



## Optimization of IPAS learning outcomes through the implementation of the Numbered Heads Together (NHT) cooperative learning model

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### ABSTRACT

The purpose of this research is to improve student learning achievement in Ilmu Pengetahuan Alam dan Sosial (IPAS) subjects through the application of a cooperative learning model of the Numbered Heads Together (NHT) type developed with an Integrated Science approach, in grade V students of SDN 27/II Sungai Arang. This research employs the Penelitian Tindakan Kelas (PTK) method, which is conducted in two cycles. Each cycle comprises the stages of planning, action implementation, observation, and reflection. The research subjects consisted of 14 students, and data collection was carried out through observation, learning outcome evaluation tests, and documentation of the learning process. The results of the analysis revealed an increase in teacher performance in both Cycle I and Cycle II. A similar increase was also seen in student involvement, which was reflected in increased activeness, teamwork, and a sense of responsibility in group activities. According to the academic results, all students achieved scores above the Kriteria Ketuntasan Minimal (KKM) set. The application of the NHT model has proven effective in creating a more interactive, interesting, and meaningful learning process. Referring to the study's results, the NHT model is suggested as an effective alternative learning strategy to improve the quality of science learning in elementary schools, while strengthening students' social and cognitive competence.

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### ABSTRAK

Tujuan penelitian ini adalah untuk meningkatkan prestasi belajar peserta didik pada mata pelajaran Ilmu Pengetahuan Alam dan Sosial (IPAS) melalui penerapan model pembelajaran kooperatif tipe Numbered Heads Together (NHT) yang dikembangkan dengan pendekatan Sains Terpadu, pada peserta didik kelas V SDN 27/II Sungai Arang. Penelitian ini menggunakan metode Penelitian Tindakan Kelas (PTK) yang dilaksanakan dalam dua siklus, di mana setiap siklus meliputi tahap perencanaan, pelaksanaan tindakan, observasi, dan refleksi. Subjek penelitian berjumlah 14 peserta didik, pengumpulan data dilakukan melalui observasi, tes evaluasi hasil belajar, serta dokumentasi proses pembelajaran. Hasil analisis mengungkapkan adanya peningkatan kinerja guru pada siklus I dan siklus II. Peningkatan serupa juga terlihat pada keterlibatan peserta didik, yang tercermin dari meningkatnya keaktifan, kemampuan bekerja sama, dan rasa tanggung jawab dalam kegiatan kelompok. Dari hasil akademik, seluruh peserta didik memperoleh nilai di atas Kriteria Ketuntasan Minimal (KKM) yang ditetapkan. Penerapan model NHT terbukti efektif dalam menciptakan proses pembelajaran yang lebih interaktif, menarik, dan bermakna. Mengacu pada hasil penelitian, model NHT disarankan sebagai salah satu strategi pembelajaran alternatif yang efektif untuk meningkatkan kualitas pembelajaran IPA di sekolah dasar, sekaligus memperkuat kompetensi sosial dan kognitif peserta didik.

**Kata Kunci:** hasil belajar; NHT; Numbered Heads Together; pembelajaran kooperatif

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## INTRODUCTION

Education is a process organized consciously and systematically, with the main goal of developing students' potential through a series of directed learning activities. More than just a process of transferring knowledge and training technical skills, education also serves as a means of character formation, the internalization of moral values, and the strengthening of attitudes that are essential for equipping individuals to live meaningfully and contribute to the progress of the nation (Wiyoko & Munfa'ati, 2022). In a juridical context, *Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 tentang Sistem Pendidikan Nasional* emphasizes that national education aims to shape individuals who are faithful, knowledgeable, virtuous, and possess skills useful both to themselves and to society at large (Wati et al., 2022). Therefore, educational design must provide deep learning experiences, stimulate learners' active participation, and create a conducive learning environment to facilitate the comprehensive development of potential (Damayanti & Suryadi, 2023). Effective education not only produces individuals who are academically competent but also builds a foundation of values and life skills that are relevant to social dynamics and global challenges (Aulia & Lena, 2023).

