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IMPROVING MATHEMATICS LEARNING OUTCOMES USING THE MIND MAPPING METHOD FOR STUDENTS OF SMPN 8 DENPASAR

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ABSTRACT

This study is a classroom action research that aims to improve mathematics learning outcomes. The research was conducted at SMPN 8 Denpasar, which is located on Jl. Meduri No. 2, Sumerta Village, East Denpasar District, Denpasar City, Bali. The research subjects were 40 class VIII-A students of SMPN 8 Denpasar semester 2 of the 2022/2023 academic year. The object of research is the mathematics learning outcames. Data on learning outcomes were collected using tests, and analyzed descriptively qualitatively. Criteria for the success of the research: (a) the average value of class is at least to classical completeness criteria of 70 and (b) classical completeness of at least 85%. The results showed that in the first cycle the average value of class was 73.70 with classical completeness 52.50%; in cycle II the average value of class was 81.30 with classical completeness of 87.50%. Thus, it can be concluded that the Mind Mapping method is able to improve the mathematics learning outcomes of class VIII-A students of SMPN 8 Denpasar semester 2 of the 2022/2023 academic year in 2 cycles.
Keywords: Mind Mapping Methods, Learning Outcomes, Mathematics

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PRELIMINARY

Developments in the current era of globalization demand high-quality human resources where this is the key to achieving development goals. One way to seek to improve the quality of human resources is education (Ulya et al., 2019). Education is a process of development and human behavior as a whole. Furthermore, education is useful for developing new values in facing the challenges of science, technology and the modern world (Hanid et al., 2020). Learning is a combination composed of human elements, materials, facilities, equipment and procedures and which mutually influence learning objectives. Learning has three interrelated components, namely objectives, processes, and learning assessment (Putri et al., 2019).

Learning mathematics aims to: a) understand mathematical concepts, explain the interrelationships between concepts and apply concepts or algorithms in a flexible, accurate, efficient and precise way in solving problems; b) have an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, concern, and interest in learning mathematics, as well as being tenacious and confident in solving problems (In'am & Sutrisno, 2020). Thus, mathematics subjects need to be given to 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. In the process of learning mathematics, the emphasis is on active, innovative, creative, effective and fun learning (Nabayra, 2022).

In learning process, the selection of learning strategies and methods is an important step that must be considered by the teacher (El-adl & Alkharusi, 2020). Learning strategy can be interpreted as a plan that contains a series of activities designed to achieve certain goals. Strategy is a skill, a general pattern for designing an action in preparing to achieve a goal optimally and maximally (Simamora et al., 2019). Basically learning is a planned activity that conditions or stimulates a person to be able to study well in accordance with learning objectives. While the learning method is a method or procedure used to convey lessons to students or practice a concept that has been studied in order to achieve learning objectives (Moreno-Guerrero et al., 2020). So, the method relates to a way that allows students to obtain convenience in order to learn the material presented by the teacher. For this reason, the selection of methods must be packaged creatively according to the learning objectives (Siagian et al., 2019). Learning strategies contain a broader meaning than learning methods. Thus, learning methods/procedures are part of the learning strategy.

Mind Mapping is a learning method that is used to train the ability to present content with mapping concept (Astriani et al., 2020). Mind Mapping is able to develop the potential of students to get new ideas and ideas through project planning (Sari et al., 2021). Mind Mapping can be a colorful and visual form of note-taking, which can be done by one person or by a team of several people. The Mind Mapping learning method uses a note taking strategy with keywords and pictures (Hidayati et al., 2019). Mind Mapping can also make it easier for students to understand learning by remembering concepts in the form of images, symbols, sounds, or other forms. Then this main concept is explored through branches that represent the main concepts, all of which are connected to the main concept. Within each main concept branch there are sub-concept branches that explore the concept in greater depth (Ma'ruf et al., 2019). This factor makes Mind Mapping have a structured

scope, so it is easy to see the parts of the concept to be explored. The cognitive scheme in the Mind Mapping learning method places visual power in the learning process.

