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Improving IPAS Learning Outcomes through the NHT Cooperative Learning Model Assisted by Wordwall

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Abstract: This study aims to improve science and social studies (IPAS) learning outcomes through the implementation of the Numbered Heads Together (NHT) cooperative learning model assisted by Wordwall media for fifth-grade students at SD Negeri Cipanjar Kabupaten Sumedang. This research employed a Classroom Action Research (CAR) design conducted in two cycles, each consisting of planning, action, observation, and reflection stages. The subjects were 20 fifth-grade students. Data were collected through teacher and student observation sheets as well as learning achievement tests administered at the end of each cycle. The results showed significant improvements in all observed aspects. Teacher performance increased from 57.5% (poor category) in cycle I to 70% (fair category) in cycle II. Student activity improved from 45% (very poor category) in cycle I to 75% (good category) in cycle II. Students' mastery learning also increased from 45% in cycle I to 75% in cycle II. Thus, the application of the NHT cooperative model assisted by Wordwall was proven effective in enhancing both student engagement and IPAS learning outcomes. This study implies that teachers can utilize a combination of cooperative learning strategies and interactive digital media to create more meaningful and engaging learning experiences.

INTRODUCTION

Education serves as a strategic instrument in shaping high-quality and competitive human resources. In the era of globalization and rapid technological advancement, learning in schools is required not only to transfer knowledge but also to cultivate critical, creative, collaborative, and communicative thinking skills (Frisnoiry, 2024). Both the Merdeka Curriculum and national education policies emphasize the importance of student-centered learning that promotes active participation in the learning process. Consequently, teachers are required to develop innovative strategies and learning media that not only help students comprehend concepts but also foster their motivation and learning skills to face the challenges of the 21st century (Nur & Andriani, 2025).

However, in practice, there remain various obstacles in implementing learning as expected. According to data from the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek), approximately 36% of elementary school students in Indonesia still experience difficulties in understanding science-based subjects, including Ilmu Pengetahuan Alam dan Sosial (IPAS, or Natural and Social Sciences) (Noviyanti et

al., 2024). These difficulties are often influenced by students' low level of engagement in the learning process. When students act merely as passive listeners, conceptual understanding tends to be shallow, and learning motivation decreases. Therefore, there is a need for innovative learning models that can simultaneously enhance student engagement and learning outcomes.

Observations conducted in Grade V of SD Negeri Cipanjar, Sumedang Regency, revealed a similar condition. Out of 20 students, most demonstrated low participation during lessons. Teachers tended to dominate the learning process using lecturing and simple question answer techniques. Assessment was conducted randomly through oral questioning, yet not all students were actively involved. Although the classroom atmosphere appeared conducive, it largely reflected passive learning behavior only a few students actively responded to the teacher's questions, while others remained silent, unfocused, and followed lessons mechanically. This indicates that the learning model used was still monotonous and had not effectively fostered full student engagement.

The most common problem found in IPAS learning in Grade V is the dominance of the teacher in classroom activities. Teachers spend most of the time explaining concepts while students merely listen, take notes, and complete exercises. As a result, students tend to become bored, lose focus, or engage in unrelated activities. Although a few students actively ask questions, most remain passive until the end of the lesson. This condition directly affects students' IPAS learning outcomes, with the majority failing to reach the expected mastery level. Such circumstances present a major challenge that must be addressed to improve the quality of IPAS learning in elementary schools.

Previous studies have demonstrated the effectiveness of cooperative learning models, particularly the Numbered Heads Together (NHT) type, in increasing student participation and learning achievement. For instance, Guslawati (2024) found that implementing the NHT model enhances student participation in group discussions and promotes equitable learning responsibility. Similarly, Santoso and Rasyid (2025) revealed that the use of interactive digital media such as Wordwall significantly improves learning motivation due to its gamification elements and instant feedback. Nevertheless, most of these studies have examined these variables in isolation, some focused on cooperative learning models without integrating digital media, while others explored digital media without linking it to a structured learning model.

This gap highlights the need for research that integrates the NHT cooperative learning model with the support of interactive digital media like Wordwall to improve IPAS learning outcomes in elementary education. The combination of these two approaches offers mutual benefits: NHT fosters active participation and shared responsibility among students, while Wordwall enhances motivation and provides instant formative assessment through educational games. Therefore, this classroom action research aims to fill this gap by providing empirical evidence on the effectiveness of combining cooperative learning strategies with digital interactive media in real classroom settings.

