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Application of Structured Problem-Based Learning Model to Improve Mathematics Learning Outcomes

Ernawati[1*], Pertiwi Indah Lestari[2], Ita Suryaningsih[3]
[1]Mathematics Education, Maros Muslim University, South Sulawesi, Indonesia
[2]Biology Education, Maros Muslim University, South Sulawesi, Indonesia
[3]Indonesian Language and Literature Education, Maros Muslim University, South Sulawesi, Indonesia
ernafajar1305@gmail.com

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ABSTRACT

This research is motivated by the learning process that applied to the SPLDV material still uses a learning model that has not been directed to structured problems, so that learning outcomes students based on mid-semester test scores are still mostly below KKM. This study aims to determine the application of the Structured Problem-Based Learning Model in improving mathematics learning outcomes in grade VII students of Junior High School. This research is a classroom action research conducted in two cycles. Cycles I and II were held for 3 meetings, consisting of 2 meetings for the implementation of actions and one meeting for the cycle test. Data analysis technique used is descriptive statistics. The subjects of the study were class VII students, which consisted of 15 students. The instruments used are learning outcomes tests and observation sheets. The results showed that the average value of the learning test results in each cycle, namely in the first cycle the average value was 68.80 and in the second cycle the average value was 78.67. Based on these results, it can be interpreted that the learning outcomes have increased in each cycle. The results of the observations showed that the activeness and self-confidence of students in the learning process increased in each cycle. This can be seen in the average score of students who did the exercises on the blackboard in the first cycle, which was 10.00% and increasing to 30.00% in the second cycle.

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A. INTRODUCTION

Education is the process of changing the behavior of a person or group of people in an effort to mature humans through teaching and training efforts (Hutauruk & Simbolon, 2018) Improving the quality of education is a development goal in the field of national education and is an inseparable part of efforts to improve the quality of Indonesian people as a whole (Friskilia & Winata, 2018). Quality Human Resources will have the ability to master information and knowledge in the midst of advances in science and technology, these abilities require critical, systematic, logical, and creative thinking (Hasratuddin, 2018). One of the educational programs that can develop critical, systematic, logical and creative thinking skills is mathematics.

Mathematics education has been growing rapidly along with the development of science and technology. Mathematics learning has undergone innovations and reforms that are expected to be in line with current and future challenges. In this regard, it is necessary to strive so that learning mathematics can be more easily accepted by students so that optimal learning

outcomes are achieved. Mathematics is the science that underlies the development of technology that has an important role in various disciplines (Bernard et al., 2018) Learning is a creative activity. Learning does not mean only absorbing but also constructing knowledge (Khaerani, 2018). In line with this statement states that learning is a process of change through internal appreciation that occurs in every individual who comes from within and outside himself through interactions with the surrounding environment. Learning outcomes are changes that are obtained after experiencing the learning process. Good learning outcomes are obtained from a good learning process (Handayani & Subakti, 2021).

Each subject has unique characteristics, as well as mathematics taught from primary education to higher education. So that in teaching mathematics a complete understanding of the characteristics of mathematics is needed so that mathematics learning is more comprehensive. Therefore, process skills and strategies in solving these problems become basic abilities in learning mathematic. In learning mathematics, it is expected to apply creative educational approaches, which include using horizontal and vertical math to solve mathematical problems and problems in the real world. However, in reality, as stated by (Rafli, 2019), from various fields of study, the most difficult for students is mathematics, both those who do not have learning difficulties and those who have learning difficulties. This means that it can be said that most students still consider mathematics as a difficult subject and also a frightening specter which results in low learning outcomes.

The low quality of student learning outcomes in mathematics is an indication that the objectives specified in the mathematics curriculum have not been achieved optimally. To achieve the desired goal, one way is to carry out a quality learning process. The quality of the learning process is influenced by various factors. One of the influencing factors is the accuracy of the approach used. The approach used by teachers is generally a teacher-centered approach, the teacher only provides learning by directly providing formulas to be memorized and then giving examples of questions so that there is no process that provides opportunities for students to obtain learning outcomes in accordance with the experiences they have experienced. This is in line with the opinion of (Sartyka et al., 2021) which states that teachers only try to make students able to answer questions correctly without asking for reasons for students' answers. Many students have difficulty in mathematics. Even most students who are smart in mathematics are often less able to convey their thoughts. In this learning the teacher functions as a center or source of material for teachers who are active in learning, while students only receive material. This is one of the causes of the low quality of students' understanding of mathematics.

