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Improving Students' Mathematics Learning Outcomes through Reflective Learning Model

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Abstract

This study aims to improve and increase students' learning outcomes on the subject of congruence in class VII SMPIT Gema Nurani Bekasi. The purpose of this study was achieved through a Classroom Action Research. The action taken is in the form of applying a reflective learning model. The research was conducted in 2 cycles, each cycle consisting of 4 stages: (1) planning, (2) implementation, (3) observation, and (4) reflection. This classroom action research involved 33 students, the researcher as the teacher, and 1 teacher observer. Research data were collected using instruments: (1) written test, (2) observation sheet, (3) interview, (4) questionnaire, and (5) documentation. The results of data analysis show an increase, student learning outcomes have reached the minimum completeness criteria (MCC) 75, and have reached a percentage of each aspect of learning outcomes of 83%. So it can be concluded that classroom action in the form of applying a reflective learning model can improve students' mathematics learning outcomes, especially on the material of symmetry.

Keywords: Learning outcomes, Mathematics, Reflective learning.

1 INTRODUCTION

Education is a process of guidance, guidance, teaching or training as a conscious effort by the government. "Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves and society. Education is a human resource that should receive continuous attention in an effort to improve its quality. Improving the quality of education also means improving the quality of human resources. For this reason, it is necessary to make updates in the field of education from time to time without stopping. Mathematics education has developed rapidly along with the development of science and technology. Mathematics learning has undergone innovations and reforms that are expected to be in accordance with current and future challenges. In this regard, it is necessary to strive so that mathematics learning can be more easily accepted by students so as to achieve more optimal results. Likewise, in learning about problem solving, it is necessary to improve learning so that student mastery can bind and the results can be better.

Mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines and advances human thinking. Mathematics itself comes from the Latin *manthanein* or *mathema* which means learning or things that are learned. Mathematics in Dutch is called *wiskunde* or exact science, all of which are related to reasoning. To master and create technology in the future requires a strong mastery of mathematics from an early age. Mathematics subjects need to be given to all students starting from elementary school to equip students with the ability to think logically, analytically, systematically, critically, and creatively as well as the ability to work

together. The competition is needed so that learners can have the ability to obtain, manage and utilise information to survive in an ever-changing, uncertain and competitive situation.

Learning in the classroom runs optimally with modern media and teaching materials using digital television and notebooks for each student, which focuses on the development of education 4.0 which innovates with digital classrooms. Realising the importance of learning that can improve student learning outcomes, a suitable learning model is needed to be applied in the classroom. Researchers determine the learning model that will be used in class action research later, namely using a reflective learning model. Reflective learning is a learning model that involves reflective thinking activities in the process. This will be very useful for students if it happens regularly, because students will arrive at a deeper understanding, change students' mindsets, and ultimately students can solve problems with their own thoughts. Reflective learning models that are carried out routinely in the learning process will help students be better prepared to process their experiences, so that they become material for students to grow and develop in solving problems, especially in learning mathematics.

Learning outcomes consist of two words that form it, namely "results" and "learning". The definition of result indicates an acquisition as a result of an activity or process that results in a functional change in input. Learning in a broad sense is all personal contact with the environment that causes behavioral changes. Where this behavior change is a process experienced by a person based on what is learned and obtained through various sources such as family, friends, the environment and oneself. Learning outcomes are a result of the learning process using measurement tools, namely in the form of tests that are prepared in a planned manner, either written, oral or action tests (Sudjana, 2012). Learner results will get maximum results when all aspects of learning are available and implemented in the learning process.

Mathematics is one of the basics that children must learn after language learning, because in everyday life we need calculations, such as add, subtract, multiply and divide which are basic operations in one of the branches of mathematics called arithmetic or arithmetic. These basic operations are familiar to ordinary people in general. Mathematics is knowledge that deals with numbers and arithmetic, things that can be accepted by reason, relating to quantity, space, and shape. The definition of mathematics itself is difficult to define accurately, according to Soedjadi (2000), mathematics is: (1) Knowledge of numbers and calculus, (2) Knowledge of logical reasoning and dealing with numbers, (3) Knowledge of quantitative facts, space, and shape, and (4) Knowledge of logical structures. In learning mathematics, teachers must master direct and indirect objects, direct objects are facts, concepts, operations and principles, while indirect objects are learning transfer, proof of postulates, problem solutions and investigative skills.