Based on the above discussion, this study aims to improve IPAS learning outcomes through the implementation of the NHT cooperative learning model assisted by Wordwall

media among fifth-grade students at SD Negeri Cipanjar, Sumedang Regency. The significance of this study is twofold. Theoretically, it contributes to the growing body of research on the effectiveness of technology-enhanced cooperative learning in elementary education. Practically, the findings are expected to serve as a reference for teachers in selecting innovative, engaging, and effective teaching strategies to enhance student participation and learning achievement. Hence, this study seeks to make a meaningful contribution to the improvement of IPAS learning practices in elementary schools.

METHOD

This study employed a Classroom Action Research (CAR) design conducted collaboratively between the researcher and the classroom teacher. The action research model adopted in this study refers to the Kemmis and McTaggart framework, which consists of four stages in each cycle: (1) planning, (2) acting, (3) observing, and (4) reflecting. The research was carried out in two cycles, with the assumption that if the results obtained in the first cycle were not optimal, necessary improvements would be implemented in the second cycle (Datuela et al., 2025).
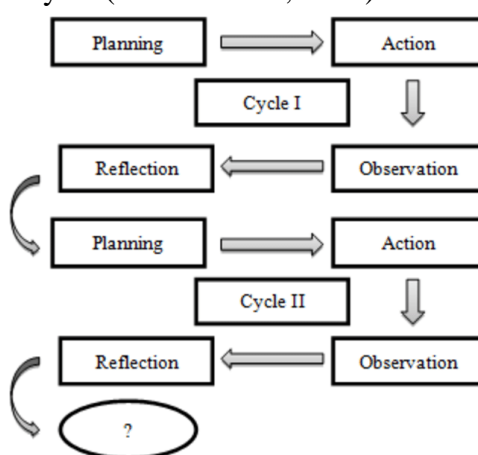

Figure 1. Design of Classroom Action Research (CAR)

The main focus of this study is to improve students' learning outcomes in *Ilmu Pengetahuan Alam dan Sosial* (IPAS) through the implementation of the cooperative learning model, specifically the Numbered Heads Together (NHT) type, assisted by *Wordwall* media. Each cycle of the classroom action research involved continuous improvement based on reflection from the previous cycle, allowing the learning process to become more effective and better aligned with students' needs.

Research Subjects

The subjects of this study were fifth-grade students at SD Negeri Cipanjar, Sumedang Regency. The class consisted of 20 students, including eight male and twelve female students. The object of this research was the cooperative learning model of the Numbered Heads Together (NHT) type assisted by *Wordwall* media. The research site was chosen based on pre-observation results indicating that the IPAS learning process was still dominated by lecturing and simple question-and-answer methods. As a result, student

participation remained low, and learning outcomes had not yet achieved the expected mastery level.

Research Procedure
This study was conducted in two cycles, with each cycle consisting of two meetings. Each cycle included the following stages:
1. Planning: Developing lesson plans (RPP), preparing Wordwall media, designing observation instruments, and constructing learning achievement test items.
2. Implementation of Action: Applying the NHT cooperative learning model assisted by Wordwall media in IPAS learning activities.
3. Observation: Monitoring teacher and student activities during the learning process using pre-prepared observation sheets.
4. Reflection: Analyzing the results of observations and tests to identify strengths and weaknesses, which then served as the basis for improvement in the subsequent cycle.

Data Analysis Techniques
The collected data were analyzed using both descriptive qualitative and quantitative methods. Qualitative data, such as the results of teacher and student activity observations, were analyzed through data reduction, data presentation, and conclusion drawing. Quantitative data, consisting of students' IPAS test scores, were analyzed by calculating the average score and the percentage of learning mastery using the following formula:

$$Classical\ Mastery = \frac{Number\ of\ Students\ Meeting\ Mastery\ Criteria}{Total\ Number\ of\ Students}\ x\ 100\%$$

The research was considered successful if the following criteria were met:
1. Teacher and student activities during the learning process reached the "good" category ($\geq 80\%$).
2. There was an observable improvement in the quality of the IPAS learning process from Cycle I to Cycle II.
3. At least 75% of students achieved the school's Minimum Mastery Criteria (Kriteria Ketuntasan Minimal or KKM), which was set at a score of 70.

RESULT AND DISCUSSION
This classroom action research was conducted in two cycles, each consisting of two meetings. The research data were collected through teacher observation sheets, student observation sheets, and reading comprehension achievement tests administered at the end of each cycle. The learning model implemented was the cooperative learning model of the Numbered Heads Together (NHT) type assisted by Wordwall media, which proved effective in improving the IPAS learning outcomes of fifth-grade students at SD Negeri Cipanjar, Sumedang Regency.