The enhancement of student mathematics learning outcomes is influenced by several factors. One of them is the process of learning activities in a classroom centered on teachers. Problem based learning (PBL) is an effective learning model used in the teaching and learning process. Problem-based learning models include questioning or problem solving, focusing on interdisciplinary relationships, authentic inquiry, collaboration, and producing works and demonstrations (Cowden & Santiago, 2016). Problem-based learning helps students to get information already in their mind and devise their own knowledge of basic and complex knowledge. Problem-based learning has a student-centered characteristic, designed based on real problems that encourage students to build a rich knowledge of contextual mathematical

concepts through a series of constructive questions. Problem-based learning is a student centered learning, while before the use of learning problem-based learning in class is only centered on teachers. Learning that involves students in learning to solve real-life problems can increase motivation and curiosity to increase (Sartyka et al., 2021).

Based on observations at the Junior High School, data obtained that the mathematics learning process is still far from the expected reality, which is caused, among others: (1) At the time of presentation of material the teacher tends to dominate learning and students do not listen instead tend to joke with their friends; (2) Teachers lack of providing problem-solving tasks both individually and in groups so that students only cheat without a desire to know and understand the steps in doing them, this is in line with the opinion (Ernawati & Lestari, 2020) that learning is still fixated on textbooks and less related to everyday life so that learning cannot be interpreted by students to solve mathematical problems; (3) Teachers are less creative in applying models or approaches that are appropriate to learning so that students do not last long in following the learning process in class. This is in line with the opinion (Sartyka et al., 2021) that effective learning can be realized, one of which is when the teacher prepares a lesson plan by selecting a learning model. The teacher's ability to choose a learning model by taking into account the characteristics of the subject matter, the availability of learning media, the mental and physical development of students. There needs to be a modification in solving problems in learning using a contextual approach to the problem-based learning model; and (4) In group learning, the teacher forms groups based only on the number of absences. By using a problem-based learning model students become accustomed to being active in group discussions and solving problems that are correlated with everyday life systematically so that learning with this approach can affect the improvement of student learning outcomes on the material studied according to indicators (Sartyka et al., 2021).

Problem-based learning has been known since the time of John Dewey, which is now starting to be raised because general-reviewed learning is comprised of presenting to students an authentic and meaningful problem situation that can provide students to investigate and inquiry (Umanailo, Yulisvestra, et al., 2019). In essence, mathematics as a structured and systematic science implies that the concepts and principles of mathematics are intertwined with each other. As the implication, then in learning mathematics to achieve a meaningful understanding of students must have adequate mathematical connection capability (Umanailo, Handayani, et al., 2019). The strong connection between mathematical concepts implicates that aspects of mathematical connections also contain other mathematical aspects or vice versa. In the school mathematics curriculum, reasoning and mathematical connections are two basic mathematical abilities that must be mastered by high school students. Reasoning is the process of thinking in the process of drawing conclusions. Broadly, there are two types of reasoning, the inductive reasoning, also known as induction. and deductive reasoning, which is also known as deduction. The equation between the deduction and induction is that both arguments have a structure, consisting of several premises and one conclusion or conclusive (Rumkel et al., 2019).

