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Improvement of Mathematics Learning Outcomes of Circle Materials Through *the Discovery Learning Model* in Madrasah Ibtida'iyah

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ABSTRACT
Discovery Learning is a teaching method in which teachers design a learning process so that students can discover new knowledge independently without prior notice from the teacher. This study aims to evaluate the application of the Discovery Learning model in improving mathematics learning outcomes, especially circle material, in grade VI MI NU Ma'rifatul Ulum 02 Kudus students in 2022. The research method used is Classroom Action Research (PTK) with three cycles, adopting the design of the PTK model of Stephen Kemmis and Robin McTaggart which involves the following steps: (1) planning, (2) implementation of actions, (3) observation, and (4) reflection. The results show that the application of Discovery Learning has succeeded in achieving the expected success indicators. From the data analysis, the completeness of student learning outcomes increased significantly: in the first cycle it reached 70%, in the second cycle it increased to 80%, and in the third cycle it reached 90%. This improvement shows that the Discovery Learning model is effective in improving student learning outcomes in circle materials.

KEYWORDS
mathematics, learning outcomes, *discovery learning*

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A. Introduction

Mathematics learning is often considered a difficult subject to understand, especially by students who have difficulty understanding abstract concepts. This is evident from the learning outcomes of students who often do not achieve maximum results. According to Ibrahim (2012), flat building mathematics is a deductive science that must be proven to be true. Due to the abstract nature of mathematics (Ety mukhlesi Yeni, 2015), The approach is not only through observation and experimentation, but requires systematic experiments to prove the theories. In this context, mathematics involves a comprehensive process of activities in learning mathematical concepts and structures, where the role of teachers is very important as dynamists and facilitators. Teachers need to pay attention to students' imagination and curiosity so that mathematics learning can be more effective. This requires students to be given the opportunity to be active in asking questions and opinions, so that the learning process does not only take place unidirectionally.

The results of observations in the classroom showed that there were shortcomings in students' mathematics learning outcomes. Based on data from daily tests on KD 3.5 and 4.5 with Minimum Completeness Criteria (KKM) 70, it can be seen that 12 students (60%) got a score below the KKM, while only 8 students (40%) achieved a score above the KKM. Further information through interviews with students revealed that the lack of opportunities to discuss and exchange ideas in study groups is one of the causes of the low learning outcomes (Utari Oktaviani, 2020). This shows that social interaction and opportunities to share ideas in study groups play an important role in improving students' understanding of the material.

The main cause of low student competence in mathematics learning is the teacher-centered teaching method. This method does not encourage students to think creatively and understand concepts through discoveries in the field. As a solution, one of the learning models that can be adopted is the Discovery Learning model. This model aims to make learning more meaningful by changing the learning conditions from passive to active and creative (Miftahus Surur and Sofi tri Oktavia, 2019). With this approach, students can be more involved in the learning process, develop critical thinking skills, and focus their learning on mastering mathematical concepts independently.

To overcome this problem, the researcher plans to conduct a classroom action research entitled "Improving the Learning Outcomes of Circle Material Mathematics through the Application of the Discovery Learning Learning Model in Class VI MI NU Ma'rifatul Ulum 02 Kudus Year 2022 Students". This study aims to evaluate the effectiveness of the application of the Discovery Learning learning model in improving mathematics learning outcomes, especially in circle materials. By using this model, it is hoped that students can experience a shift from teacher-centered learning to more student-centered learning, so that they can better understand and master mathematics material (Witri LestarI, 2017).

B. Theoretical Framework

Discovery Learning is a learning model that prioritizes the discovery of knowledge by students independently. According to Josua Kabunggul (2017), this model involves regulating the learning process in such a way that students can explore and find new information without first being conveyed by the teacher. The main concept of Discovery Learning is to provide students with the opportunity to understand concepts, meanings, and relationships through an intuitive process, which ultimately leads them to their own conclusions (Budiningsih, 2005). This model focuses on in-depth understanding and more effective application of knowledge rather than simply receiving information from teachers.