The steps in using the Mind Mapping method are as follows (Abbas et al., 2021): 1) the teacher conveys the learning objectives to be achieved; 2) the teacher presents concepts/problems to be discussed by students; 3) forming a group of 3-5 people; 4) each group takes inventory and records the possible answers obtained from the results of the discussion; 5) each group (or random group) presents the results of their discussion in front of the class and classifies the results according to the direction and guidance of the teacher; 6) students make mind maps or diagrams based on the alternative answers that have been discussed; 7) some students are given the opportunity to explain their thinking concept mapping ideas; 8) students are directed to make conclusions and the teacher gives comparisons according to the desired concept.

Although the Mind Mapping learning method has shown a lot of success in learning, this learning method also has advantages and disadvantages. The advantages of the Mind Mapping learning model include (Widdah & Faradiba, 2022): (a) this learning method quickly makes it easier for students to understand the material presented by the teacher; (b) can be used to organize ideas that arise through the mind; (c) diagrams that have been formed can be a guide for writing the concepts found. While the weaknesses include (Arsana et al., 2019): (a) there is a possibility that only active students are involved in the process of finding concepts; (b) not all students are able to learn with the Mind Mapping method, especially students with lower middle abilities;

Learning outcomes are changes in behavior in a person that can be observed and measured in the form of knowledge, attitudes and skills (Widana & Ratnaya, 2021). This change can be interpreted as an increase and development that is better than before and those who do not know become aware. Learning outcomes can be interpreted as the maximum results that have been achieved by a student after experiencing the teaching and learning process in studying certain subject matter. Learning outcomes are not absolute in the form of grades alone, but can be in the form of changes, reasoning, discipline, skills and so on that lead to positive changes (Susmariani et al., 2022). Learning success is not only determined by the increase in the ability of the educators, but is determined by other factors that influence one another.

Learning outcomes achieved in the learning process are a measure of the results of the efforts made by educators and students with all related factors. Several factors that can influence student learning outcomes include (Astawayasa et al., 2022): (a) factors

originating from within the learner, such as talent, interest, motivation, and self-confidence and (b) factors originating from outside the student's self, for example teachers, study buddies, infrastructure, family environment, and community environment. Thus it can be seen that the factors that influence student learning outcomes need assistance and guidance in order to improve student achievement and avoid learning difficulties experienced by students and finally optimal learning achievement can be achieved (Damayanthi et al., 2022).

In practice in the field, teachers still have difficulty presenting learning strategies that are able to develop creative and innovative abilities in class. From the results of observations in the mathematics learning process for class VIII-A, SMPN 8 Denpasar on February 1 2023, students paid little attention to the teacher's explanation. This can be seen when the teacher is explaining that there are still some students who are busy with their desk mates and cannot answer when asked questions by the teacher. When analyzed further, the strategy applied by the teacher is not quite right so that the material to be given cannot be conveyed properly. In addition, the learning method used by the class VIII-A math teacher at SMPN 8 Denpasar still uses the lecture method. In this learning method, communication between teachers and students still goes in the same direction.

In addition to choosing an inappropriate learning method, mathematics is generally seen as difficult for students because it is difficult to understand, full of symbols and an unattractive approach to learning mathematics. This results in students quickly getting bored in learning so that student learning outcomes are not optimal. In the initial reflection activities, it can be seen that the average score of mathematics learning outcomes in midterm tests only reached 65 and only 68 in final semester tests which was below the minimum completeness criterion of 70. Likewise, the activeness of students participating in learning was relatively low. This condition is probably caused by the selection of learning methods by the teacher. Some students are often late in submitting assignments given by the teacher.

Based on the problems above, it is deemed necessary to find the best solution so that the learning outcomes of class VIII-A students of SMPN 8 Denpasar can be improved. One solution that can be done is to analyze the use of learning methods. So far, the learning methods used by teachers have not been able to build motivation and learning activities. In accordance with the joint analysis of tutors, the Mind Mapping method is thought to be able to overcome the problems encountered. The advantages of the Mind Mapping learning method are expected to be able to increase student activity and

motivation in participating in learning. The framework of thinking using Mind Mapping is able to provide guidance in the form of concept mapping. Thus the formulation of the research problem is, Can the application of the Mind Mapping learning model improve the mathematics learning outcomes of class VIII-A students of SMPN 8 Denpasar for the 2022/2023 academic year? Thus the aim of the study was to analyze the application of the Mind Mapping learning model to improve mathematics learning outcomes for class VIII-A students of SMPN 8 Denpasar for the 2022/2023 academic year.