Reflection has several meanings, including: movement; reflection outside the will (consciousness) as an answer to a matter or activity that comes from outside (Kumala & Arundaya, 2017). The word reflection which we translate into reflection or reflective means thoughts, ideas, views formed, or notes made based on the results of serious consideration or thought. According to colloquial language, the word reflective often means introspection or often also called self-reflection, while in the field of education reflective means collecting data, information, or knowledge to solve a problem. Sulasmono (2019) defines reflective as an intellectual and affective activity where individuals are involved in exploring their experiences in order to achieve new understandings and appreciations. From this description, it can be concluded that reflective can be expressed as a response given in depth and critically by a person to the experiences they have felt. Through this process, a person will increasingly try to understand the meaning and consequences of their experiences and can learn from the experiences they have gone through, so that new thoughts are formed that make a person able to overcome other problems. In addition, reflective thinking can provide a stimulus for a person's thinking so that they are accustomed to solving problems with solutions that they get themselves with a thought process that is in accordance with the subject matter.

The reflective thinking process can be depicted in the following chart. Reflective learning relies on the ability to think reflectively and is closely related to the workings of the human brain. Boyd and Fales (in Rohana, 2015), define reflective learning as follows: "the process of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in terms of self, and which results in a changed conceptual perspective". Coughlan asserts that students who engage in reflective learning are actively engaged in learning and recognise their personal responsibility to become lifelong learners (Rohana, 2015). Pollard (2002) suggests seven characteristics of reflective teaching, namely: (1) Reflective teaching applies activeness by paying attention to goals and consequences, as well as technical means and efficiency. (2) Reflective teaching is applied in a cyclical process (spiral), teachers monitor, assess, and revise learning activities continuously. (3) Reflective teaching demands proficiency in evidence-based classroom research methods, to support the progressive development of higher standards of teaching. (4) Reflective teaching demands an attitude of open-mindedness, responsibility and sincerity. (5) Reflective teaching is carried out on the basis of teacher judgment or assessment through evidence-based assessment and knowledge from various studies. (5) Reflective teaching, professional learning and personal achievement can be enhanced through collaboration and dialogue with peers. (6) Reflective teaching allows teachers to creatively bridge or structure externally developed frameworks into learning.

In reflective learning the student acts as the protagonist who carries out all the instructions needed to understand the given subject matter. In implementing reflective learning in the classroom, there are several important things that Nainggolan (2011) conveyed, which are summarized as follows: (1) Students should be involved more in doing than listening. (2) Concrete learning is an excellent preparation. (3) Develop self-monitoring strategies and an ongoing record-keeping system on the development of students' skills. (3) There is deliberate and consistent teaching of reflective thinking and metacognition to students, until students make the process a part of themselves.

2 RESEARCH METHODS

This research is in the form of Classroom Action Research, which is research conducted on learning activities that are raised and actions taken together in a class. The research used is class action research. According to Kemmis and Mc Taggart (2014), who said that class action research is a form of collective self-reflection carried out by participants in social situations to improve the reasoning and justice of these practices and the situation in which these practices are carried out. Classroom Action Research is a systematic study of efforts to improve the implementation of educational practices by a group of teachers in carrying out actions in learning, based on their reflection on the results of these actions (Hopkins, 1985). Classroom action is carried out in the form of implementing a reflective learning model. This research model is an action taken by someone in carrying out activities, improvements, adjustments, and renewals, using a cycle model carried out twice. Which refers to the Taggart model, where each cycle consists of four stages, namely planning, implementation, observation and reflection. Before the class action was carried out, the researcher first conducted a pre-action stage which aimed to divide the learning material in the three planned cycles, and determine the initial conditions as a basis for measuring the improvement of mathematical problem solving skills.

3 RESULT AND DISCUSSION

Before the researcher's action, the researcher conducted a preaction stage which consisted of determining the initial conditions and the distribution of material to be taught in each cycle. Determination of initial conditions is done by giving pretest questions where the

initial condition before the action is taken shows that only 12 students (36.36%) are not complete or below the MCC. After going through 2 cycles of action, it is assumed that students who successfully reach the MCC will increase student learning outcomes in mathematics on the subject of symmetry. Through this pre-action stage, the researcher then divides the material into 2 cycles, namely cycle 1 with the subject matter of the concept of symmetry, and cycle 2 with the subject matter of symmetry in triangles. The following classroom action research procedures are more detailed in Figure 1.