Howard Kingsley divides learning outcomes into three main categories: skills and habits, knowledge and understanding, and attitudes and aspirations. In the context of the national education system, educational goals are formulated by paying attention to the components of learning outcomes which are divided into cognitive, affective, and psychomotor domains according to Benjamin Bloom (Nana Sudjana, 2014). The cognitive realm deals with intellectual aspects and knowledge, the affective realm involves attitudes and feelings, while the psychomotor realm deals with physical skills (Nailatun Khalishah and Nur Iklilah, 2021). The application of Discovery Learning in learning can cover all of these domains, thus providing a holistic approach to student learning outcomes.

The theory of constructivism, which is closely related to the Discovery Learning model (Retni Paradesa, 2015), emphasizes that knowledge is formed through interaction with new environments and experiences. Asri Budiningsih (2008) explained that this theory considers knowledge as the result of students' own construction, which is formed through learning experiences and direct interaction with materials. This theory suggests

that students build their own knowledge by using their five senses, such as seeing, hearing, and feeling. In the context of mathematics, this theory is relevant because mathematics as a science of logic and structure (James and James, 2001) also requires an understanding that is built through the independent exploration and discovery of new concepts.

C. Method

This research was carried out at MI NU Ma'rifatul Ulum 02 Mijen Kaliwungu Kudus, for one month, from December 1 to December 31, 2022. The implementation of the research was carried out in the first semester of the 2022/2023 academic year and was divided into three cycles. The purpose of this study is to improve the learning outcomes of students in class VI B consisting of 20 students, with details of 5 female students and 15 male students. This study uses a variety of data collection techniques, including observation, tests, and documentation. Observation is carried out to observe student development (Hasyim Hasanah , 2016), while tests are used to measure learning outcomes. Documentation serves as a support for the data that has been obtained during the study.

The results of the study showed that in the initial or pre-cycle conditions, only 8 out of 20 students managed to achieve a score above KKM, with classical learning completeness of 40% and an average score of 69. In the first cycle, there was an increase in student learning completeness to 70%, with 14 students who managed to achieve KKM scores, but the expected research target of 80% had not been achieved. The average score of students in the first cycle also increased to 75, but the results were considered unsatisfactory so it was necessary to make improvements in the next cycle (Nurohmah, 2022).

In the second cycle, the observation results showed a significant improvement, especially in the assessment of spiritual and social attitudes, with reaching 87.5% and 82.5%, respectively. The assessment of students' skills also increased to 85%. Student learning completeness reached 80% with an average class score of 79.5. However, even though the success indicators have been achieved, researchers feel that there are still shortcomings in the implementation of the second cycle. In the third cycle, the assessment results showed a better improvement, with spiritual and social attitudes reaching 92.5%, and the skills of students and teachers in managing learning reaching 95%. This shows that the success indicators have been fulfilled very well.

D. Discussion

Based on the analysis of the research results, it is known that there is a significant improvement in mathematics learning outcomes in basic competency 3.5 related to the explanation of the estimated circumference and area of the circle, as well as the basic competency 4.5 which includes the ability of students to estimate the circumference and area of the circle and use it to solve problems in daily life (Asriyati Nadjamuddin and Evi Hulukati, 2018). This increase can be seen from the increase in student learning completeness, especially in the cognitive realm, which is observed at several stages of classroom action research (PTK), namely pre-cycle, cycle I, cycle II, and cycle III. In the pre-cycle stage, student learning outcomes are at a relatively low level with few students reaching the minimum completeness criteria (KKM). However, after the intervention in cycle I, there was a significant increase, although some students still did not reach KKM.

In cycle II, student learning outcomes are increasing along with the improvement of learning strategies applied by teachers, such as the use of problem-based learning methods and emphasis on the application of concepts in the context of daily life. Student learning completeness in the cognitive realm continues to increase until cycle

III, where most students have reached and even exceeded KKM. Improvements in the learning process, both in terms of methods, learning media, and increased student interaction, play an important role in encouraging students' understanding of the concept of circumference and circle area (Sarwoedi and others, 2018). The results of this study show that appropriate intervention in mathematics learning can significantly improve students' understanding, especially in materials that require analytical skills and application in everyday contexts. The increase in evaluation results in pre-cycle, cycle I, cycle II and cycle III can be seen in the following table.