METHODS

This research is a classroom action research, which was conducted at SMPN 8 Denpasar, located on Jl. Meduri No. 2, Sumerta, Kec. East Denpasar, Denpasar City, Bali. The research subjects were 40 class VIII-A students of SMPN 8 Denpasar Semester 2 of the 2022/2023 academic year. The object of research is the result of learning mathematics. Data on learning outcomes were collected using tests, and analyzed descriptively qualitatively. The main material discussed in this study is Basic Competence (3.7) Explaining the central angle, circumferential angle, arc length, and area of the arc of a circle, and their relationship; (4.7) Solving problems related to central angles, circumferential angles, arc lengths, and areas of circles, and their relationships. Research success criteria: (a) minimum class average equivalent to KKM of 70 and (b) classical completeness of at least 85%. The research is said to be successful if all the criteria have been met and the cycle is ended. Conversely, if one or both of the criteria that have been set have not reached the criteria, the research is declared unsuccessful and the research is continued in the next cycle.

The procedure for implementing classroom action research is carried out in the form of cycles. Each cycle consists of 4 stages of activity, namely planning, action, observation, and reflection. Prior to implementing the action, an initial reflection is carried out. The procedure for conducting classroom action research can be described as follows.

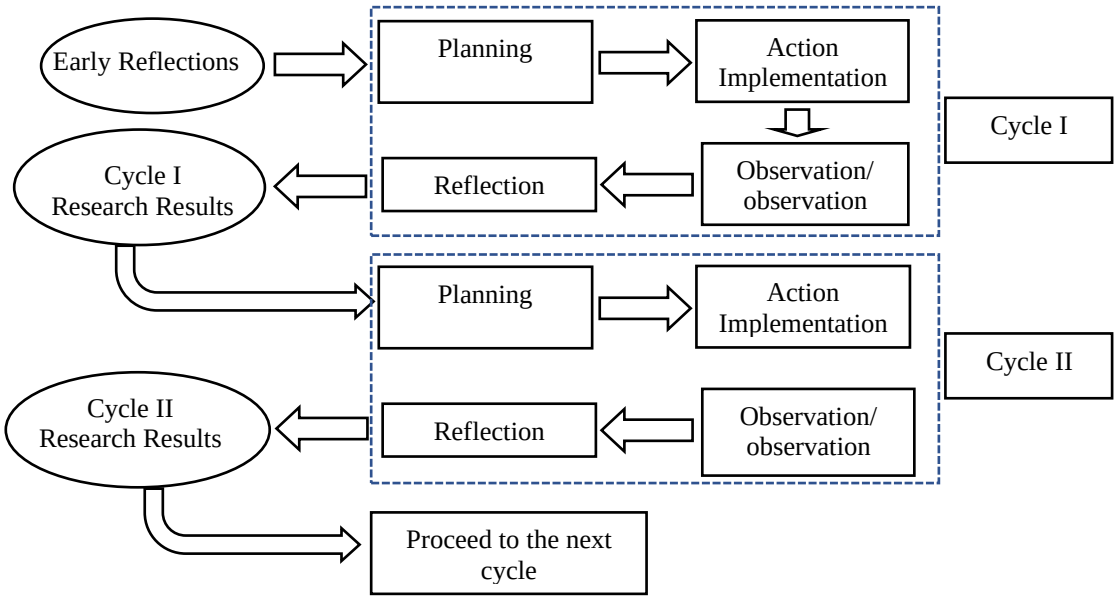

Figure 1. Classroom Action Research Cycle

RESULT AND DISCUSSION

Results

1. Early Reflections

Initial reflection is carried out to obtain information about how the teacher implements learning, student activities in learning, and how the learning outcomes are. Based on the results of initial observations and interviews with subject teachers, information was obtained that so far teachers were still more active in learning activities. According to the subject teacher, this was done because there was quite a lot of curriculum load that had to be completed while the presentation time in class was very limited. Not to mention there are incidental events at school which reduce the time for presenting subject matter in class. The teacher finally decided to convey more information to students. This has an impact on the activities of students in learning to be less active. They become listeners and carry out tasks given by the teacher without any initiative and creativity from the students themselves. Students are not given time and space to discuss and interact with their friends. Learning is felt static and boring.