In line with the times, the educational curriculum system has also undergone various adjustments and updates (Sari et al., 2024). The Kurikulum Merdeka has begun to be implemented as an improvement on the previous curriculum, emphasizing learner-centered learning, focusing on essential material, character development, and competence strengthening. This curriculum was developed in *Peraturan Menteri Pendidikan, Kebudayaan, Riset, dan Teknologi Nomor 12 Tahun 2024 tentang Kurikulum pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah*, which emphasizes flexibility, a focus on essential content, and the strengthening of the profile of Pelajar Pancasila as the main foundation. With this kind of approach, teachers are given the freedom to adjust teaching strategies according to the needs, interests, and local context of students. The goal is not merely to complete all the material, but to delve into the essential aspects for meaningful improvement of students' literacy, numeracy, and character competencies (Susilana et al., 2023).

In implementing the Kurikulum Merdeka, the subjects of Natural Sciences (*IPA*) and Social Sciences (*IPS*) are combined into a single field of study called Natural and Social Sciences (*IPAS*) (Fadila & Fitriyeni, 2024). *IPAS* integrates various disciplines, such as physics, biology, geography, and sociology, so that students acquire a holistic understanding of natural and social phenomena and develop critical and analytical thinking skills. *IPAS* learning requires a model that fosters curiosity, involves student activity, and encourages cooperation. One model that supports this is the Numbered Heads Together (NHT) type of cooperative learning, which positions students as the main actors in the learning process through group collaboration and reinforcement of individual responsibility.

The NHT model has a learning structure that encourages student interaction, develops critical thinking and oral expression skills, and enhances academic mastery (Pratiwi, 2023). This approach is suitable for *IPSA* learning, which demands a deep understanding of concepts and the ability to work together in groups (Awal & Nasarudin, 2020).

Based on observations at SD Negeri 27/II Sungai Arang on May 4, 2024, *IPAS* learning is still dominated by lecture and discussion methods that do not fully involve students. Many students appear passive, less interested, and show minimal active participation in the learning process. In addition, students tend to avoid interaction in discussions or in individual assignments. Only a small number of students are actively asking or answering questions. Students seem to prefer waiting for the teacher's instructions, and some even show a lack of interest by diverting their attention to other things.

The results of the *IPAS* learning evaluation show that of the 14 students who participated in the learning process, 13 successfully met the Minimum Completeness Criteria (*KKM*) set at 65. This means that quantitatively, the students' learning completeness level is relatively high, with a graduation percentage reaching 92.8%. However, from the perspective of learning quality, this achievement does not fully reflect a meaningful, in-depth learning process. This is evident in the low active involvement of some students during the learning process, as well as in the minimal internal drive or strong learning motivation among others (Maling, 2024). This situation highlights the importance of innovation in learning strategies that not only focus on achieving academic results but also prioritize the quality of learning experiences that are contextual, enjoyable, and capable of fostering active student engagement.

A learning approach that positions students as the main subjects in the learning process and relies on structured, meaningful interactions is believed to strengthen their internal motivation and overall participation. Learning using the NHT model has been proven effective in increasing students' enthusiasm for learning in *IPAS* subjects by fostering increased collaboration, group involvement, and a sense of individual responsibility in the learning dynamics (Ananda *et al.*, 2025). Numbered Heads Together (NHT) in Classroom Action Assessment (*PTK*) in two cycles effectively increases students' motivation and learning outcomes, as evidenced by higher average scores and a higher percentage of learning completeness. (Ayunda *et al.*, 2022).

Given the problems identified in the previous learning process, the researcher determined that the NHT cooperative learning model is one of the alternative approaches believed to improve the quality of *IPAS* outcomes. This study aims to evaluate the extent of the NHT model's effectiveness in improving the learning achievements of fifth-grade students at SDN 27/II Sungai Arang.