Teacher Observation Results

Based on the observation results of the teacher's performance during the implementation of the cooperative learning model, specifically the Numbered Heads Together (NHT) type assisted by Wordwall media.

Table 1. Teacher Observation Results

Activity	Percentage Score Category		Average Score	Category
	Meeting			
	I	II		
Cycle I	55%	60%	57,5%	Not Good
Cycle II	65%	75%	70%	Good Enough

Based on the table above, there was a noticeable improvement in the quality of learning implemented by the teacher from Cycle I to Cycle II. In Cycle I, the average score of teacher observation was 57.5%, categorized as not good. However, after implementing improvements in Cycle II, the average observation score increased to 70%, which falls into the good enough category. This indicates that the teacher became increasingly capable of managing the learning process more effectively by utilizing the Numbered Heads Together (NHT) model assisted by Wordwall media. The improvement also reflects that the adjustments made to the teaching strategies between Cycle I and Cycle II had a positive impact on the overall quality of instructional implementation.

Student Observation Results

Observation of students' activities during the learning process was conducted to determine the extent of their engagement and participation in classroom learning activities. The data on student observations are presented in Table 2.

Table 2. Student Observation Results

Activity	Average Score	Category
Cycle I	45%	Very Poor
Cycle II	75%	Good

Based on the table, it can be seen that students' learning activities showed a significant improvement. In Cycle I, the average level of student engagement reached only 45%, which was categorized as Very Poor. However, in Cycle II, the average observation score increased to 75%, categorized as Good. This finding indicates that the implementation of the Numbered Heads Together (NHT) model assisted by Wordwall media effectively encouraged students' involvement in group discussions, enhanced active participation, and stimulated students' interest in learning IPAS subject matter.

IPAS Learning Achievement Test

In addition to teacher and student observations, the success of this study was also measured through an IPAS learning achievement test administered at the end of each cycle. The results of the test are presented in Table 3.

Table 1. IPAS Learning Achievement Test

Activity	Mastery	Non Mastery
Cycle I	45%	55%
Cycle II	75%	25%

Based on the table and graph above, students' learning mastery in Cycle I reached only 45%, while 55% of students did not achieve the minimum mastery criteria. After implementing improvements in Cycle II, students' learning mastery increased to 75%, and the proportion of students who had not yet achieved mastery decreased to 25%. These results demonstrate that the implementation of the Numbered Heads Together (NHT) cooperative learning model assisted by Wordwall media had a positive effect on improving the IPAS learning outcomes of fifth-grade students at SD Negeri Cipanjar, Sumedang Regency.

Discussion

The results of this study show that the implementation of the Numbered Heads Together (NHT) cooperative learning model assisted by Wordwall media had a significant impact on improving the quality of IPAS learning in Grade V. Gradually, the quality of instructional implementation by the teacher increased from 57.5% (Poor) in Cycle I to 70% (Fair) in Cycle II, representing a 12.5-point (≈21.7% relative) improvement. Student engagement rose sharply from 45% (Very Poor) to 75% (Good) a 30-point (≈66.7% relative) increase, accompanied by a rise in IPAS learning mastery from 45% to 75% (a 30-point improvement) and a reduction in the proportion of students who did not meet mastery criteria from 55% to 25% (a 30-point ≈54.5% relative decrease). This consistent pattern of improvement across all three indicators (teacher process, student activity, and learning outcomes), suggests a functional relationship in which better implementation of the NHT model mediates higher student engagement, which in turn enhances learning mastery.

From a theoretical standpoint, these findings align with the principles of cooperative learning, which emphasize positive interdependence, individual accountability, promotive face-to-face interaction, social skills, and group processing (Virnanda et al., 2025). In NHT, the numbering of members and random calling strengthen individual accountability while maintaining group cohesion. Since any student can be called upon to represent their group at any time, the tendency toward free riding is minimized, group discussions become more meaningful, and the conceptual argumentation of IPAS content is strengthened. The 30-point increase in student activity reflects a reduction in passivity and an increase in on-task behavior, consistent with meta-analytic findings that well-structured cooperative learning enhances participation and academic achievement.

From a social constructivist perspective, peer discussions in NHT facilitate co-construction of knowledge and scaffolding within the Zone of Proximal Development (ZPD) (Kusuma et al., 2025). Students with stronger understanding provide contextually appropriate explanations, examples, and feedback, while others negotiate meaning, test misconceptions, and construct new conceptual schemas. This mechanism is particularly relevant to IPAS, which demands scientific reasoning, inter-conceptual connections, and application to everyday phenomena. Thus, the increase in learning mastery from 45% to 75% can be interpreted as a consequence of conceptual clarification through meaningful peer interaction.

