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THE INFLUENCE OF PROBLEM-BASED LEARNING ASSISTED BY MATHICA TO IMPROVE THE PROBLEM-SOLVING ABILITY OF ELEMENTARY SCHOOL STUDENTS

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Abstract

This study aims to determine whether the Problem-Based Learning Model assisted by Mathica influences the ability to solve mathematical problems in fifth grade students. The results of the statistical inference analysis showed that in the Wilcoxon test there was a significant difference between the problem-parameter scores of the problem-solving ability of the VA model assisted by Mathica Problem Based Learning and the parameter scores of the problem-solving ability of students in the V class model problem-based learning. From the results of this study, conclusions were drawn about the influence of Mathica-assisted Problem-Based Learning Models on students' problem-solving abilities.

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Keywords

Problem-based learning models; mathica; problem-solving capabilities

INTRODUCTION

Education is the interaction between educators (teachers) and learners (students) to achieve educational goals in a specific environment. This interaction is called educational interaction, the mutual influence between educators and students. Mathematics is a tool to develop the ability to think, so the use of mathematics is extensive both as a science, tool, and shaper of the expected attitude. Mathematics plays an essential role in community education as a direct object (facts, skills, concepts, principles) and an indirect object (critical, logical, diligent, able to solve problems, etc.). In facing the era of globalization, mathematics education has great potential in preparing human resources. This potential can occur if mathematics education can produce proficient students and successfully develop the ability to think logically, critically, creatively, initiatively and adaptively to change and development. Resoning is the process of thinking in the process of drawing conclusions (Malmia et al., 2019). Critical thinking is one of the skills that everyone in the 21st century should master (Saputra et al., 2019).

Mathematics is one of the subjects studied from the elementary school level to college. The subject has the aim that students can understand mathematical concepts, explain the relationships between concepts and apply these concepts accurately and efficiently in solving problems Masitoh & Prabawanto (2016). Based on this opinion, one of the abilities students must master in learning mathematics is understanding mathematical concepts in solving a problem. Therefore, the success of mathematics learning can occur if students can understand and master a concept presented. Providing mathematics learning that does not separate learning mathematics from everyday

experience, students will be able to aplly mathematics in everyday life and not quickly forget (Sukmawati, 2021).

Technology development in modern times has always been relevant to the influence of universal science, including mathematics. The critical role of mathematics in various ways will make human patterns advance. So it is essential to teach mathematics at every level of education, which is a provision for the development of abilities when applying mathematical language in explaining a situation. According to Erman & Dkk, (2003), mathematics studies relationships and patterns, art, language, tools, paths, and mindsets. The meaning of mathematics used as a language is that students can have communication skills in conveying their mathematical ideas. Students' expertise in communicating is helpful as a competency of what is learned and taught, but educators make efforts so that students or students can solve mathematical problems. Problem solving skill is an important part of mathematics curriculum (Yerizon et al., 2021).

Technology development in modern times is very relevant to the influence of universal science, including mathematics. The critical role of mathematics in various ways will make human patterns advance. So it is essential to teach mathematics at every level of education, which is a provision for the development of abilities when applying mathematical language in explaining a situation. According to Erman & Dkk, (2003), mathematics studies relationships and patterns, art, language, tools, paths, and mindsets. The meaning of mathematics used as a language is that students can have communication skills in conveying their mathematical ideas. Learners' expertise regarding how to communicate mathematically is helpful as a competence of what is learned and taught. However, educators make efforts so that students or students can solve mathematical problems.

Some of the goals in achieving success in mathematics learning are students' ability in mathematical communication to provide extensive opportunities for students to integrate and develop skills in communicating in writing and orally as well as displaying and explaining the material. Along with the objectives of mathematics education, nctm or the National Council of Mathematics Teachers says that in mathematics learning in schools, The teacher can pay attention to mathematical abilities, as follows: mathematical representation, mathematical reasoning, mathematical communication, problem-solving ability, and mathematical connections. From the previous, students' problem-solving ability is a standard under NCTM and the Ministry of National Education.

The importance of solving a problem can affect solving the problem facing students. Based on the results of researchers' observations in the field and problem-solving ability in mathematics subjects, many students still have difficulty solving problems. Students tend to be less able to do problems, lack confidence and students' basic mathematics skills are still minimal. Students lack operational independence in the learning process, so they depend on their peers, and when the teacher gives questions, sometimes students do not respond to them. It shows that students in the process of learning mathematics are still not confident and independent.