## LITERATURE REVIEW

### Optimization

Optimization is a measure of the success of efforts made to achieve goals. Optimization can also be understood as the process of maximizing various activities to obtain the expected benefits (Komarudin *et al.*, 2025). In its application, optimization is often interpreted as an action to improve performance, overcome shortcomings, and adjust strategies to achieve effective and efficient results that meet needs.

Furthermore, optimization is viewed as an effort to reduce losses and, at the same time, increase profits under conditions with limitations. Optimization is a strategy designed to achieve targets efficiently with the minimal use of resources (Fiqry *et al.*, 2024). This

indicates that optimization not only focuses on achieving the best results but also on managing resources wisely to achieve effectiveness and efficiency simultaneously (Girsang, 2021).

## **Learning Outcomes**

Learning outcomes are an important indicator of the effectiveness of the learning process, as they reflect relatively permanent changes in students, including knowledge (cognitive), attitudes (affective), and skills (psychomotor). These changes occur through systematic interaction between students and educators, and are influenced by a supportive learning environment. These three domains are the main focus of educational assessment. Hence, the measurement of learning outcomes is not limited to academic abilities alone but also encompasses the development of students' attitudes and practical skills (Nada *et al.*, 2025). The cognitive domain concerns the ability to think logically and understand concepts; the affective domain involves the internalization of values and the development of character. In contrast, the psychomotor domain is related to motor skills acquired through direct learning experiences (Mahmudi *et al.*, 2022). These three domains must be assessed comprehensively so that educators can obtain a complete picture of learning achievements. Therefore, learning outcome evaluation serves as a reference in designing more effective learning strategies that are oriented towards achieving educational goals holistically.

## **Cooperative Learning**

Cooperative learning is a learning approach that emphasizes cooperation among students in small groups. Each group member is encouraged to actively contribute, support each other, and share knowledge, so that shared learning objectives and the development of individual and group responsibility are achieved (Slavin *et al.*, 2003). Cooperative learning is a learning strategy that emphasizes cooperation among students in small groups with a shared goal, where each member is responsible for both individual and group achievement (Johnson & Johnson, 2002).

## **Numbered Heads Together (NHT)**

The NHT type cooperative learning model is a group learning strategy that structures students into heterogeneous groups, with each group member assigned a specific number. The learning process includes numbering the members, the teacher giving questions, group discussions, and presenting answers according to the number called (Fredimento & Sariyyah, 2020). This approach aims to encourage active involvement of all group members, foster a sense of shared responsibility, and ensure that every student participates in understanding the material (Sunarsih, 2020). Through this mechanism, students' opportunities to think critically and express ideas can be more evenly distributed, thereby improving learning effectiveness (Mardiyah *et al.*, 2023).

From the perspective of learning achievements, the implementation of the NHT model has been shown to positively affect students' conceptual understanding and learning outcomes

(Wiyoko & Munfa'ati, 2022). In mathematics learning, this model significantly enhances mathematical thinking skills compared to conventional methods. Similar positive results are also observed in thematic learning in elementary schools, where the implementation of NHT encourages gradual improvement in students' learning completeness from one cycle to the next. These findings indicate that NHT has high flexibility and can be adapted to various subjects and educational levels to improve learning quality (Diana *et al.*, 2023).

### **Natural and Social Sciences (IPAS)**

Natural and Social Sciences (IPAS) is a curriculum approach that integrates aspects of the natural sciences (IPA) and the social sciences (IPS) within a single integrated learning framework, aiming to create a comprehensive and contextual understanding of life phenomena. The implementation of this approach, especially in the Kurikulum Merdeka, has proven effective in improving students' learning achievement and problem-solving skills, while simultaneously strengthening mastery of the cognitive, affective, and psychomotor domains (Zakarina *et al.*, 2024).