The use of PBL in learning mathematics is expected to facilitate students to learn actively to construct their knowledge related to math. Through PBL in mathematics learning, students can develop their thinking skills, solving problems and understanding deeper of math concepts. On the other hand, PBL provides learning motivation for students and make students feel confident in their mathematical skills. One type of questions that can be presented in a PBL is

an opened ended problem. The PBL learning syntax is student orientation on issues, organizing the students to learn, guiding the individual or group investigation, developing and providing the works and analyzing and evaluating the problem solving process (Sartyka et al., 2021). The above description shows that the problem solving approach is the focus in learning mathematics. To improve the ability to solve problems, skills need to be developed to understand problems, create mathematical models, solve problems, and interpret solutions. Thus, in learning mathematics, teachers should start learning mathematics with an introduction to problems that are appropriate to real situations or contextual problems. By proposing this contextual problem, students are gradually guided to master mathematical concepts (Pohan et al., 2020).

In the Problem Based Learning (PBL) learning model, students will be formed in small groups and students can work together to solve problems that have been agreed upon by students and teachers related to the material. The application of the Problem Based Learning (PBL) learning model allows students to actively discuss with group members to solve problems and find their concepts. When teachers apply learning models, students often use various problem-solving procedures. Therefore, whether they like it or not, students must actively read and explain the material explanation from the teacher. In addition, they should actively seek additional information from various sources to resolve the issue under discussion. The learning process using this model can encourage and train students to think in their way, because by using this PBL model students will work alone, and feel what they will learn, in other words, students will know more about the material discussed. Students will have an active role, and the learning situation will be more enjoyable so that the learning objectives to be achieved can be achieved easily as expected (Simamora & Manurung, 2021).

The stages of the PBL learning model proposed by (Simamora & Manurung, 2021) as follows: (1) student orientation to the problem; (2) organizing students to learn; (3) guiding individual/group experiences; (4) develop and present the work; and (5) analyzing and evaluating the problem-solving process. While the characteristics of the PBL model presented by (Simamora & Manurung, 2021): (a) Learning begins with problems; (b) Ensuring that the problems given are related to the realities of the student's world; (c) the implementation of learning that covers problems, not around scientific disciplines; (d) gives great responsibility to students in building and running the learning process directly; (e) using small groups; and (f) requiring students to demonstrate what they have learned in the form of products or appearances (Simamora & Manurung, 2021).

In structured problem-based learning, the problems presented to students must be able to generate student understanding of the problem, awareness of gaps, knowledge, desire to solve problems, and the perception that they are able to solve the problem (Simamora & Manurung, 2021). The structured problem-based learning model is expected to improve student learning outcomes in learning mathematics so that students can optimize their ability to absorb scientific information and can motivate students to play an active role in learning in class and can improve student learning outcomes. The results of this study are expected to be used by the community, especially for teachers in improving student learning outcomes.

B. METHODS

The type of research used in this research is classroom action research. CAR is action research carried out by teachers as well as researchers in their class or together with other people (collaboration) by designing, implementing, and reflecting on collaborative and participatory actions that aim to improve or improve the quality of the learning process in the classroom through a certain action in a cycle. CAR is action research conducted to improve the quality of classroom practice (Simamoraa et al., 2017) (through four stages, namely planning, implementation, observation, and reflection. (Simamora & Manurung, 2021) says that classroom action research is a form of professional and reflective scientific activity, carried out with certain actions. So that, it can support the improvement of the practice and process of learning activities in the classroom and outside the classroom. The subjects of this study were all students of Class VII Junior High School totalling 15 students consisting of 9 boys and 6 girls. The procedure for classroom action research as shown in Figure 1.