With the learning conditions above, the average score of mathematics learning outcomes in midterm tests only reaches 65 and in final semester tests only 68 is below the minimum completeness criteria of 70. This condition must immediately find a solution, so that learning mathematics is more interesting and fun. Student activity in

learning must be increased. Likewise, the creativity of students needs to be developed by providing opportunities for exploration both in groups and individually. After discussing with subject teachers and various considerations, it was finally agreed to replace the learning method with the Mind Mapping learning method.

2. Cycle I

a. Planning Stage

At the planning stage, some of the activities carried out include: (1) conducting intensive discussions with subject teachers about the strategies to be carried out, (2) preparing learning tools and learning media according to the subject to be taught, namely about circles, (3) compiling learning achievement tests, (4) preparing observation sheets, and (5) preparing worksheets as materials for discussion. All of these materials are prepared together with the subject teacher. During the preparation of the materials, discussions were held about the validation of the materials that had been prepared. Likewise, in the development of mathematics learning outcomes tests continue to be discussed, so that they are in accordance with the learning objectives that have been set.

b. Implementation Stage

This classroom action research was carried out in collaboration with subject teachers. Thus, those in charge of presenting the subject matter are subject teachers. In cycle I, the main material presented was the central angle, circumferential angle, and arc length on the circle. Cycle I was presented in 3 meetings where 2 meetings were filled with presentation of material, while the 3rd meeting was filled with learning outcomes tests. Presentation of learning material in accordance with the learning steps that have been prepared in the lesson plan using the steps of the Mind Mapping learning method. Learning activities begin with preliminary activities, core activities, and closing.

c. Observation Stage

Considering that this research is collaborative research, those who are assigned to make observations are the researchers themselves. The focus of observation activities is to observe the suitability of the presentation of learning materials with predetermined learning plans, namely the Mind Mapping method, student activities in learning, class management by subject teachers. All observation results are recorded in the observation sheet that has been prepared beforehand. Some important notes that can be conveyed include: (1) the teacher has presented learning

material according to the Mind Mapping learning steps, but it still looks a bit awkward because it is the first time using the Mind Mapping learning method, (2) some participants are still confused about following the lesson, because it was the first time receiving assignment instructions directly from the teacher, (3) only students who had high abilities were active and dominated class discussions, while other students were only listeners; and (4) the students' work has not been well organized because they are not used to working independently.

d. Reflection Stage

In the reflection stage the research team conducted a self-evaluation of the constraints, progress, and follow-up plans to be carried out related to the results of the implementation of action research in cycle I. After observing the implementation of cycle I, several obstacles were found, including: (a) students had not fully actively participating in learning, this is because they are not familiar with the Mind Mapping learning method, (b) class management has not been optimally carried out, because teachers have not been able to involve all students actively, and (c) group work results have not been well organized, need to be guided to be able to write better. The progress that has been achieved during the implementation of research in cycle I includes: (a) students are starting to be seen actively interacting with their friends through presentation discussion activities, although it is still dominated by students with high learning abilities, (b) students have started to practice exploring independently, even though the results are not optimal, and (c) the teacher feels there is a positive change in the learning he does. Based on the results of this reflection, improvements will be made in cycle II.

e. Research result

After carrying out of the actions in cycle I, students are then given a learning achievement test that has been prepared beforehand. The mathematics learning outcomes that have been achieved by class VIII-A students of SMPN 8 Denpasar semester 2 of the 2022/2023 school year are as follows.

