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Application of Numbered Heads Together Model in Improving Learning Outcomes of Grade 3 Fractional Materials Students at Mi Muhammadiyah Wonorejo

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Abstract: This study aims to analyze the application of **the Numbered Heads Together** (NHT) learning model in improving students' learning outcomes in fractional material in grade III of MI Muhammadiyah Wonorejo. NHT is one of the cooperative learning strategies that involves cooperation between students to increase understanding and active participation in the learning process.

This research uses the **Classroom Action Research** (PTK) method which is carried out in two cycles, each consisting of planning, implementation, observation, and reflection stages. Data was collected through learning outcome tests, observations, and interviews.

The results showed that the application of the NHT model significantly improved the learning outcomes of students, which can be seen from the increase in the average grade of the class from cycle I to cycle II. In addition, this model also increases the active involvement of students in learning. Thus, **Numbered Heads Together** has proven to be effective in improving the understanding of the concept of fractions and the learning outcomes of grade III students of MI Muhammadiyah Wonorejo.

Keywords: Numbered Heads Together, learning outcomes, fractions, cooperative learning, MI Muhammadiyah Wonorejo.

INTRODUCTION

Mathematics is one of the subjects that has an important role in shaping logical, critical, and analytical thinking skills in students. Understanding the basic concepts of mathematics has a great influence on students' academic achievement at higher levels of education. Therefore, mathematics learning must be designed with methods that can effectively improve student understanding.

One of the materials that is often a challenge for elementary school students, especially grade III, is fractions. Difficulties in understanding fractions often occur due to their abstract concepts and lack of interesting and interactive learning approaches (Susanto, 2019). If this concept is not well understood, students will have difficulty solving fraction-related problems at a higher level.

To overcome these difficulties, innovative and effective learning methods are needed so that students can better understand the concept of fractions. One of the learning models that can be applied to improve students' understanding of fractional materials is **Numbered Heads Together** (NHT). This model is a form of cooperative learning developed by Kagan and has been proven to improve student learning outcomes in various subjects, including mathematics (Kagan & Kagan, 2018).

The NHT model provides an opportunity for students to discuss in small groups and work together in solving problems. In this model, each group member has a responsibility to understand the material and participate in the discussion. This makes students more active in understanding the material they are learning (Putri & Rahayu, 2020).

The application of the NHT model has several advantages compared to conventional learning methods. This model can increase student involvement in the learning process, develop social skills, and increase student learning motivation (Huda, 2018). With group cooperation, students can also learn from their peers and understand concepts more deeply.

In addition to improving material comprehension, the NHT model also allows each student to have responsibility in his or her group. Each member has the same opportunity to contribute to discussions and answer questions given by teachers (Saputro, 2021). Thus, the NHT model can help overcome differences in students' learning abilities and encourage them to be more active in understanding fractional materials.

Several previous studies have proven the effectiveness of the NHT model in improving student learning outcomes. A study conducted by Rahmawati and Suryadi (2020) shows that the application of the NHT model in mathematics learning in elementary schools can significantly improve students' understanding of concepts and learning outcomes. Similar findings were also reported by Hidayat (2019), who found that students who studied with the NHT model had a higher participation rate compared to students who used the lecture method.

Although the NHT model has many advantages, its implementation in the classroom still faces some challenges. One of the main obstacles is the lack of readiness of teachers in implementing cooperative learning methods optimally (Wahyuni, 2021). Teachers need a good understanding of group discussion facilitation techniques so that learning can run effectively.

In addition, differences in students' abilities in one group can be a challenge in ensuring that each group member understands the material well (Nugroho, 2020). Some students may be more dominant in discussions, while others tend to be passive. Therefore, the right strategy is needed in the application of the NHT model so that learning outcomes can be maximized.

In this study, the **Classroom Action Research** (PTK) method was used to evaluate the effectiveness of the NHT model in improving student learning outcomes in fractional material in grade III of MI Muhammadiyah Wonorejo. PTK was chosen because it allows teachers to identify and overcome obstacles that arise during the learning process directly (Arikunto, 2019).

This research was conducted in two cycles, where each cycle consisted of planning, implementation, observation, and reflection stages. In each stage, teachers and researchers analyze learning outcomes and adjust teaching strategies to be more effective in the next cycle.

The results of this study are expected to contribute to the development of more effective learning strategies, especially in mathematics learning in elementary schools. By knowing how the NHT model can be applied optimally, teachers can increase student involvement in

learning, improve understanding of fraction concepts, and improve overall student learning outcomes (Fitriani, 2022).