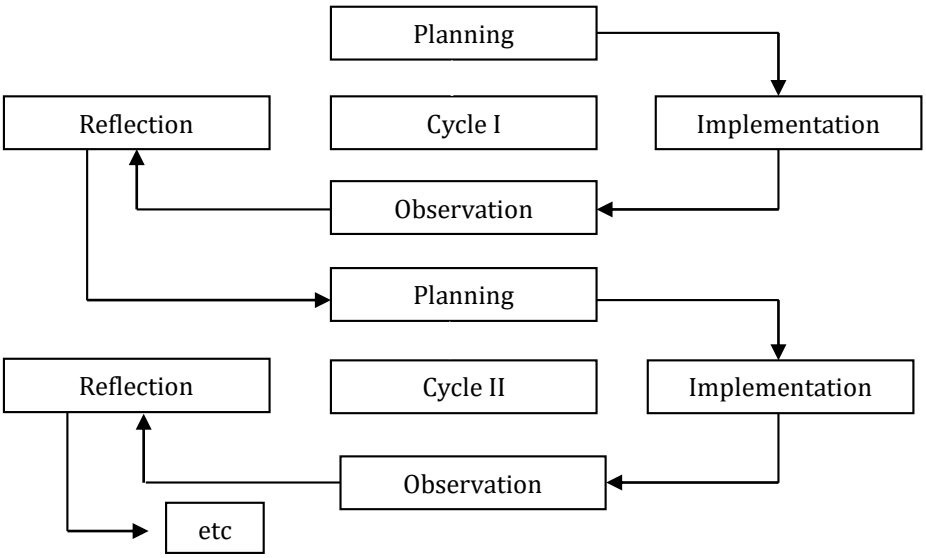

Figure 1. Action Execution Flow (Barst & McGoon, 2003)

Data collection techniques in this study through observation and tests. Observation as a data collection tool is used to measure individual behavior or the process of occurrence of an activity that can be observed both in actual situations and in artificial situations. The instruments used in this study were learning outcomes tests and observation sheets. (Sugiyono, 2019) states that "Research instrument is a tool used to measure observed natural and social phenomena". The data analysis technique used is quantitative data which is analyzed descriptively in the form of learning outcomes scores given each cycle and the results of student activity observation sheets, as shown in Table 1.

Table 1. Guidelines for Categorizing Student Learning Outcomes

No	Value Interval	Category
1	0 – 59	Very low
2	60 – 69	Low
3	70 – 79	Currently
4	80 – 89	Tall
5	90 – 100	Very high

The criteria for success in this classroom action research are if the mathematics learning outcomes of class VII students junior hight school show classical learning mastery of 80% and individual students are said to have completed learning if students meet the minimum completeness criteria (called KKM) that have been set, which is 70. Mastery level 70 is said to have succeeded. However, if it is still < 70, then there will be a repetition of the material for learning Mathematics using the Structured Problem-Based learning model in order to create optimization of academic achievement or good learning abilities.

C. RESULT AND DISCUSSION

All data obtained from the results of this study are by using classroom action research conducted in Class VII Junior High Schools. This research was conducted in two cycles and each cycle consists of 4 meetings plus 1 meeting for the end of the cycle test. The allocation of meeting time in this study was 2 × 35 minutes. Implementation each cycle of research through the planning stage, the action stage, the observation, and reflection stage. This research data relates to improve students' mathematics learning outcomes through the Structured Problem-Based Learning model. Research data are collected and analyzed. Research results from various research instruments are interpreted to find out how the development of the research carried out. The following are the research results obtained:

1. Observation Results

The results of observing student activities during the application of a structured problem-based learning model in two cycles for each meeting. The results of observing the activities of class VII students of Junior High School during learning using the Structured Problem-Based learning model in cycles I and II, are shown in the following Table 2.

Table 2. Cycle I and II Observation Results

No	Observed Components	Cycle I		Cycle II	
		f	Percentage (%)	f	Percentage (%)
1	Students who are present during the learning	27	90.00%	29	96.67%
2	Students who pay attention to the material	14	46.67%	21	70.00%
3	Students who ask about material that has not been understood	11	36.67%	4	13.33%
4	Students working on practice questions on the blackboard	3	10.00%	9	30.00%
5	Students who present their learning outcomes	2	6.67%	7	23.33%
6	Students doing other activities	8	26.67%	4	13.33

After giving action in the form of a structured problem-based learning model on triangle material, activities that can be recorded in ongoing learning can be used as reflections in cycle I. There is an increase in understanding of mathematics lessons, during the research in Cycle I there were a number of changes that occurred in students' attitudes and behavior. Increased in cycle II. These changes are qualitative data obtained from observation sheets at each meeting that are recorded in each cycle as well as teacher notes to determine changes in student attitudes during class learning.