Tabel 1: Increase in evaluation results in pre-cycle, cycle I, cycle II and cycle III

Value	Learning Completion	Pre Cycle		Cycle I		Cycle II		Cycle III	
		Number of Students	%	Number of Students	%	Number of Students	%	Number of Students	%
≥ 70	Complete	8	40	14	70	16	80	18	**90**
< 70	Incomplete	12	60	6	30	4	20	2	**10**
Category		Less		Enough		Good		**Excellent**	
Average grade		**69**		**75**		**79,5**		**84**	

Based on the table above, it can be concluded that there is a significant increase in student learning completeness in the cognitive realm from pre-cycle to cycle III. In the pre-cycle, the learning completeness only reached 40% with an average score of 69. This shows that most students have not reached the expected competency standards. However, after learning interventions were carried out through various cycles, there was an improvement in results. In the first cycle, learning completeness increased to 70% with an average score of 75, which shows an improvement in students' abilities after a more structured teaching method. This progress continued in cycle II with learning completeness of 80% and an average score of 79.5, and reached its peak in cycle III with learning completeness of 90% and an average score of 84. This improvement indicates that the approach used has been successful in helping students understand the material better over time.

From the results of the analysis of existing data, it can be concluded that the application of the Discovery Learning learning model has a positive impact on improving student learning outcomes, especially in the circle material for students in grade VI MI NU Ma'rifatul Ulum 02 Mijen Kaliwungu Kudus in 2022. Discovery Learning, which encourages students to discover concepts independently through exploration and discovery, has proven to be effective in helping students master the math material being taught.[1] With this model, students not only passively receive information, but also actively search, identify, and understand important concepts in learning. The application of this method is able to increase student involvement in the learning process, which in turn has an impact on improving their understanding and learning achievement. These results prove that innovative learning strategies can facilitate significant improvement in learning outcomes.

E. Conclusion

Based on the results of the research analysis, it can be concluded that the application of the Discovery Learning model has succeeded in improving student learning outcomes in Mathematics subjects, especially in circle materials. This can be seen from the significant increase in students' average scores in each cycle. In the pre-cycle, the average score of

[1] Ilham Muhammad and Dadang Juandi, 'Discovery Learning Model in Junior High School Mathematics Learning: A Bibliometric Review', 11 (2023).

students only reached 69, then increased to 75 in the first cycle. In addition, the percentage of completeness of student learning outcomes has also increased significantly. In the pre-cycle, only 40% of students achieved learning completeness. However, after the implementation of Discovery Learning, completeness increased to 70% in cycle I, then 80% in cycle II, and finally reached 90% in cycle III. This improvement shows that the Discovery Learning learning model is effective in improving students' understanding and learning outcomes, and is able to encourage students to be more active in discovering concepts independently. Thus, this model can be used as a good alternative to use in mathematics learning, especially in materials that require a deep understanding of concepts such as circles.

Although the Discovery Learning model has been proven to be effective in improving student learning outcomes, especially in the inner circle material in mathematics in grade VI of Madrasah Ibtida'iyah, the research that was only conducted once is not enough to provide a comprehensive and in-depth picture. First, the success of the implementation of this learning model is highly dependent on the classroom context, student characteristics, and teacher competence in facilitating the discovery-based learning process. Thus, the results obtained from a single study may not be reliable as a basis for generalization. Additionally, variations in students' learning styles and their basic ability to understand mathematical concepts can differ from classroom to classroom, so more research is needed to evaluate the effectiveness of these methods in different contexts. External factors such as implementation time, other teaching materials that are complex, and facility support must also be taken into account in further research. One study alone is also not enough to measure the long-term impact of the application of Discovery Learning on students' understanding and analytical ability in mathematics. Further research, including longitudinal observations, will provide a better understanding of the consistency and effectiveness of this model in improving student learning achievement in a sustainable manner. Therefore, further research with various variables and more diverse conditions is needed to obtain more accurate and reliable results.

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