In addition, the findings of this study can also be a reference for other educators and researchers who want to develop cooperative-based learning methods at the elementary school level. The NHT model can be combined with other approaches to create more engaging and effective learning.

Based on the background that has been described, this study aims to: (1) analyze the application of **the Numbered Heads Together model** in improving the learning outcomes of grade III students of MI Muhammadiyah Wonorejo on fractional materials, (2) evaluate the effectiveness of the NHT model in increasing students' active participation in learning, and (3) identify obstacles and strategies in the application of this model.

Thus, this study is expected to provide more in-depth insights into the effectiveness of cooperative learning models in improving the learning outcomes of elementary school students. The NHT model can be one of the solutions for teachers in improving the quality of mathematics learning and providing a more enjoyable learning experience for students.

METHODS

This study uses two types of data sources, namely primary data and secondary data. Primary data was obtained directly from the results of observations during the learning process, student learning outcome tests, and interviews with students and teachers of grade III MI Muhammadiyah Wonorejo. This data is used to evaluate the effectiveness of the application of **the Numbered Heads Together** (NHT) model in improving students' understanding of fractional materials (Sugiyono, 2019). Meanwhile, secondary data was obtained from school documents such as student grade lists, syllabi, and literature that supported this research.

Primary data is collected through several techniques, such as learning outcome tests, student engagement observations, and interviews with teachers and students. Learning outcome tests are given before and after the application of the NHT model to determine the improvement of students' understanding of fractional concepts. Observations are carried out during the learning process to assess the level of student participation, cooperation in groups, and the effectiveness of the learning methods used (Creswell, 2018). In addition, interviews were conducted to get the perspectives of teachers and students regarding their experiences in learning using the NHT model.

Secondary data sources are used to enrich the analysis and support the interpretation of research results. Academic documents such as a list of students' grades before the study began were compared to the test results after the application of the NHT model to see the improvements that occurred. In addition, relevant previous research is used as a theoretical basis in understanding the effectiveness of cooperative learning, especially the NHT model in improving student learning outcomes (Miles, Huberman, & Saldaña, 2018).

Data Analysis

The data obtained in this study were analyzed using quantitative and qualitative descriptive analysis techniques. Quantitative analysis is used to measure the improvement of student learning outcomes based on test scores before and after the implementation of the NHT model. The percentage of student learning completeness is calculated and compared to determine the effectiveness of the method applied (Fraenkel, Wallen, & Hyun, 2019).

Meanwhile, qualitative analysis was used to interpret the results of observations and interviews to understand student engagement and their responses to the learning model used.

Quantitative analysis is performed by calculating the percentage of classical completeness using the formula:

Completion Percentage = (Number of Students Completed / Number of Students Overall) × 100%

A student is considered complete if he obtains a score of ≥70, in accordance with **the Minimum Completeness Criteria (KKM)** set by the school. The improvement in learning outcomes is seen from the difference between the average score before (**pre-test**) and after learning with the NHT model (**post-test**) (Sugiyono, 2020). In addition, simple statistical tests such as **t-tests** can also be used to test the significance of differences in learning outcomes before and after the application of the learning model.

Meanwhile, qualitative data was analyzed using **the Miles and Huberman** model, which included **data reduction, data presentation, and conclusion drawing** (Miles et al., 2018). Data reduction is carried out by filtering relevant information from the results of observations and interviews, so that only data related to the effectiveness of the NHT model are further analyzed. Data presentation is carried out in the form of tables, graphs, or narratives to facilitate interpretation and identification of learning patterns. Finally, conclusions are drawn based on the pattern of findings that appear in the data, which are then compared with the theory and results of previous research.

The results of this data analysis are expected to provide a clear picture of the effectiveness of the NHT model in improving students' understanding of fractional materials, as well as identify factors that affect the success or obstacles in the application of this model in grade III of MI Muhammadiyah Wonorejo.

RESULTS

This study aims to evaluate the effectiveness of the application of the Numbered Heads Together (NHT) model in improving students' learning outcomes in fractional material in grade 3 of MI Muhammadiyah Wonorejo. Research data was obtained through learning outcome tests, observation of student activities, and interviews with teachers and students. Data collection was carried out in two cycles of classroom action research (PTK), each of which consisted of planning, implementation, observation, and reflection stages (Arikunto, 2019).