The changes referred to in Table 1 above are as follows is (a) Student attendance increased. This can be seen from the number of students attending the lesson which has increased, at the first meeting as many as 13 people and the second meeting as many as 14 people in the first cycle and in the second cycle of 96.67 % for two meetings of the total 15 students. This shows the seriousness of students to take mathematics lessons; (b) In the learning process takes place students who pay attention to the material in the first meeting as many as 6 people while at the second meeting as many as 8 people in the first cycle and increased in the second cycle; (c) Students who asked about material that had not been understood, at the first meeting as many as 5 people, while at the second meeting as many as 6 people in the first cycle and increased in the second cycle; (d) Students who work on practice questions on the blackboard, at the first meeting there are 1 person, at the second meeting there are 2 people in the first cycle and increasing in the second cycle; (e) Students who presented their learning outcomes at the first meeting were 1 person, while the second meeting was 1 person in the first cycle and increased in the second cycle to 23.33 %. This shows that the students' courage and self-confidence began to increase; and (f) Students who did other activities in the first meeting, and 4 people in the second meeting. in cycle I and increased in cycle II.

2. Learning results

Description of learning outcomes for students of class VII Junior High School during learning using the Structured Problem-Based Model in cycles I and II, as shown in Table 3.

Table 3. Statistical Data of Student Learning Outcomes in Cycle

	Cycle I	**Cycle II**
Subject	15	17
ideal score	100	100
highest score	87	94
lowest score	50	64
score range	37	30
average score	68.73	78.67
Median	70	80
Mode	70	75
standard deviation	11.03	9.73

Furthermore, the student test scores are grouped into five categories, then the frequency and percentage distributions are obtained as shown in Table 4.

Table 4. Distribution of Frequency and Percentage of Student Scores in Cycles I and II

		Cycle I		**Cycle II**	
Score	Category	Frequency	Percentage	Frequency	Percentage
0 – 59	Very Low	2	13.33	-	0.00
60 – 69	Low	5	33.33	3	20.00
70 – 79	Currently	5	33.33	4	26.67
80 – 89	Tall	3	20.00	5	33.33
90 – 100	Very high	-	0.00	3	20.00
	Amount		100		15

From Table 4 it is known that the category of learning outcomes through the structured problem-based learning model in the first cycle has increased in the second cycle, the student

learning outcomes in the very low category are 2 people with a percentage of 13.33% decreasing to 0%, the low category is 5 people. with a percentage of 33.33% decreased to 20%, the medium category as many as 5 people with a percentage of 33.33% decreased to 26.7%, the high category as many as 3 people with a percentage of 20.00% increased to 33.3%, and the very category high from none increased to 20%. If the average value of 68 obtained from the results of data analysis is entered in Table 4, then the average value is in the low category and medium category. The percentage of students' complete learning outcomes after applying the structured problem-based learning model in the first cycle is shown in Table 5.

Table 5. Complete Description Student Learning Outcomes in Cycle I and II Tests

Score	Category	Cycle I		Cycle II	
		Frequency	Percent (%)	Frequency	Percent (%)
0 – 69	Not Complete	7	46.67	3	20.00
70 – 100	Complete	8	53.33	12	80.00
	Amount	15	100.00		15

From table 5, information is obtained that from 15 students in class VII there are 7 students (46.67%) who have not finished studying and 8 students (53.33%) who have finished studying. This means that learning completeness in cycle I has not been achieved classically because the number of students who have completed has not reached 80%. Therefore, the second cycle was carried out so that there was an increase in the complete category to 80% and a decrease in the incomplete category to 20%. Researchers gave remedial and additional assignments to students who did not complete as many as 7 people (46.67%). The remedial provided is in the form of a summary of the material that has been studied previously so that students can better understand and understand the material that has been taught previously, so that students in this case are able to balance knowledge between students who are complete and students who are not.

a. Reflection on the action of cycle I

At the first meeting and the second meeting the teaching and learning process went quite well, but the researchers found difficulties in dealing with students. In general, students are difficult to manage, they are often noisy and do other activities such as talking to their classmates and in terms of learning students act passively and only listen to what the teacher explains. The activeness of students in learning, especially in providing questions, answers or responses is still lacking.