Furthermore, IPAS is not merely a combination of curricula, but also an important means of preparing students to face the challenges of the 21st century through the application of contextual and project-based approaches. In the context of the Kurikulum Merdeka, IPAS learning is designed to give teachers and students the freedom to explore natural and social phenomena comprehensively—providing space for students to think critically and creatively and to learn independently. Other studies show that a holistically and thematically developed micro IPAS curriculum can improve the relevance of learning for elementary school students. However, challenges such as teacher training and facilities still need to be addressed for optimal implementation (Permatasari *et al.*, 2023).

## **METHODS**

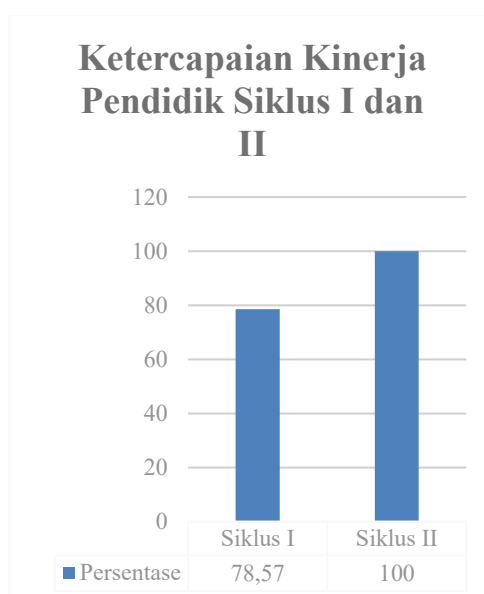
The method used in this study is the Classroom Action Research (PTK) approach. In this study, interventions were carried out in two cycles, each following four main stages systematically: action planning, implementation of learning, observation of the process and results, and reflection on the effectiveness of the implementation. The research was conducted in the odd semester of the 2024/2025 academic year, involving 14 elementary school students, consisting of 9 male students and 5 female students, as the primary subjects in the learning activities. This approach was chosen to identify and address learning problems directly in the classroom, while also evaluating the impact of the NHT model on students' academic achievement. Data processing in this study was carried out using descriptive quantitative and qualitative analysis techniques, namely by calculating the average value of IPAS learning outcomes, the percentage of learning completeness, and the improvement in learning outcomes. This study used a descriptive approach, utilizing quantitative data (percentage of learning completeness and observation scores) and qualitative data (observation notes and reflections). Quantitative data are used to objectively assess improvements in students' learning outcomes by analyzing class average scores and the percentage of mastery achievement in each action implementation cycle (Putri *et al.*, 2023). Mastery is considered achieved if at least 70% of the total students obtain scores that meet

or exceed the Minimum Mastery Criteria (*KKM*), which is 65. The success indicators of the action are determined by comparing learning evaluation results between the first and second cycles, which specifically reflect the effectiveness of implementing the NHT-type cooperative learning model in improving students' academic performance. Qualitative data is used to complement the interpretation of learning dynamics, changes in students' behavior, and the quality of interactions during learning activities.

Meanwhile, qualitative data are used to observe and evaluate the ongoing learning process, particularly student interactions within groups, participation in discussions, and the teacher's role during activities. Observations are categorized based on the quality qualifications of learning, with the minimum threshold set at the "Good" level. Through this approach, the effectiveness of implementing the NHT model can be seen comprehensively, both in terms of outcomes and the learning process.

## **RESULTS AND DISCUSSION**

### **Achievement of Educator Performance Cycle I and II**



**Figure 1.** Achievement of Educator Performance Cycle I and II

*Source: Author's Documentation 2025*

The bar chart in the image above shows a clear increase in educator performance from Cycle I to Cycle II. In the initial stage (Cycle I), the teacher's performance level was recorded at 78.57%. This percentage was obtained based on achievements in several teacher performance observation indicators, including: 1) skills in opening the lesson; 2) presentation of material; 3) use of teaching methods/strategies; 4) two-way interaction with students; 5) classroom management; and 6) lesson closure.