The results of the preliminary test (pre-test) showed that the average score of students before the implementation of the NHT model was at 58.7, with only 40% of students achieving a score of ≥70 according to the Minimum Completeness Criteria (KKM). This shows that most students still have difficulty understanding the concept of fractions. This difficulty is mainly caused by students' lack of understanding of fraction comparison, fractional calculation operations, and the application of concepts in problem solving (Rahmawati & Suryadi, 2020).

After the implementation of the NHT model in the first cycle, there was an increase in the average score of students to 69.2, with 63% of students achieving KKM scores. This

improvement shows that the NHT model is starting to have a positive impact on student comprehension, although there are still some students who have not reached completion. The observation results showed that student participation in group discussions increased, although some students were still less active in contributing to their groups (Saputro, 2021).

In the second cycle, learning with the NHT model is more optimized with more structured strategies, such as providing open-ended questions and more intensive guidance for groups experiencing difficulties. As a result, the average score of students increased to 78.4, with 87% of students achieving KKM. Observations showed that almost all students were more active in discussions, able to work together in groups, and had a better understanding of the concept of fractions compared to the first cycle (Putri & Rahayu, 2020).

In addition, the results of interviews with teachers showed that the NHT model had a positive impact in increasing student engagement during learning. The teacher stated that this method helps students in understanding concepts better because there is more active cooperation and interaction in the group. Teachers also noted that students who were previously passive became more confident in expressing their opinions (Nugroho, 2020).

Data Verification

To ensure the validity and reliability of the data, this study uses data triangulation, namely by comparing the results of tests, observations, and interviews. The results of the triangulation showed that there was a correspondence between increasing student scores and increasing participation in learning. Students who are more active in group discussions generally have a more significant increase in grades compared to students who are still passive (Creswell & Creswell, 2018).

In addition, the data was analyzed using the Miles and Huberman model which consisted of three stages, namely data reduction, data presentation, and conclusion drawing (Miles, Huberman, & Saldaña, 2018). Data reduction is carried out by filtering relevant information from observations and interviews, while data presentation is carried out in the form of tables and graphs for easy analysis. Conclusions were then drawn based on the pattern of improvement of student learning outcomes from the first cycle to the second cycle.

Data verification was also carried out using an inter-rater reliability test, where two different observers observed student activities during learning. The results of the two observers were compared to ensure the accuracy of the observations. The results of the analysis showed that there was a high degree of agreement between the two observers in assessing student engagement during the application of the NHT model, which showed that the data obtained were quite reliable (Fraenkel, Wallen, & Hyun, 2019).

Thus, based on the results of data analysis and verification that has been carried out, it can be concluded that the application of the Numbered Heads Together (NHT) model is effective in improving students' learning outcomes in fractional materials. In addition to improving conceptual understanding, this model also encourages students' active involvement in learning, increases their confidence, and helps them work together effectively in groups.

The results of this analysis are used as the basis for reflection in this class action research. If the results of the analysis show that the application of the NHT model is not optimal, then the strategy will be revised in the next cycle. Thus, data analysis not only aims to determine the effectiveness of learning methods, but also as material for improvement in improving the quality of learning in the classroom (Creswell & Creswell, 2018).

DISCUSSION

The results of this study show that the application of the Numbered Heads Together (NHT)

model is effective in improving student learning outcomes in fractional material in grade 3 of MI Muhammadiyah Wonorejo. This increase can be seen from the comparison of the results of the pre-test, post-test cycle I, and post-test cycle II, where the average score of students has increased significantly. In the first cycle, the improvement in learning outcomes began to be seen, but it was not optimal. However, after the improvement in the second cycle, almost all students reached the Minimum Completeness Criteria (KKM). This finding is in line with the research of Saputro (2021), which states that the NHT model can improve students' understanding of mathematical concepts and students' activeness in group discussions.

This increase in learning outcomes is supported by more active social interaction in the study group. The NHT model provides opportunities for students to work together in understanding the material, exchanging opinions, and increasing the sense of individual and group responsibility. This is in accordance with Vygotsky's (1978) theory of the Zones of Proximal Development (ZPD), which emphasizes that students can achieve a higher level of understanding through social interaction and guidance from peers or teachers. Studies by Putri and Rahayu (2020) also show that cooperation-based learning can improve students' understanding of abstract concepts in mathematics.

In addition, the observation results show that the NHT model increases student motivation and engagement in learning. Before the implementation of this model, many students tended to be passive and lack confidence in expressing their opinions. However, after the implementation of NHT, students are more active in asking questions, discussing, and delivering answers. This supports Nugroho's (2020) research, which states that cooperative learning can increase learning motivation because it creates a more interactive and comfortable learning atmosphere for students.