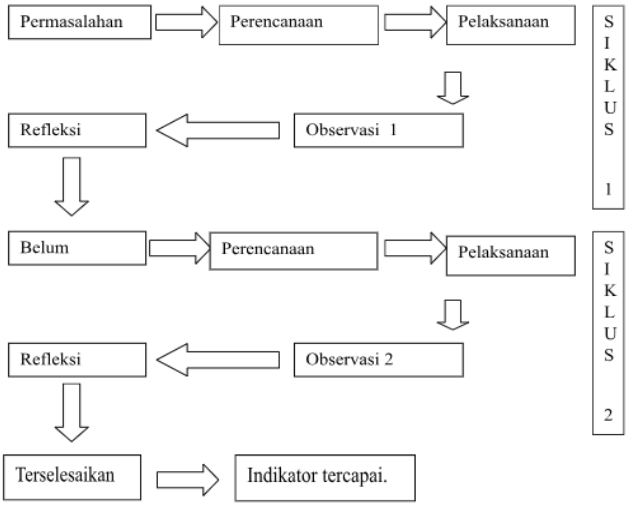

Figure 1. Flow of Cycle Stages according to Kemmis and Mc. Taggart

3.1 Cycle 1 Classroom Action Results

Cycle 1 was carried out for 4 meetings with each meeting as much as 2 hours of lessons. The first meeting on 13 March 2023 discussed the conditions and the same elements of two congruent figures, the second meeting on 16 March 2023 discussed the material of the corresponding and comparable elements between the size and the actual model, the third meeting on 20 March 2023 discussed material about calculating one of the elements, if other elements are known, and the fourth meeting on 29 March 2023 conducted a posttest. The following is an explanation of the results of the action based on the stages of research in cycle 1.

The results of the planning stage are: (1) Conducting curriculum analysis (2) Making a Learning Plan with the limitations of triangular symmetry material, (3) Making learning instruments, and (4) Arranging learning evaluation tools. In the implementation stage of the first meeting, the researcher began the activity by praying and checking the presence of students. Furthermore, researchers provide apperceptions about the material to be studied, convey learning objectives and techniques, and show learning videos about symmetry. The researcher informed the division of study groups which were divided into 6 groups of 5 to 6 students. In the second meeting and the third meeting, learning activities were carried out by discussing groups with the subject matter contained in the learning video. Meetings 1, 2 and 3 in cycle 1 generally ran smoothly and were attended by observers who observed the activities of researchers acting as teachers and observed student activities in the classroom. Furthermore, at the 4th meeting, posttest questions will be given.

At the 4th meeting, a posttest was conducted which was attended by 33 students. The posttest went smoothly and the results are presented in Table 1.

Table 1. Cycle 1 Post Test Results

Achievements	Number of Students	%	Average
Completed MCC	27	81,82%	87,27
Not Completed MCC	6	18,18%	

Table 1 shows that 81.82% of students achieved the MCC score and 18.18% of students did not complete. While the success criteria set is 83% of students complete MCC. This shows that student achievement in cycle 1 has not reached the percentage of research criteria and needs to be improved in the next action process.

Based on the observation of students, it is known that each student shows different behaviour when receiving learning. Based on the observation sheet, it can be shown that student activity is still low, namely the average score of 3.27 or 64.45%, while the success criteria is set at 83%. Based on observations, it was also found that students were less focused which was indicated by the behaviour of disturbing other students, and students were also found who felt nervous when they did not understand the problem solving steps that should be done. The observer's observation shows that the researcher as a teacher needs to improve learning activities in the hope of making students more focused on the problem solving process at hand.

Based on the observation results, some things that need to be improved in cycle 2 actions include researchers needing to increase activities with the aim of making students more focused on the learning process. In addition, researchers as teachers will take a personal approach to motivate students who still have mathematical anxiety. Through this improvement, it is expected that student learning outcomes in cycle 2 will increase.