In understanding the material and solving the questions given, it is still not focused. This is because the learning model, namely Structured Problem-Based, has just been introduced to them so that they are not familiar with this approach, the number of students who want to be directly guided by researchers in understanding the material and solving problems causes class management to seem less organized. The results of descriptive data analysis found that from 15 students of class VII Junior High School obtained data information that students who were in the complete category were 8 people or 53.33% while students who were in the incomplete category were 7 people or 53.33 %.

In addressing the various problems that occurred during the first cycle, both from the first and second meetings, the researcher can conclude that the first cycle has not been said

to be complete so that it will be continued to the next cycle, namely cycle II. To get the results to be achieved in cycle II, the researchers are more trying and enthusiastic in guiding students and researchers always give words of praise and encouragement so that students are motivated to learn. In addition, teachers are also more involved in approaching students to provide guidance on the material being taught find it difficult without distinguishing between one student and another.

b. Reflection on action

During cycle II, students' awareness and attention increased. This is indicated by the increasing number of students who are present at the time of learning. Likewise, students who dared to answer questions asked by the teacher increased from meeting I and meeting II. Cohesiveness, responsibility and cooperation in working on group assignments also seemed to increase which was marked by the increase in the number of students who were active in group discussions and actively completed group assignments. Students who often do disruptive activities in the learning process are decreasing, this can be seen from the increasing number of students in paying attention to teacher explanations.

The results of descriptive data analysis found that from 15 students of class VII Junior High School obtained data information that students who were in the complete category were 13 people or 80% while students who were in the incomplete category were only 3 people or 20%. This means that in the second cycle it has increased and has achieved the desired results so that there is no need to continue to the next cycle or the third cycle.

3. Discussion

This research was conducted in 3 meetings for each cycle and ended with giving a test at the end of each cycle to determine student learning outcomes. At each meeting, observations were made to see if there were things that were different from the previous learning. Based on the results of observations of student activities during the two cycles carried out by the researchers, it can be seen that overall there was a fairly good increase in terms of the level of student independence to solve problems in the second cycle which reached 96.67%. In addition, in the second cycle students have also started to be active to answer and respond to questions given by the teacher and other students. The level of mastery of the material also increased, as seen from the results of the final test in the second cycle.

The results of the data analysis of the final test scores of cycle I and cycle II obtained an overview of increasing mathematical ability and mastery with a structured problem-based learning model. The data in the first cycle obtained an average value of 68.73 and was in the medium category. This is because students are still less active in learning and students are still shy to ask and respond to questions posed by the teacher, in addition, the level of independence and level of mastery of the material is also still lacking. While in the second cycle, the average value obtained was 78.67 and was in the high category. In this cycle, students were active in learning, students' independence in doing assignments also increased and the level of mastery of the material also increased as seen from the final test results obtained by students.

The improvement obtained in cycle II cannot be separated from the teacher's treatment of students, where the learning process of mathematics as an effort to improve student learning outcomes by using a structured problem-based learning model. The teacher takes several

actions, namely by delivering teaching materials systematically and clearly in accordance with the Structured Problem-Based learning model, the teacher acts as a facilitator and guides students in the learning process, gives instructions on the steps to work on each question that is considered difficult, the teacher also gives more often problems that are more real and different from one student to another so that it requires students to solve the problems they face independently.

The results of this study indicate that both teachers and students of class VII Junior High School in general in terms of activity and learning outcomes have made progress. The teacher plays more of a role in approaching students to provide guidance on material that is considered difficult without distinguishing one student from another. This is in line with the opinion of (Luthfiana et al., 2018) that repeated teacher guidance, encouraging and directing students to ask questions, seek solutions to real problems can improve student understanding. Thus, it can be said that the learning outcomes of mathematics through the structured problem-based learning model for the seventh grade students of Junior High School who were tested twice at the end of the cycle have increased. The results of this study prove that the professional competence of teachers through research (Supriyanto et al., 2019).

