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Application of Double Loop Problem Solving to Improve Mathematical Literacy Skills in Junior High School Students in Learning to Build a Flat Side Space

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Abstract: *The implementation of learning that tends to be monotonous without paying attention to the active participation of students is one factor contributing to the low mathematical literacy students' skills. The purpose of the study is to explain how to improve mathematical literacy after using the double-loop problem-solving method in learning to build a flat side space. The type of research conducted uses qualitative descriptive with a case study approach. This research was conducted at SMPN 2 Bangsalsari on grade VIII students totaling 8 boys and 7 girls. The data collection technique uses tests, interviews, and observations Interview sheets, observation sheets, and test questions with descriptions are used in the data collection tool. According to the study's findings, both teacher and student activities increased during the course of the study. This is consistent with an increase in the average score for mathematical literacy skills following the introduction of double-loop problem-solving learning. Thus, it very well may be presumed that the use of the twofold circle critical thinking learning model can further develop the numerical proficiency capacity of middle school understudies.*

Key words: Mathematical literacy, double loop problem solving, building a flat-sided space

INTRODUCTION

Mathematics learning is a process of relationships between learning components to spread students' thinking skills in problem-solving. Mathematics learning can help students to construct mathematical concepts through their abilities. The ability to reason, logic, creative thinking, problem-solving skills, and other mathematical skills can be developed with mathematics (Murtianto, 2013).

A person's ability to efficiently formulate, use, and interpret mathematical concepts in the context of everyday problems is called mathematical literacy. Students' Mathematics literacy is more than just numeracy skills but also the ability to solve problems using logic and critical thinking. The facts in the field show that there is still a lack of mathematical literacy skills in students. According to Mia Siswowyoyo & Kadir Tiya (2018), if there is an improvement, Indonesia cannot reach the international standard of aptitude for understanding math. So far, the results of observations at the location show that the average percentage of students' mathematical literacy skills at SMPN 2 Bangsalsari is 25%.

An elective methodology that can be utilized for the above issues is to utilize the Twofold Circle Critical thinking (DLPS) learning model. In addition to improving problem-solving abilities, the DLPS learning model can also improve critical thinking abilities, the quality of learning, learning outcomes, and student learning achievement. The mathematical approach known as DLPS places an emphasis on the search for the occurrence of the problem. This is in line with the skills of mathematical literacy, which require students to be able to identify problems, formulate problems, solve problems, and interpret mathematical problem-solving that has been done by concepts and contexts that are already in place.

This review aims to ascertain the improvement of mathematical literacy after using the double loop problem-solving method in learning to build a flat-sided space According to the description and general description The researcher's goal is to study " Double Loop Problem Solving as a Method for Enhancing Mathematical Literacy Skills in Junior High School Students in Learning to Create a Space with a Flat Side".

METHOD

The kind of study conducted uses a method that is qualitatively descriptive. The case study approach plans to describe the improvement of mathematical literacy skills after the program itself of double-loop problem-solving in being able to build a flat side space. This research was conducted at SMPN 2 Bangsalsari on grade VIII students totaling 8 boys and 7 girls. In this study, narrative data analysis techniques are used. Narrative analysis techniques focus on delivering data with a narrative or story.

The data collection technique uses meetings, perceptions, and tests. The device for gathering data uses test questions in the form of interview, observation, and descriptions. The instruments used in this study are 1) Interview conducted directly with grade VIII students of SMPN 2 Bangsalsari. 2) Observation, which is observing teachers and students when mathematics learning takes place in the classroom. 3) Test to find out the extent of students' understanding of the material studied. The test that will be given to students is the shape of a description made up of 5 questions based on mathematical literacy. Students' mathematical literacy skills will be analyzed with aspects of mathematical literacy skills (NCTM, 2020) and guidelines for calculating the level of math literacy as follows:

Table 1. Indicators and Guidelines for Mathematical Literacy Ability Scoring

No	Aspects of Mathematical Literacy	Description	Score
1	Formulating real problems in problem-solving	• Able to recognize and plan issues appropriately.	4
		• Able to recognize and plan issues but overcoming them is not appropriate.	3
		• Able to recognize and plan issues but overcoming them is not appropriate and inappropriate.	2
		• Unable to identify and formulate problems.	1
2	Using concepts, facts, procedures, and reasoning in problem-solving	• Able to apply mathematical concepts or procedures and use the right calculation formulas or operations	4
		• Able to apply mathematical concepts or procedures and use formulas or calculation operations but not precise.	3
		• Able to apply mathematical concepts or procedures and use formulas or calculation operations but not precise and not by the problem.	2
		• Inability to implement solution strategies and use formulas or calculation operations	1
3	Interpreting, applying, and evaluating the results of a mathematical process	• Able to explain solutions and interpret conclusions accurately.	3
		• Able to explain solutions and interpret conclusions but not precise.	2
		• Unable to explain the solution and interpret the conclusion.	1

$$P = \frac{f}{N} \times 100$$

Information:

P = Grade score

f = Frequency

N = Number of respondents

RESULT AND DISCUSSION

This study was carried out beginning with Phase I and Phase II. Stage I is a pre-learning activity before using the Double Loop Problem Solving (DLPS) studying model while stage II is learning that uses the DPLS studying model. Each stage of Teachers' actions are observed during the learning process., and student activities, as well as administers assessments to gauge students' mathematical literacy abilities utilizing the Double Loop Problem Solving (DLPS) studying model. The purpose of this study is to describe the learning process and how to improve mathematical literacy talents in grade VIII students of SMPN 2 Bangsalsari. The outcomes of teacher and student activities observed with the Double Loop Problem Solving (DLPS) studying model as shown in Table 2.

Table 2. Effects of Observation of Educator and Understudy Exercises

No	Aspects	Educator Activities		Understudy Activities	
		Phase I	Phase II	Phase I	Phase II
1	Introduction	75	90	70	85
2	Identifying problems	75	81	64	81
3	Detecting the cause	67	83	65	71
4	Initial solution	69	75	67	77
5	Identifying Deeper	63	81	60	80
6	Key solutions	75	88	75	74
7	Closure	83	92	75	92
	Average	72	84	68	80

Based on the results of the analysis presented, it very well may be seen that instructor and understudy exercises have expanded from stage I to phase II with the use of the Double Loop Problem Solving (DLPS) studying model. In Phase I, teacher and student activities obtained a poor category compared to Phase II and did not reach the established measures of success. In phase II, The activities of teachers and students have grown.

At each stage, a test is carried out to measure students' mathematical literacy skills by giving questions. The questions given are guided by mathematical literacy indicators. The following categories of percentage students' mathematical literacy skills are as follows:

Table 3. Literacy in Mathematics Ability Percentage Category

Interval	Category
58 - 64	Not Good
65 - 71	Good
72 - 78	Pretty Good
79 - 85	Excellent

The improvement of mathematical literacy skills in students can be seen in Figure 1 as follows:

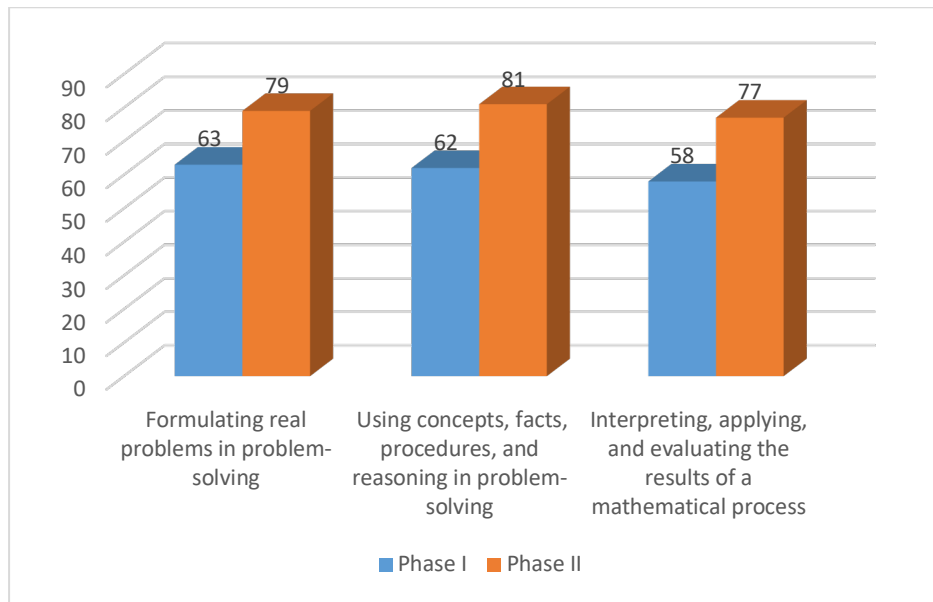


Figure 1. Improving Mathematical Literacy Skills in Students

In stage I, students' ability to formulate problems obtained a poor category. This is because, during the learning process, students are still cool on their own, so students find it difficult to focus on learning and lack of student understanding regarding the tests given. In phase II, it was upgraded to the very good category, this was influenced because some students had begun to focus on listening to the teacher and students were able to formulate problems according to the content of the test.