3.2 Cycle 2 Classroom Action Results

Cycle 2 was carried out for 4 meetings with each meeting as much as 2 hours of lessons. The first meeting on 30 March 2023 discussed the conditions for proving two triangles are equal and congruent, the second meeting on 5 April 2023 discussed the material to determine the ratio of the sides of two triangles that are congruent, the third meeting on 6 April 2023 discussed the material to prove the conditions of two congruent triangles and solve problems involving the concept of congruence and the fourth meeting on 3 May 2023 conducted a posttest. The following is an explanation of the results of the action based on the stages of research in cycle 2.

The results of the planning stage are: (1) Conduct more intensive guidance to students who are having difficulties, and (2) Provide recognition and appreciation to students. In the implementation stage of the first meeting, the researcher began the activity by praying and checking the students' attendance. Furthermore, the researcher gave apperception about the material to be studied, conveyed the learning objectives and techniques, and showed a learning video about symmetry. The researcher informed the division of study groups which were divided into 6 groups of 5 to 6 students. In the second meeting and the third meeting, learning activities were carried out by discussing groups with the subject matter contained in the learning video. Meetings 1, 2 and 3 in cycle 1 generally ran smoothly and were attended by observers who observed the activities of researchers acting as teachers and observed student activities in the classroom. Furthermore, at the 4th meeting, posttest questions will be given.

At the 4th meeting, a posttest was conducted which was attended by 33 students. The posttest went smoothly and the results are presented in Table 2.

Table 2. Cycle 2 Post Test Results

Achievements	Number of Students	%	Average
Completed MCC	28	84,85%	88,18
Not Completed MCC	5	15,15%	

Table 2 shows that 84.85% of students achieved the Minimum Passing Criteria (MCQ) score and 15.15% of students did not complete. While the success criteria set is 83% of students complete the MCC. This shows that the achievement of student learning outcomes in cycle 2 has met the expectations of researchers with the number of students who have completed the MCC percentage of more than 83%.

Based on the observation of students, it is known that each student shows different behaviour when receiving learning. Based on the observation sheet, it can be shown that student activity is still low, namely the average score of 4.45 or 89.09%, while the success criteria is set at 83%. Based on this percentage, it can be concluded that the reflective learning model has succeeded in achieving more than 83% of the researcher's expectations.

Based on the results of observations in cycle 2, both the learning outcomes of students, as well as the level of completeness of students have both increased, and both have reached the success criteria expected by researchers. Therefore, this class action research was not continued in the next cycle, and the research was considered successful.

3.3 Discussion for the Research Result

Classroom action research conducted in 2 cycles has been completed following the research procedures set out in this study. In general, the class action carried out ran smoothly without any obstacles. Before the action was taken, a pretest was carried out which showed that only 63.63% of students managed to reach the MCC, which then this condition was used as the basis for taking action.

The results of providing action in the form of applying a reflective learning model in cycle 1 are shown by the results of the post test, namely students reaching MCC by 81.82% and the results of observations of student activity observations by 64.45%. Furthermore, the researcher made improvements to the learning process in cycle 2 according to the suggestions made by the observer. The results of providing action in cycle 2 showed an increase in learning outcomes, namely students who reached the MCC of 88.18% and the percentage of student activity observations of 89.09%. The outline of the increase in student learning outcomes from cycles 1 and 2 is presented in Figure 2.