The implementation of the teaching and learning process includes planning, which is the stage undertaken when starting a teaching and learning process: The teacher asks for the attendance of students and records students who are absent; Asks students how far they have covered the previous discussion; Provides an opportunity for students to ask questions

about the lesson material they have not yet mastered from the lessons that have been delivered; Briefly reviews other lesson materials. Implementation, which is the stage of delivering lesson material that can be identified in several activities as follows: Explaining to students the objectives to clarify the discussion of each lesson material; Concluding the results of the discussion from all main topics; furthermore, observation of the process and results, as well as reflection on the effectiveness of learning.

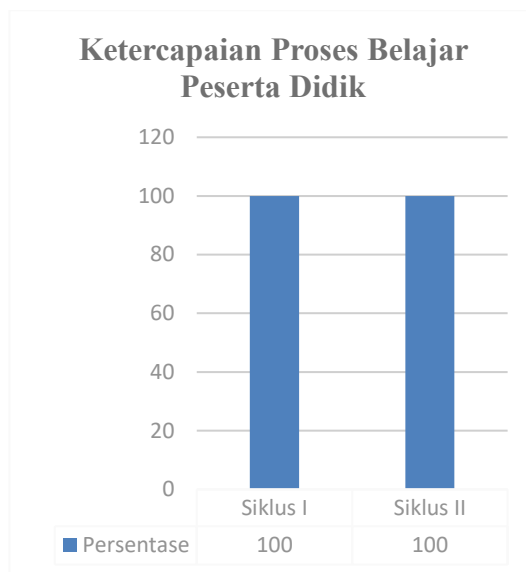
The results indicate that most learning components have been implemented quite well. However, there are still aspects that need optimization, such as strengthening two-way interactions and managing classroom dynamics. After reflection and improvements, the educator's performance in Cycle II increased significantly to 100%. This shows that all indicators in the observation sheet have been implemented optimally and consistently, reflecting an improvement in the teacher's professional capacity to design, implement, and reflect on learning activities.

A score of 78.57% in cycle I indicates that the implementation of learning has not fully run according to plan. Some obstacles that arose at this stage include poor time management, ineffective distribution of group tasks, and limited active student interaction. These findings form the basis for reflection and the development of improvement strategies ahead of cycle II. In cycle II, the NHT type cooperative learning approach was applied more deliberately and systematically. The teacher ensures that each student has a role in group discussions, provides reinforcement for group tasks, actively guides students throughout the learning process, and conducts evaluations consistently. These efforts impact increased student engagement and learning effectiveness. As a result, the teacher's performance reaches 100%, indicating that all indicators in the observation sheet have been implemented very well. All learning components, from opening activities to core activities to closing activities, can be carried out optimally in accordance with NHT principles. This condition makes the learning activities more active, enjoyable, and student-centered.

In general, this data visualization shows that the evaluation and follow-up from the first to the second cycle can positively impact overall learning quality. The implementation of the NHT learning model not only improves students' learning achievements but also encourages educators to optimize their roles as facilitators and managers of the learning process.

The performance achievement of educators reaching 100 in cycle II indicates that the NHT learning model effectively facilitates IPA learning for fifth-grade students.

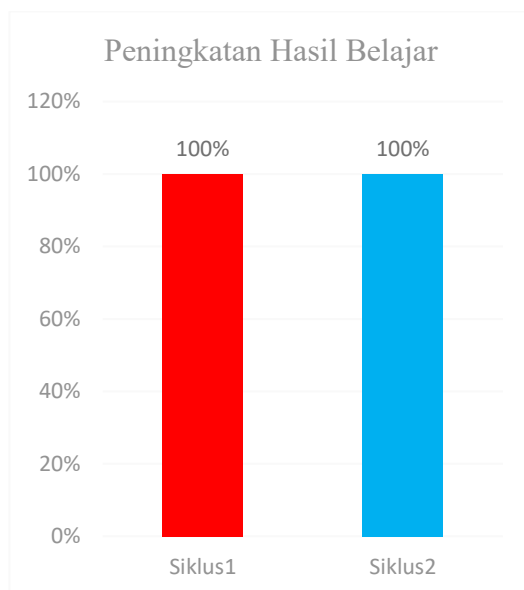
## **Achievement of Student Process Cycle I and II**