Based on the existing phenomenon, to choose a learning model, it is necessary to pay attention to several things, such as the

material to be delivered, the time available and the number of students and things related to the teaching and learning process. From this, researchers learned that students are still required to memorize formulas and solve problems according to the examples given. In addition, teachers also still use the direct learning model, namely the conventional learning model, so that the learning process does not involve students. It leads to a low interest in students' learning of mathematics lessons and the assumption that mathematics is a complex subject.

METHOD

The type of research used is experimental research. The research method used is a pseudo-experimental (Quasi-Experiment) design of a type of nonequivalent control group. The design used in this study was a nonequivalent control group design. In this study, two classes were sampled and given different treatments at the learning time. The class becomes an experimental class for learning using the Model Problem-Based Learning (PBL) approach assisted by mathica, namely the first grade.

In contrast, the control class is a problem-based learning model, that is, the second class. Provide a pretest of students' problem-solving abilities in experimental and control classes before giving treatment at the learning time. Then after the treatment ends in the two classes, a final test (posttest) of the student's problem-solving ability is held.

RESULT AND DISCUSSION

The Problem Based Learning model is a process used as a guide applied sequentially by a teacher, commonly called a teacher. It is to establish learning media that support learning activities so that students get the expected targets and the teaching and learning process smoothly. The concept of the learning process will be. Apart from a mature and correct concept, teachers must have various forms of learning that will support the success of students' learning steps. “Several models recommended study for use in the curriculum 2013 is a problem-based model learning” (Hayanah et al., 2019:144). Nugroho & Chotim (2013) states that Problem Based Learning is an approach in the learning process that initially determines the problem and then by solving the problem. To solve the problem, according to (Ha Roh, 2008), students need a new understanding to get problem (Nugroho & Chotim, 2013).

The PBL model has an essential difference from discovery learning. Discovery learning is based on discipline-based questions, and student inquiry takes place under the teacher's guidance and is limited to the scope of the classroom. In contrast, Problem Based Learning (PBL) begins with meaningful real-life problems where students have the opportunity to choose and conduct any investigation both inside and outside the school to the extent necessary to solve the problem. The goal of PBL is long-term learning that generates behaviour change and mastery, not just conceptual (Brownell & Jameson, 2004), to generate solutions (Wirkala & Kuhn, 2011).

Every problem encountered in everyday life cannot be fully said to be a problem. The problem is something that must be solved. A problem is a situation or question a person faces that cannot be immediately solved using specific rules or procedures. During the problem-solving process, every student needs to realize that the solution sought is a form of the actual learning process. The vital purpose of teaching problem-solving in mathematics is not only to procedures but tends to allow

students to think about what they think. When initially, there was no standard problem-solving process. The abundance of ways to solve problems has a lot to do with the level of difficulty and skilful abilities possessed by the individual who solves the problem. However, there are many ways or methods of solving the problem that experts think can be useful as a guideline.

Media is a graphic tool and photo graphics to capture, process, or recompose visual or verbal information (Anriyani, 2019). “the media has important role in creating a lesson…” (Manurung, 2020). The development of teaching materials with media makes learning more directed and attractive. So that students feel that they have great curiosity and focus on paying attention to learning.

According to Kustandi & Sutjipto, (2011), learning media is a tool that can help the teaching and learning process and clarifies the message's meaning so that it can achieve learning objectives better and perfectly. Learning media has four groups: print technology media, audio-visual technology-based media, computer-based technology-based media, and media combined with print and computer technology.

From experts' opinions, learning media is a tool to convey learning materials so that learning takes place effectively and efficiently. The learning media used in this study is visual learning media. According to Wina (2008) visual media is a medium that we can only see and does not contain sound elements. Visual media is a medium that involves the sense of sight. This medium can only convey messages through the sense of sight; Other senses, such as the ears, cannot be used for this visual medium. Utilization of visual media in Problem Based Learning will encourage student creativity, increase curiosity, and train students to be able to think critically and logically (Devi & Bayu, 2020, h. 241). The visual media used is the media "Mathica". This media will explore the problem-solving skills of students presented with a problem. According to Olivia et al., (2020), this medium's objectives are to train students to recall the subject matter, Increase student concentration, Make students more thorough, and drive boredom in the teaching-learning process.