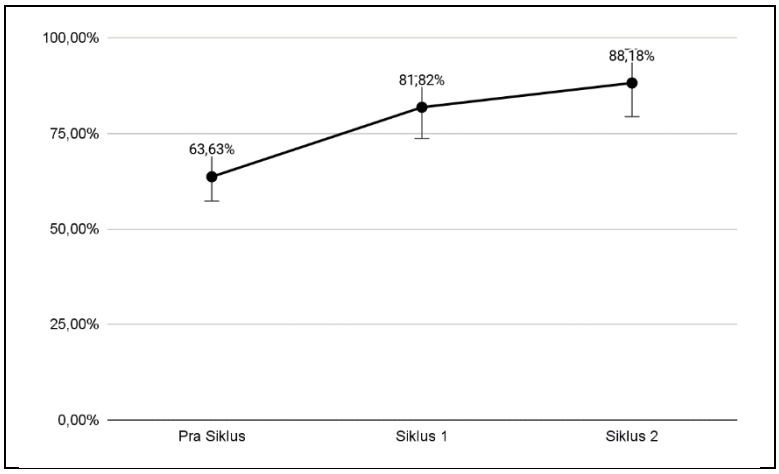

Figure 2. Improvement of learning outcomes in each cycle

In cycle 2, it appears that 28 students or around 88.18% have reached the MCC, which shows that the learning process carried out has reached the established completeness criteria of 83%. If the increase in MCC achievement is calculated, from the pre-cycle stage to cycle 1 there was an increase of 18.19%, and from cycle 1 to cycle 2 it increased by 6.36%. Researchers have been able to show an increase in the percentage of student observation results in each cycle. In cycle 2, 89.09% of the percentage of student observation results was seen, which shows that the learning process carried out has reached the established completeness criteria of 83%. If the percentage increase in student observation results is calculated, then from the cycle 1 stage to cycle 2 it is 24.64%. And the percentage increase in students' problem solving ability is presented in Figure 3.

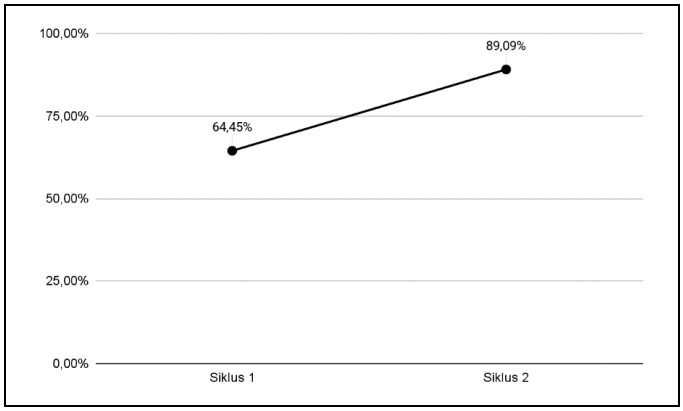

Figure 3. Percentage increase in student observation results

Based on Figure 4, the researcher has been able to show that the provision of classroom action through the application of reflective learning models is proven to improve student learning outcomes, especially in learning grade VII symmetry material.

4 CONCLUSION

Based on the results of data analysis, researchers have been able to show an increase in student learning outcomes. The improvement in learning outcomes is shown by the results of the pretest and posttest with an average value of learning outcomes in cycle I of 87.27, with a completeness rate of 81.82%, and in cycle II obtained at 88.18, with a completeness rate of 84.85%. These results show that student learning outcomes have reached the set criteria, namely reaching MCC 75, and meeting the criteria for the percentage of learning outcomes, which is 83%. The reflective learning model on grade VII students' symmetry material is in accordance with the level of thinking of grade VII students who are still in the concrete thinking level. With a reflective learning model, students learn abstract symmetry, and this gradual process helps students happy and enthusiastic about learning symmetry supported by teacher guidance and the learning process becomes active and fun. So it can be concluded that classroom action in the form of applying reflective learning models can improve student learning outcomes, especially on the material of the symmetry. Thus the research conducted has achieved the research objectives set.

5 REFERENCES

Hopkins, D. (1985). *A teacher's guide to action research*. Milton Keynes.
Kemmis, S., & Mc Taggart, R. (2014). *The Action Research Planner*. Springer.
Kumala, A., & Arundaya, F. (2017). *Kamus Bahasa Indonesia*. Ikhtiar.
Nainggolan, L. (2011). *Model Pembelajaran Reflektif untuk Meningkatkan Pemahaman Konsep dan Kemampuan Komunikasi Matematis* (Publication No. 10358) [Master thesis, Universitas Pendidikan Indonesia]. https://repository.upi.edu/10358/
Pollard, A. (2002). *Reflective Learning*. Continuum.
Rohana, R. (2015). Peningkatan Kemampuan Penalaran Matematis Mahasiswa Calon Guru Melalui Pembelajaran Reflektif. *Infinity Journal*, *4*(1), 105-119.
Soedjadi, R. (2000). *Kiat Pendidikan Matematika di Indonesia*. Depdiknas.
Sudjana, N. (2012). *Penilaian Hasil Proses Belajar Mengajar.* Bandung: Remaja Rosdakarya Offset.
Sulasmono, B. (2019). *Reflective Teaching Learning Model*. Universitas Kristen Satya Wacana.