The integration of Wordwall adds a layer of gamification and digital formative assessment, enhancing students' motivation and self-regulation. According to the ARCS model (Susanti & Imbiri, 2020), the game-based features that are fast-paced, challenging, and varied capture Attention; the contextual relevance of IPAS-related questions fosters Relevance; instant scoring and feedback build Confidence; and the sense of accomplishment yields Satisfaction. This motivational increase was reflected in the surge of student activity and consistent participation during NHT discussions, which subsequently contributed to improved learning outcomes.

From a cognitive perspective, Wordwall provides scaffolded practice with immediate feedback, helping to reduce extraneous cognitive load (e.g., search or instructional confusion) and allocate cognitive resources toward essential and germane processing (Sweller). The Multimedia Learning Principles (Santoso & Ginting, 2023) such as segmentation, modality, and minimal redundancy further explain why short, repeated, game-based exercises support conceptual schema reinforcement in IPAS. When extraneous load is minimized and information is structured, students enter NHT discussions with sufficient prior knowledge, enhancing the quality of group argumentation.

The 12.5-point improvement in teacher observation scores indicates enhanced fidelity of implementation: the design of guiding questions became more precise, heterogeneous grouping was better maintained, think–pair–share time was managed more proportionally, and random calling was applied consistently. These micro-strategy refinements are critical to NHT since, without disciplined facilitation, individual accountability may weaken. This improvement in teacher performance serves as an intervening variable that explains the parallel increase in student engagement and learning mastery.

From an assessment for learning perspective, Wordwall also functioned as a diagnostic and formative tool that enabled rapid identification of misconceptions, allowing the teacher to make cyclical instructional adjustments between cycles. When data indicated dominant misconceptions, the teacher revised discussion prompts, modified item difficulty, or added contextual examples. This teach–elicit–feedback–adjust cycle served as the driving mechanism for the observed improvements across both cycles.

The findings also align with the TPACK/SAMR framework (Muslimin, 2024). Wordwall did not merely digitize quizzes but augmented (A) and partially modified (M) learning tasks through instant feedback, game elements, and actionable performance data. The combination of NHT (social structure) and Wordwall (technological assessment) generated a technopedagogical synergy that maximized engagement while improving conceptual mastery tracking accuracy.

Despite the strong data pattern, causal interpretations should be approached with caution. This classroom action research did not employ a control group, the sample size was not reported, and the indicators were presented as aggregate percentages, which restricts the computation of standardized effect sizes and inferential analyses. A potential novelty effect arising from the use of gamified media should also be considered; therefore, the sustainability of the observed effects needs to be examined across different IPAS topics and over extended periods. Future research could incorporate continuous gain-score

measurements, misconception analyses for each learning indicator, Wordwall log analytics to map response times and error patterns, process rubrics to assess the quality of scientific argumentation during NHT discussions, and quasi-experimental designs to strengthen internal validity. From a practical standpoint, the findings recommend ensuring clear and rotating member roles (recorder, presenter, questioner, respondent) to maintain accountability, employing tiered question items (lower–higher order) to promote deeper reasoning during NHT discussions, maintaining disciplined timing and random-calling procedures, utilizing instant Wordwall feedback for micro-remediation before plenary sessions, and ensuring equitable participation through heterogeneous grouping and spokesperson rotation. Therefore, the observed increases in student activity and learning mastery in this study demonstrate the replicable and scalable potential of integrating the Numbered Heads Together model with Wordwall to improve the quality of IPAS learning in elementary schools.

CONCLUSION

Based on the results of the two-cycle classroom action research, it can be concluded that the implementation of the Numbered Heads Together (NHT) cooperative learning model assisted by Wordwall media effectively improved both the quality of the learning process and the learning outcomes of IPAS among fifth-grade students at SD Negeri Cipanjar, Sumedang Regency. Improvements were evident across three main aspects: (1) the teacher's performance in managing instruction increased from the Poor category in Cycle I (57.5%) to the Fair category in Cycle II (70%); (2) student learning activity rose significantly from 45% (Very Poor) in Cycle I to 75% (Good) in Cycle II; and (3) students' IPAS learning mastery improved from 45% in Cycle I to 75% in Cycle II. These findings indicate that integrating the NHT model with interactive Wordwall media not only enhanced student engagement during the learning process but also positively impacted their conceptual understanding and mastery learning achievement. The implication of this study is that teachers can adopt the NHT model assisted by Wordwall as an innovative and effective instructional strategy to improve the quality of IPAS learning and other subjects in elementary education.

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