The advantages of this structured problem-based learning model are that students are active in teaching and learning activities, are challenged to better themselves, are motivated to always have healthy competition between students and help students understand the subject matter. The weakness of the structured Problem-Based learning model is that more groups will report and need to be monitored, fewer ideas will arise and if there is a problem there is no mediator. According to (Santyasa et al., 2019) in a structured problem-based learning model in addition to equipping students with knowledge, it can also be used to improve problem solving, critical and creative thinking skills, because learning with this model is no longer a transfer of knowledge from teacher to student so that students "know", but by using this model. In this model, learning will take place naturally in the form of active student activities. The same thing was also revealed in a study by (Siagian et al., 2019) whose results show that problem-based learning-oriented learning materials meet the criteria of being effective and able to improve their mathematical problem-solving abilities and metacognitive abilities. Based on the results of this study, it can be concluded that the use of a structured problem-based learning model can improve activities and learning outcomes of.

D. CONCLUSION AND SUGGESTIONS

Based on the results of the study, it can be concluded that student activity has increased, namely the average in the first cycle of 68.73% increased to 78.67% in the second cycle, this proves that with the application of the structured problem-based learning model students have great attention in learning, students become active and enthusiastic in participating in Teaching and learning process compared to before the implementation of the Structured Problem-Based learning model, namely students are not active and not enthusiastic in Teaching and learning process.

The application of the Structured Problem-Based learning model can improve the learning outcomes of the triangle concept mathematics in class VII Junior High School, Lau District, Maros Regency. This is based on the average test results increasing in each cycle, namely the average value of 68.80 in the first cycle increasing to 78.67 in the second cycle. While the

mastery of learning outcomes also increased, namely in the first cycle 53.33% increased to 80.00% in the second cycle. This shows that the researcher's expected goals have been achieved, where there is an increase in student learning outcomes classically, which means that the indicators of success have been achieved and are an indication that the learning carried out is effective.

REFERENCES

Barst, R., & McGoon, M. (2003). Arikunto, Suharsimi. 2010. Prosedur Penelitian: Suatu Pendekatan Praktik. Jakarta: Rineka Cipta Badesch, D., Barst, R., Delcroix, M., McLaughlin., Olschewski, H., Sitbon, O V. and Vizza, C. 2004. Prostanoid therapy for pulmonary arterial hypertension. Jou. *Cardiology*, *41*(12), 2119–2125.

Bernard, M., Rosyana, T., & Afrilianto, M. (2018). Improve students creative ability in discrete mathematics course with approach open ended assisted visual basic application for excel. *International Conference on Mathematics and Science Education of Universitas Pendidikan Indonesia*, 602–607. http://science.conference.upi.edu/proceeding/index.php/ICMScE/article/view/51/43

Cowden, C. D., & Santiago, M. F. (2016). Interdisciplinary Explorations: Promoting Critical Thinking Via Problem-Based Learning In An Advanced Biochemistry Class. *Journal Of Chemical Education*, *93*(3), 464–469.

Friskilia, O. ., & Winata, H. (2018). Regulasi Diri (Pengaturan Diri) Sebagai Determinan Hasil Belajar Siswa Sekolah Menengah Kejuruan. *Jurnal Pendidikan Manajemen Perkantoran*, *3*(1), page?. http://ejournal.upi.edu/index.php/jpmanper/article/ view/9454

Handayani, E. S., & Subakti, H. (2021). Analisis Penggunaan Media Realia Melalui Pembelajaran Online di Sekolah Dasar. *Jurnal Basicedu*, *5*(2), 772–783. https://doi.org/https://doi.org/10.31004/basicedu.v5i2.810

Hasratuddin. (2018). *Why Should You Learn Mathematics*. Perc Edir.