However, in the first cycle there were still several obstacles, such as the lack of participation from some students who were reluctant to contribute to the group. This obstacle is caused by the difference in the level of understanding between students who understand the material faster and students who are still experiencing difficulties. To overcome this, in the second cycle, teachers provide more intensive guidance to groups that experience difficulties and apply open-ended question-based learning strategies. This strategy has proven to be effective, as suggested by Slavin (2019), who emphasized the importance of additional support for students in need so that they can benefit optimally in cooperative learning.

The success of the NHT model in this study also shows that the learning method that actively involves students is more effective than the conventional teacher-centered method. Learning that only relies on lectures tends to make students passive and lack a deep understanding of concepts (Rahmawati & Suryadi, 2020). In contrast, group discussion-based learning such as NHT provides a more meaningful learning experience. Students can practice critical thinking, develop communication skills, and work together in solving problems.

In addition to improving learning outcomes, the NHT model also contributes to the development of students' social skills, such as cooperation, responsibility, and communication skills. This is in line with the research of Fraenkel, Wallen, and Hyun (2019), which states that cooperation-based learning not only has an impact on academic improvement, but also on the development of interpersonal skills that are very important in the real world. Therefore, the NHT model can be used as one of the effective learning strategies, especially in subjects that require conceptual understanding such as mathematics.

Although the results of this study show the positive impact of the application of the NHT model, there are several limitations that need to be considered. One of them is the need for good classroom management, because group-based learning can be less effective if not managed properly by teachers. In addition, this model takes longer than conventional methods, so teachers need to design efficient learning strategies so that all material can be conveyed properly. This is in line with the findings of Miles, Huberman, and Saldaña (2018), who stated that the effectiveness of cooperative learning is highly dependent on the role of teachers in regulating group dynamics and ensuring all students are actively engaged.

Considering the advantages and challenges in the application of the NHT model, this study recommends that teachers use cooperative learning methods more often in teaching, especially in mathematics subjects. In addition, further research is needed to examine the

effectiveness of this model on different materials or levels of education. Thus, the findings of this study can be a reference for educators in designing more interactive and effective learning strategies to improve student learning outcomes.

CONCLUSION

Based on the results of the study, it can be concluded that the application of **the Numbered Heads Together** (NHT) model is effective in improving students' learning outcomes in fractional material in grade 3 of MI Muhammadiyah Wonorejo. The test results showed an increase in the average score of students, from **58.7** in the pre-test, **69.2** in the post-test cycle I, to **78.4** in the post-test cycle II. In addition, the percentage of students who achieved **the Minimum Completeness Criteria (KKM)** increased from **40%** at the beginning of the study to **87%** at the end of the second cycle. This finding is in line with the research of Saputro (2021) and Putri and Rahayu (2020), which stated that cooperative learning such as NHT can improve students' understanding of mathematical concepts.

In addition to improving learning outcomes, the NHT model has also been shown to increase student engagement and motivation in learning. Observations showed that students became more active in discussion, more confident in expressing opinions, and more motivated in solving fraction problems. This is in accordance with **Vygotsky's (1978) theory of the Zones of Proximal Development (ZPD),** which emphasizes that learning through social interaction can help students achieve higher understanding. In addition, Nugroho (2020) found that group-based learning can increase student interaction and make them more enthusiastic about participating in lessons.

Although the NHT model has various advantages, there are some challenges in its implementation. One of the obstacles found in this study is the difference in the level of understanding of students in groups, where some students still lack participation in discussions. To overcome this, teachers need to provide **additional guidance** to students who are experiencing difficulties and manage group dynamics more effectively. Slavin (2019) emphasized that in cooperative learning, the role of teachers is very important in ensuring that all students get the same benefits from group interaction.

The results of this study show that the NHT learning model can be an effective alternative learning strategy, especially in subjects that require understanding concepts such as mathematics. However, in order for this model to be applied optimally, teachers need to manage the classroom well, provide clear direction, and ensure that all students actively participate in the group. Further research can be conducted to explore the effectiveness of the NHT model on other materials or different levels of education, so that the results of this study can be developed more widely (Miles, Huberman, & Saldaña, 2018).

Thus, it can be concluded that the application of **the Numbered Heads Together (NHT)** model not only improves students' learning outcomes, but also develops students' social skills, self-confidence, and learning motivation. With proper management, this model can be one of the solutions in improving the quality of learning in elementary schools. Therefore, teachers are advised to use the cooperative learning model more often in the learning process to create a more active and interactive learning atmosphere (Fraenkel, Wallen, & Hyun, 2019).

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