Table 1. Results of Action Research Cycle I

No.	Description	Mark
1.	The average value of the math class	73.70
2.	Number of students who complete	21
3.	The number of students who did not complete	19
4.	Classical mastery of learning	52.50%

The results of the research in the first cycle were then compared with the success criteria. The class average score of 73.70 has exceeded the KKM score set at 70. However, classical learning completeness has only reached 52.50%, which is still far below the success criteria set at 85%. Therefore, action research is continued to cycle II.

3. Cycle II

a. Planning Stage

At the planning stage, several activities carried out were almost the same as those in cycle I, including: (1) conducting intensive discussions with subject teachers about perfecting the strategy to be carried out, (2) preparing learning tools and learning media according to the subject to be discussed. taught, namely about circles, (3) preparing learning achievement tests, (4) preparing observation sheets, and (5) preparing worksheets as material for discussion. It's just that in cycle II, at the planning stage several adjustments and improvements were made in accordance with the results of reflection in cycle I.

Some of the improvements made by the teacher include: (a) motivating students who are enthusiastic about learning using the Mind Mapping learning method, (b) encouraging students who are less active with a direct appointment system during presentation discussions, (c) the teacher provides more individual guidance intensively and around the class during discussions, (d) the teacher ensures that all students are actively involved in learning, and (e) the teacher pays special attention to students' work so that they can be better organized.

b. Implementation Stage

Learning is carried out according to the learning steps in the Mind Mapping learning method which have been refined by adding special activities. As in cycle I, learning is still carried out by the subject teacher. The main material presented is solving problems related to central angles, circumferential angles, arc lengths, and areas of circular arcs. Cycle II was held in 3 meetings, where 2 meetings were filled with the presentation of subject matter and 1 meeting to carry out learning outcomes tests. The technical implementation of learning consists of preliminary steps, core activities, and closing. Teachers also provide opportunities for students to reflect on what new things are obtained in learning activities.

c. Observation Stage

Observation activities were carried out by researchers with a focus on observing the suitability of the learning steps carried out by the teacher, student activities, enhanced teacher activities according to the results of reflection in cycle I. Based on the monitoring carried out, it was seen that the teacher was no longer awkward in carrying out learning. The learning steps are in accordance with the learning scenarios of the Mind Mapping method. Teachers also seem more confident in presenting learning. Students who are less active appear to be approached by the teacher and given specific directions. The teacher continues to motivate students' enthusiasm for learning. The faces of the students have also started to look cheerful, it means that the learning has been fun. Students also look more active and do not hesitate to ask questions to their teachers and friends. The presentation activity took place in a happy atmosphere, there did not seem to be any tensions like in the previous lesson.

d. Reflection Stage

Based on the results of observations, it can be seen that learning using the Mind Mapping method has been able to arouse the enthusiasm of students. The teacher's self-confidence increases, so that the presentation of learning takes place relaxed and enjoyable. What's more, at the end of the learning activity, the teacher provides an opportunity for students to reflect on the new things that are obtained from learning activities, what has not been mastered properly, and what efforts will be made so that mastery of concepts and problem-solving abilities can be improved. Learning conditions that are fun, interactive, and take place in a happy atmosphere must be maintained and even improved.

e. Research result

After the end of the implementation of cycle II, students were again given a learning achievement test to find out the achievement of student learning outcomes. The learning outcomes of class VIII-A students of SMPN 8 Denpasar Semester 2 for the 2022/2023 Academic Year can be seen in the following table.

Table 2. Results of Action Research Cycle II

No.	Description	Mark
1.	The average value of the math class	81.30
2.	Number of students who complete	35

No.	Description	Mark
3.	The number of students who did not complete	5
4.	Classical mastery of learning	87.50%

The results of the research in cycle II were then compared with the success criteria. The class average score of 81.30 has exceeded the KKM score set at 70. However, the classical learning completeness has only reached 87.50% and has also exceeded the established success criteria of 85%. Therefore, action research can be said to be successful in 2 cycles. Thus, the application of the Mind Mapping learning method can improve the mathematics learning outcomes of class VIII-A students of SMPN 8 Denpasar semester 2 of the 2022/2023 academic year.

