
Control	6,87	11,07	Normal

Based on the data analysis presented in Table 2, it was found that the X^2_{count} in the experimental group was 6.77, and the X^2_{table} with a significance level of 5% and dk = 5 was 11.07. It shows that the X^2_{hitung} of the thematic learning outcomes of the experimental group is smaller than the X^2_{table} ($X^2_{count} < X^2_{table}$) so that the experimental group's learning outcome data is normally distributed. X^2_{count} in the control group is 6.87, the X^2_{table} with a significance level of 5% and dk = 5 is 11.07. It means that the X^2_{count} of mathematics learning outcomes in the control group is smaller than the X^2_{table} ($X^2_{count} < X^2_{table}$) so that the data on mathematics learning outcomes in the control group is normally distributed.

The homogeneity test results found that the Fcount homogeneity of student mathematics learning outcomes was 2.03. At the same time, Ftable at a significant level of 5% with df1 = k − 1 = 2 − 1 = 1, and df2 = n − k = 28 − 2 = 26, obtained Ftable ie 4.23. These results show Fcount <Ftable. It can be concluded that the results of learning mathematics in the experimental and control groups are homogeneous. Then do the hypothesis testing using the sample t-test. The t-test results are presented in Table 3.

Table 3. Summary of t-test Results

Group	N	db	Average ($\bar{X}$)	Variance (s^2)	t_{count}	t_{table}
Experiment	14	26	83,00	131,79	5,46	1,70
Control	14		65,50	268,30		

Based on the t-test results presented in Table 3, it was found that tcount = 5.46 and t_{tabel} = 1.70 for db = 26 at a significance level of 5%. These results show that arithmetic t_{hitung} (5,46) > t_{tabel} (1,70) so that H0 is rejected and H1 is accepted. Thus, it was concluded that the LAPS-Heuristic learning model significantly affected the math problem-solving abilities of fifth-grade students at SD Negeri Gugus III Udayana in the 2021/2022 academic year.

Discussion

The data analysis found a significant effect of the LAPS-Heuristic learning model on fifth-grade students' math problem-solving abilities. It is because the LAPS-Heuristic learning model can improve mathematical problem-solving abilities. Problem-solving ability is important for students (Buchori, 2019; Priyanthi et al., 2017; Utami & Wutsqa, 2017). In learning activities, applying the LAPS-Heuristic learning model makes it easier for students to absorb information. The ability to solve mathematical problems in the experimental group is much better than in the control group. It can be seen from the learning outcomes of students who take part in learning (Bano et al., 2018; Dewanti et al., 2020; Lin et al., 2020). The learning activities in the experimental group ran optimally and conducive—learning activities that run optimally (Nur et al., 2018; Tiwow et al., 2020). Also revealed, research states that learning models that create a conducive environment can make students concentrate fully on learning (Atikah et al., 2020; Nusantara et al., 2021; Olivares et al., 2020). It will certainly impact student understanding which will increase while implementing the LAPS-Heuristic learning model.

Second, the LAPS-Heuristic learning model can increase students' enthusiasm for learning. The LAPS-Heuristic learning model is an innovation that intensifies learning in four stages. These four stages must be passed by students so that students will be active in participating in learning activities. In the first stage, students must understand the problem so students will think seriously. The findings of previous research also revealed that learning activities that involve students fully will increase student enthusiasm (Mahuda, 2017; Tias & Wutsqa, 2015; Yusri, 2018). Then in the next stage, students are also required to be able to plan problem-solving and collaborate with their friends. Collaboration between students and their friends will certainly add enthusiasm to students in learning because students are required to be active in learning (Nuryanti, 2019; Putri, 2018; Salim Nahdi & Cahyaningsih, 2018). In addition, students are also free to look for alternative answers to give the impression of joy in learning. Previous research friends also say that those who feel happy learning will make learning fun (Arthaningsih & Diputra, 2018; Wardani & Wiyasa, 2020).

Third, the LAPS-Heuristic learning model can create active learning. During the learning activities, students look more active because learning with the LAPS-Heuristic model creates a meaningful learning atmosphere. Students are stimulated to construct their knowledge (Aziza, 2019; Lesi & Nuraeni, 2021). The first stage is understanding the problem. Students are invited to think about solving problems at this stage to create a good learning atmosphere (Dadri & Putra, 2017; Lagur et al., 2018). It follows the curriculum, which requires every student to actively participate in learning so that learning activities become conducive (Dwi Sari & Setiawan, 2020; Yatini, 2021). In addition, students can also get an innovation in solving a problem that will shape student creativity (Nawafilah & Masruroh, 2020; Septian et al., 2020). In learning activities, students are also more enthusiastic because the thematic concepts discussed are always associated with student problems, so students understand the material more easily.

Previous research findings also reveal that learning activities that allow students to think can improve students' mathematical problem-solving abilities (Sirait & Apriyani, 2020; Utami & Wutsqa, 2017; Widayanti & Nur'aini, 2020). Other studies have also revealed that fun learning can improve students' mathematical abilities, so teachers must be able to design good learning (Arnawa & Wirdaningsih, 2017; Safithri et al., 2021). Based on this, it was concluded that the LAPS-Heuristic learning model could help students learn mathematics, thereby increasing their problem-solving. This research implies that

implementing the LAPS-Heuristic learning model will positively impact students' learning conditions. Students who participate in learning activities with this model will be more enthusiastic and active in learning, impacting student learning outcomes.

4. CONCLUSION

The data analysis found a significant effect of the LAPS-Heuristic learning model on fifth-grade students' math problem-solving abilities. It was concluded that the LAPS-Heuristic learning model could improve fifth-grade elementary school students' math problem-solving skills.

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