**Figure 2.** Achievement of the Student Learning Process  
*Source: Author's Documentation 2025*

**Figure 2** shows data on students' learning progress in cycles I and II. Based on the image, the level of achievement in both cycles reached 100%. This indicates that all students in the class have participated in the learning activities according to the predetermined success indicators, including participation, involvement, and task completion. In cycle I, the implementation of the NHT learning approach created an active and enjoyable learning environment. Students showed enthusiasm in following the learning stages, including group discussions, answering questions, and interacting with their group members. These results indicate that implementing the learning model from the initial stage has had a positive impact on student involvement in learning activities. Although the learning process in cycle I was already optimal, the researcher conducted reflections to refine the learning strategy. Some improvements in cycle II include providing more specific instructions, reinforcing role distribution during discussions, and more efficient time management. In cycle II, the students' learning process again achieved 100% achievement. This means that all students remained active, participated to the fullest, and completed all learning activities well. This consistency shows that the NHT model is not only effective in improving learning outcomes but also in maintaining students' motivation and involvement throughout the learning process. Thus, Figure 2 provides evidence that the application of the NHT model is highly effective in achieving distributed learning engagement among all students evenly. The 100% success in both cycles also shows that the learning process has been designed and implemented optimally, making it a strong recommendation for applying a similar model in other classes or subjects.

## Student Learning Outcomes



**Figure 3.** Learning Outcomes of Cycle I and II  
*Source: Author's Documentation 2025*

The bar chart above illustrates the learning achievement results for students in both cycles, with all students achieving a completeness level of 100%. This achievement provides evidence that the NHT learning model can promote optimal learning outcomes. Although the percentage of completeness is the same in both cycles, a striking difference is seen in the quality of its implementation. In the first cycle, students' success was greatly influenced by the researcher's direct support, and some students remained passive in group discussions. Meanwhile, in the second cycle, students demonstrated more active participation, the courage to express their opinions, and an overall improvement in understanding of the material.

## Discussion

The results of this study indicate a significant improvement in both educator performance and student learning achievement after the implementation of the NHT model. This improvement is understood not only quantitatively but also analyzed within the framework of optimization and learning outcomes. Therefore, this discussion focuses on how NHT contributes to optimizing student engagement and learning outcomes, its relevance to applicable theories, comparisons with previous research, and new implications for *IPAS* learning and the Kurikulum Merdeka. The implementation of the NHT model has been proven to optimize student engagement in the learning process. During activities, students are more active in discussions, focused on the material, and able to use time efficiently.

The NHT learning model significantly increases student engagement (Puspita & Ningsih, 2023). With this technique, students not only listen to explanations but are also trained to cooperate, discuss, and be accountable for their understanding individually (Oktaviani *et al.*, 2023). In this process, every student feels valued and responsible for their group's learning,

which improves concept comprehension and evaluation results (Awaliya & Utami, 2024; Barkah & Robandi, 2024). Each group member has a clear role, so no student is passive. This activeness makes learning more interactive and fosters a sense of responsibility both individually and collectively.

Thus, learning engagement is optimized through increased participation, two-way interaction, and students' emotional involvement in learning. This improvement not only reflects enhancements in teacher performance but also becomes an important element contributing to students' success in following the *IPAS* learning. Students' enthusiasm for learning increases, their collaborative skills develop, and their understanding of the lesson material strengthens. Therefore, optimal teacher performance significantly influences the overall quality of the learning process. These findings align with research indicating that active teacher participation in the learning process positively contributes to improvements in students' motivation and learning outcomes (Al Munawar *et al.*, 2025; Haque *et al.*, 2024).