Discussion

The results of the research above indicate that the Mind Mapping learning method is able to build teacher confidence in presenting learning. Mind Mapping is able to provide a complete concept map of the learning material to be taught. This research method fits perfectly with the characteristics of mathematics subjects, where mathematical concepts are connected in a hierarchical manner. In general, the learning of mathematical concepts is carried out sequentially in such a way, a concept must be mastered first as a prerequisite for learning other material. With a concept map it will make it easier for students' minds to understand mathematical concepts.

A fun and interactive learning atmosphere is created in a conducive manner, if the teacher has mastered the procedures for implementing the Mind Mapping learning method (Asrawati, 2020). In the first cycle the teacher was seen to be still awkward in carrying out learning, this also had an impact on learning outcomes in mathematics that were not optimal. However, mathematics learning outcomes increase significantly after the teacher has high self-confidence, so that the implementation of learning seems more relaxed but achieves the expected goals. Student activities can also be increased according to the demands of the Mind Mapping learning method. Likewise, students do not hesitate to ask questions when the learning process is fun and interactive. All students are actively involved in learning.

The advantages of the Mind Mapping learning method are also able to improve critical thinking skills (Ma'ruf et al., 2019). In line with the results of previous research which stated that the Mind Mapping method can improve students' creative thinking

abilities. This is due to the trained thinking patterns of students based on concept maps. Finding relationships between concepts is one of the important stages in Mind Mapping. If students are trained to map mathematical concepts, it will have an impact on increasing students' analytical skills, especially the ability to find relationships between concepts. This is in line with the demands of competence in the 21st century, namely the ability to think critically and creatively in order to be able to face the very tight competition in life in this era.

The results of the study also show that the active involvement of students can improve learning outcomes. This is in accordance with the opinion that knowledge comes from action, and a person's cognitive development largely depends on how far a person manipulates and actively interacts with his environment. With a mind map, someone will then build their own thinking schemes and build concepts through their experiences. People form knowledge from what they know, not as a result of transferring what they find in the environment. The best strategy in learning something is: (a) prior knowledge plays a very important role in the learning process, (b) understanding knowledge and the differences between them, (c) helps explain the knowledge received, then break down and process it in the brain's memory system. It can be seen in this study that in 2 cycles the ability of students of SMPN 8 Denpasar class VIII-A in semester 2 of the 2022/2023 school year to construct their own understanding can increase significantly after participating in learning using the Mind Mapping method.

Although the Mind Map learning method is able to improve the mathematics learning achievement of class VIII-A students of SMPN 8 Denpasar, in this discussion it is also necessary to mention some of the obstacles encountered during the research. Some of the obstacles encountered include: (1) this learning method requires quite a long time so that students understand the concept well, (2) requires relatively more complex preparation and learning media so that the presentation of material can be done more easily by students, (3) the teacher needs to be patient so that students as a whole can enjoy this learning with fun. Thus, the implementation of the Mind Mapping learning method needs to consider the availability of time and the readiness of learning media in order to achieve optimal learning outcomes.

CONCLUSION

Based on the results of the research above, it can be concluded that the implementation of the Mind Mapping learning method can improve the mathematics learning outcomes of class VIII-A students of SMPN 8 Denpasar Semester 2 for the 2022/2023 academic year. The increase in learning outcomes is inseparable from the advantages of the Mind Mapping learning method, which is able to increase teacher self-confidence and student activity in learning. Mind Mapping is able to lead students to find relationships between mathematical concepts, making it easier for students to understand mathematical concepts.

The suggestions that can be submitted based on the results of this study are: (1) teachers of other subjects are advised to try the Mind Mapping learning method; (2) researchers are advised to carry out further research on Mind Mapping with other research variables; (3) To achieve optimal mathematics learning outcomes, the Mind Mapping learning method needs to be combined with other learning methods, and (4) the use of the Mind Mapping learning method takes quite a long time to build students' conceptual understanding, therefore for teachers who will use this learning method to consider the availability of time so that curriculum targets can be achieved.

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