This research is SDN Ungaran 01, with the study population being VA and VC class students in the odd semester of the 2022/2023 academic year. This research is an experimental study. Researchers used quasi-experiments to determine whether the Mathica-assisted Problem Based Learning Model affected the ability to solve mathematical problems in grade V students of SDN Ungaran 01. The sample taken was as many as two classes, namely the VA and VC classes, where the VA Class was an experimental class with 25 students while the VC class was a control class with 25 students. In this study, researchers gave treatment in the form of a problem-based learning model assisted by mathica in the VA class and a problem-based learning model in the VC class.

To provide an overview of students' mathematical problem-solving abilities in the experimental class with the application of the mathica-assisted Problem Based Learning Model carried out in the VA class of SDN Ungaran 01. The following researchers present a statistical breakdown of the mathematical mass of students in the experimental class after treatment.

Table 1 Experimental Class Problem Solving Ability Description Statistics

Statistics	Pretest Value	Postest Value
Sample	25	25
Mean	42,52	88
Standard Deviation	10,4202	7,308
Minimum Value	35	80
Maximum Value	55	100

Sumber: Research result, 2022

Based on the table above, the researcher concluded that the pretest score of solving mathematical problems of students before applying the mathica-assisted Problem-Based Learning Model in the VA class on revival and mirroring materials obtained an average score of 42.52 and a standard deviation of 10.4202. Students obtained the lowest score, namely 35, while students, namely, 55, obtained the highest score. In contrast, the posttest score for solving students' mathematical problems after the application of the Mathica-assisted Problem Based Learning Model in class V A on the material of revival and mirroring material obtained a mean value of 88 and a standard deviation of 7,308. The lowest score obtained by students is 80, while the highest score obtained by students is 100.

Provides an overview of students' mathematical problem-solving abilities in the control class by applying the Problem Based Learning model in the VC class of SDN UNGARAN 01. The following are statistics on solving mathematical problems of students in the control class after being given treatment.

Table 2 Control Class Troubleshooting Capability Description Statistics

Statistics	Pretest Value	Postest Value
Sample	25	25
Mean	42,32	80
Standard Deviation	7,207	7,106
Minimum Value	30	70
Maximum Value	50	88

Sumber: Research result, 2022

Based on the table above, the pretest value of solving students' mathematical problems before applying the Problem Based Learning Model in the VC class of SDN Ungaran 01 obtained a mean value of 42.32 and a standard deviation of 7.207. The lowest score obtained by students was 30, and the highest score obtained by students was 50. In contrast, the posttest score for solving students' mathematical problems after applying model problem-based learning in the VC class obtained a mean value of 80 and a standard deviation of 7.106. The lowest score obtained by students is 70, and the highest score obtained by students is 88.

Experimental research on the effect of the Mathica-assisted Problem Based Learning Model on the mathematical problem-solving ability of grade V students of SDN Ungaran 01 based on the assessment of students' mathematical problem-solving ability tests. It results in different average values between the experimental and control classes. This research was carried out in experimental and control classes three times.

The results of the t-test data analysis showed that students' problem-solving abilities in the experimental class using the Mathica-assisted Problem Based Learning Model were excellent. It differs from the problem-solving ability of students in the control class who use the Problem Based Learning Model. From the results of the analysis using the t-test (paired sample t-test), it appears that the significance level is 5%, and the p-value (sig. (2-tailed)) is 0.525 > 0.05. It means that H0 does not apply and H1 is accepted; that is, the mathematical problem-solving ability of students in the Experimental class is higher than the mathematical problem-solving ability of students taught in the Control class.

In the implementation of the research, it appears that students who get a mathica-based Problem Based Learning learning model are more confident in doing the given questions. Meanwhile, many students who get Problems Based Learning lack confidence, resulting in many forgetting formulas and trying to cheat. We can see this in the learning carried out during the learning process in the classroom because students who use the Problem Based Learning learning model get help from mathica students who are more enthusiastic. However, in the direct learning model, only brilliant students do it, while those who are not good at following it so that those who become students are less difficulty in doing problems.

CONCLUSION

After being explained earlier, the researcher concluded that the learning of class V A students with a Problem Based Learning Model assisted by Mathica had an excellent ability to solve problems, obtaining an average score of 88. The maximum score of the student is 100, and the minimum score of the student is 80. Class V C students learning with The Problem Based Learning Model have an excellent ability to solve problems obtaining an average score of 80. The maximum score of the student is 88, and the minimum score of the student is 70.

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