In addition to increasing engagement, NHT also helps optimize learning outcomes. In the first cycle, learning success is still influenced by teacher intervention, whereas in the second cycle, students demonstrate a deeper understanding and independence in completing tasks. This success contributes to achieving learning objectives and improving the quality of the classroom educational process (Zebua *et al.*, 2023).

The fundamental difference from conventional models, such as lectures, lies in the numbering system that ensures all students are ready to participate. This impacts the equality of learning outcomes, as each student has the same opportunity to engage and contribute. In this way, learning outcomes improve not only quantitatively but also qualitatively in the cognitive, affective, and psychomotor domains. The implementation of NHT has been proven to increase student participation and activeness in *IPAS* learning in elementary schools (Suparmini *et al.*, 2024). These findings reinforce the theory of cooperative learning, which emphasizes working together in small groups to achieve shared learning goals. Optimizing learning outcomes depends on meaningful social interactions, the exchange of ideas, and a sense of shared responsibility among group members.

Increasing classroom interaction and instruction clarity can improve the effectiveness of science learning (*IPA*) (Yasin *et al.*, 2024; Zahroh *et al.*, 2023). Implementing NHT among elementary school students also increases participation in the learning process (Hunter *et al.*, 2026). Nevertheless, this study has its own uniqueness because it is conducted in the context of the *IPAS* subject in the Kurikulum Merdeka. The integration of science (*IPA*) and social (*IPS*) studies into a single subject requires cross-disciplinary understanding, and the research results show that NHT is effective not only for single subjects but also relevant for integrated learning that emphasizes the interconnectedness of concepts.

This finding suggests that NHT can be an effective learning strategy to optimize *IPAS* learning outcomes in elementary schools. The uniqueness of NHT lies in its numbering mechanism, which ensures an equitable distribution of responsibility and student participation, thereby achieving optimal learning outcomes across cognitive, social, collaborative, and affective domains. This study affirms that optimizing learning outcomes is not only about improving academic scores but also about the quality of a comprehensive learning experience, in line

with the spirit of the Kurikulum Merdeka, which emphasizes active, enjoyable, and meaningful learning.

## CONCLUSION

The results of the classroom action research implementation over two cycles show a fairly significant improvement in teacher performance. In the first cycle, the teacher's performance achievements indicated that several aspects of the learning process still needed refinement. Through reflection and the preparation of improvement steps in the second cycle, these achievements were further enhanced. These accomplishments indicate that more directed planning, the implementation of more systematic teaching strategies, and the active involvement of the researcher in assisting with teaching and learning activities can contribute to the overall improvement in the quality of the learning process.

The students' learning process also shows optimal results. All students actively participate in the learning process well in both cycle I and cycle II. The implementation of the NHT learning model has been proven to increase students' participation, interaction, and responsibility in learning activities. Through this method, the classroom atmosphere becomes livelier, students are more focused, and can work together and understand the material more deeply.

The students' learning outcomes increased significantly, as evidenced by 100% learning completion in both cycles. Although the target of completeness was achieved in the first cycle, the implementation of learning in the second cycle was of higher quality. This improvement can be seen in students' increased confidence, more active involvement in discussions, and the ability to answer questions with a deeper understanding of concepts. Thus, it can be concluded that the use of the NHT model not only successfully improves students' academic achievement but also creates a more active, interactive, and meaningful learning environment. With this research, future researchers can expand the application of cooperative learning to other *IPAS* topics, for example, integrating science concepts with social issues in the students' environment. In addition, the research can also assess the effectiveness of this model in developing 21st-century competencies such as creativity, communication, and digital literacy that align with the demands of the Kurikulum Merdeka.

## AUTHOR'S NOTE

The author states that there is no conflict of interest related to the publication of this article. The author emphasizes that the data and content of the article are free from plagiarism.

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