Hutauruk, P., & Simbolon, R. (2018). Improving student learning outcomes by using teaching aids in science class IV subjects at SDN Number 14 Simbolon Purba. *School Education Journal PGSD FIP Unimed*, *8*(2), 121–129. https://doi.org/https://doi.org/10.24114/sejpgsd.v8i2.9770

Khaerani. (2018). Peningkatan hasil belajar aljabar linier melalui pendekatan problem posing cooperative pada mahamahasiswa semester iv program studi pendidikan aljabar linier stkip yapim maros. *Prosiding Seminar Nasional UNCP*. http://journal.uncp.ac.id/index.php/proceding/article/view/778

Luthfiana, M., Yuliansyah, & Fauziah, A. (2018). The effect of a problem-based learning model on the mathematical problem solving ability of students in class xi science ma Negeri 1 Lubuklinggau. *Journal of Mathematics Education*, *1*(1)., page? https://doi.org/https://doi.org/10.31539/judika.v1i1.184

Pohan, A. M., Asmin, & Menanti, A. (2020). The Effect of Problem Based Learning and Learning Motivation of Mathematical Problem Solving Skills of Class 5 Students at SDN 0407 Mondang. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, *3*(1), 531–539. https://doi.org/https://doi.org/10.33258/birle.v3i1.850

Rafli, M. (2019). Impact of Problem Based Learning (PBM) Implementation in Mathematics: Literature Review. *Journal of Integrated Education and Learning*, *1*(1), 31–39. https://doi.org/https://doi.org/10.32696/pgsd.v1i1.347

Rumkel, L., Sam, B., & Umanailo, M. C. B. (2019). Village Head Partnership, Village Consultative Body and Customary Institution in Village Development. *International Journal Of Scientific & Technology Research*, *8*(8), 1058–1063.

Santyasa, I. W., Santyadiputra, G., & Juniantari, M. (2019). Problem-based learning model versus direct instruction in achieving critical thinking ability viewed from students' social attitude in learning physics. *Advances in Social Science, Education and Humanities Research*, 335, page?. https://doi.org/https://doi.org/10.2991/icesshum-19.2019.101

Sartyka, B., Mujib, A., & Mawengkang, H. (2021). Pengembangan Perangkat Pembelajaran Berbasis Masalah untuk Meningkatkan Kemampuan Komunikasi Matematik dan Kemandirian Belajar Peserta Didik Pendidikan Matematika. *APOTEMA: Jurnal Program Studi*, *7*(1), 35–46. https://doi.org/https://doi.org/10.31597/ja.v7i1.560

Siagian, M., Saragih, S., & Sinaga, B. (2019). Development of learning materials oriented on problem-based learning models to improve students' mathematical problem solving abilities and metacognition abilities. *International Electronic Journal of Mathematics Education*, *14*(2), 331–340. https://doi.org/https://doi.org/10.29333/iejme/5717

Simamora, D. F., & Manurung, H. M. (2021). The Effect of Problem-Based Learning Model during Pandemic On the Thematic Learning Outcomes of Students in Elementary School. *Jurnal Basicedu*, *5*(5), 2580-1147. https://doi.org/https://doi.org/10.31004/basicedu.v5i5.1242

Simamoraa, R. E., Sidabutarb, Rotua, D., Suryac, & Edy. (2017). Improving Learning Activity And Students' Problem Solving Skill Through Problem Based Learning (PBL) In Junior High School. *International Journal Of Sciences: Basic And Applied Research (IJSBAR)*, *33*(2), 321–331.

Sugiyono. (2019). *Statistics for Research*. CV Alfabeta.

Supriyanto, A., Hartini, S., Syamsudin, S., & Sutoyo, A. (2019). Indicators Of Professional Competencies In Research Of Guidance And Counseling Teachers. *Counsellia: Jurnal Bimbingan Dan Konseling*, *9*(1), 53–64.

Umanailo, M. C. B., Handayani, N., Masniati, A., Makatita, S. H., & Lisaholit, S. (2019). The Urbanization And Diversification Of Farmland Namlea Village. *International Journal Of Scientific & Technology Research*, *8*(8), 1049–1053.

Umanailo, M. C. B., Yulisvestra, M., Oki, K. K., Mulyasari, W., & Ridwan. (2019). The Thought Of Emile Durkheim In The Contestation Of Development In Indonesia. *International Journal Of Scientific & Technology Research*, *8*(8), 1881–1885.