In the test carried out in phase I, the students' capacity for concepts, facts, procedures, and reasoning in tackling issues obtained a poor category. This is because students have difficulty reasoning and determining the procedures to be used based on the assumptions that have been given in the question. In stage II, it has increased to the very good category, this is because students are getting used to determining the concepts, facts, procedures, and reasoning presented in the test.

In stage I, students' ability to interpret, apply, and evaluate the results of a mathematical process is categorized as poor. Students do not understand how to apply simple problem-solving strategies based on different facts or sources and find it difficult to convey arguments. After the implementation of the DLPS model, phase I has improved to a fairly good category. In the second stage test, students are encouraged by the teacher to convey arguments, interpret, apply, and evaluate the results, obtaining an improvement to the category of good enough.

The outcomes of the assessment of the student's mathematical literacy carried out at school as shown in Table 4.

Table 4. The Mathematical Literacy Test Results in Phase I and Phase II

	Best Results	Cheapest Rate	Average
Phase I	70	55	63
Phase II	90	70	80

In table 4. The outcomes of the assessment of the student's mathematical literacy on the application of double loop problem solving to improve When students learn to build a

flat-sided space, their mathematical literacy skills can be presented with the average value of student's abilities as shown in the following bar chart:

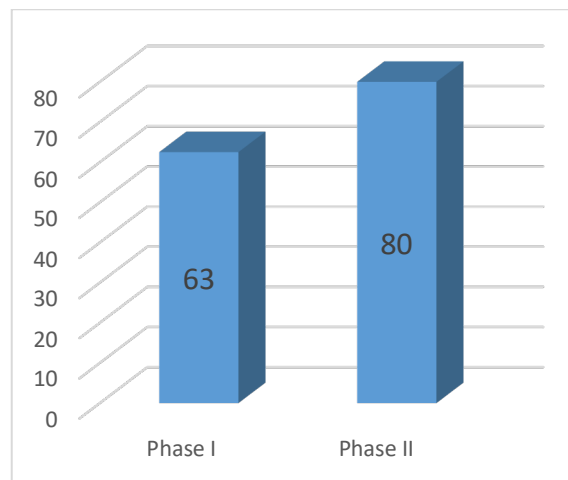


Figure 2. Improving Students Mathematical Literacy Talents in Phase I and Phase II

In light of information obtained from research results related to understudy test results, it is known to have improved from Phase I and Phase II. Based on the test results phase I, an average of 63 was obtained, which is a poor category and is said to have not been achieved. This has not met the performance goals that have been determined so it still needs improvement in phase II. After learning with the DLPS learning model in phase II, there was a significant increase of 80 with a good category, so in this cycle, it has reached the achievement indicator.

The results of the study demonstrated a significant rise in the use of the DLPS studying model on students' mathematical literacy skills. The DLPS studying model has the potential to enhance students' mathematical literacy abilities as a result of the learning model's, Students are taught to think through various activities. and students play an active role. Students have the ability to improve their mathematical literacy skills in line with the thinking process that they continue to be taught.

As the preceding explanation demonstrates, the utilization of double loop problem solving (DLPS), which is used to get to the next level mathematical literacy, can assist students in understanding the material they are learning, particularly when it comes to building a flat-sided space When working on test questions. this demonstrates an enhancement in mathematical literacy talents. The Double Loop Problem Solving model is a creative strategy for problem solving that seeks to raise students' active movements more so by employing a problem-based approach to help their mathematical literacy.

In accordance with the notion of mathematical literacy, the problem-based approach seeks to determine the root cause of student issues. Students' activities operate in two distinct loops, However, they are interconnected. Loop 1 focuses on identifying the main problems' causes, then designing and implementing temporary or problem-solving solutions. For loop 2, the next step is to focus on determining the root cause of the higher problem before developing and putting into action the primary or alternative solution. Research backs this by Sinurat (2018) that discovered students' mathematical literacy talents can worked on by consolidate Double Loop Problem Solving into math instruction.

CONCLUSION

Based on the observation results educator and understudy exercises have expanded from Phase I to Phase II by 12 percent. Mathematical literacy skills increased after its use the double-loop problem-solving studying model. The consequences of the typical score of understudies' numerical proficiency capacity from stage I to stage II increased by 17 percent. This happens because the learning steps are not motivated and students are getting used to working on problem-based problems. Thus, the mathematical literacy abilities of students have increased after its use the DLPS studying model in each cycle.

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