Al-Ishlah: Jurnal Pendidikan
Vol.18, 4 (December, 2026), pp. 4176-4188
ISSN: 2087-9490 EISSN: 2597-940X, DOI: 10.35445/alishlah.v18i4.9771

Improving Fifth-Grade Students' IPAS Learning Outcomes through a Wordwall-Assisted Deep Learning Approach: A Classroom Action Research Study

Izzati Putri Zahra[1], Nasyariah Siregar[2], Kiki Fatmawati[3]

[1] Universitas Islam Negeri Sulthan Thaha Saifuddin, Jambi, Indonesia; Izzatizaza2004@gmail.com
[2] Universitas Islam Negeri Sulthan Thaha Saifuddin, Jambi, Indonesia; nasyariahsiregar@uinjambi.ac.id
[3] Universitas Islam Negeri Sulthan Thaha Saifuddin, Jambi, Indonesia; kikifatmawati86@uinjambi.ac.id

ARTICLE INFO

Keywords:

deep learning approach;
wordwall;
classroom action research;
science and social studies

Article history:

Received 2026-03-12
Revised 2026-08-30
Accepted 2026-11-2

ABSTRACT

Improving students' conceptual understanding and engagement in Natural and Social Sciences (IPAS) remains a challenge in elementary education, particularly when instruction relies on teacher-centered approaches. This study aimed to improve fifth-grade students' IPAS learning outcomes through a Wordwall-assisted deep learning approach integrating mindful, meaningful, and joyful learning principles. This study employed classroom action research based on the Kemmis and McTaggart model, involving 35 fifth-grade students at SD Negeri 131/IV Jambi City during the 2025/2026 academic year. The research was conducted in two cycles comprising planning, action, observation, and reflection. Data were collected through learning achievement tests, classroom observations, interviews, and documentation. Quantitative data were analyzed using descriptive statistics, mastery percentages, and normalized gain (N-Gain), while qualitative data were analyzed thematically. Students' mean scores increased from 55.42 in the pre-cycle to 69.71 in Cycle I and 86.00 in Cycle II. Classical mastery improved from 37.14% to 68.57% and 88.57%, respectively, exceeding the predetermined 85% success criterion. The overall N-Gain was 0.69, indicating moderate improvement. Teacher activity increased from 65.7% to 86.8%, while student activity increased from 63.4% to 84.2%. The findings suggest that integrating deep learning principles with Wordwall-supported interactive activities can facilitate more engaging and meaningful IPAS instruction. This approach offers a practical strategy for improving learning outcomes in elementary classrooms, although its effectiveness requires further investigation across broader educational contexts.

This is an open access article under the CC BY-NC-SA license.

Corresponding Author:
Izzati Putri Zahra
Universitas Islam Negeri Sulthan Thaha Saifuddin, Jambi, Indonesia; Izzatizaza2004@gmail.com

1. INTRODUCTION

The implementation of the Merdeka Curriculum in Indonesian elementary schools emphasizes student-centered learning that promotes conceptual understanding, critical thinking, and the application of knowledge in real-life contexts. One significant curricular development is the integration of Natural Sciences (IPA) and Social Sciences (IPS) into Natural and Social Sciences (IPAS), which aims to strengthen students' scientific literacy and understanding of interconnected natural and social phenomena (Alfarisi et al., 2025; Kemendikbudristek, 2024). Effective IPAS instruction requires learning experiences that encourage students to actively construct knowledge, investigate scientific phenomena, and develop meaningful connections between concepts and everyday experiences (Kelly, 2014; Rodriguez, 2015). However, elementary science instruction continues to face challenges related to teacher-centered practices, limited student participation, and insufficient opportunities for conceptual exploration (Lidiawati et al., 2025; Osborne & Dillon, 2008). These challenges highlight the need for instructional approaches that promote active engagement and meaningful understanding rather than memorization.

Similar challenges were identified at SD Negeri 131/IV Jambi City, particularly in fifth-grade IPAS instruction on the human digestive system. Preliminary classroom observations and interviews with the homeroom teacher indicated that instruction predominantly relied on teacher explanations and textbook-based activities, providing limited opportunities for interactive exploration and collaborative learning. Initial assessment results revealed that only 13 of 35 students (37.14%) achieved the Learning Objective Achievement Criteria (KKTP) of 70, substantially below the targeted classical mastery level of 85%. These findings suggest a discrepancy between expected learning competencies and students' actual achievement. The human digestive system presents particular instructional challenges because students must understand interconnected biological structures, functions, and processes that are not directly observable. Consequently, instructional strategies incorporating visualization, conceptual exploration, and interactive activities are needed to facilitate students' understanding of these scientific concepts.

A deep learning approach offers a pedagogical framework for addressing these challenges by emphasizing active knowledge construction, conceptual connections, reflection, and authentic learning experiences. Unlike surface learning, which primarily emphasizes information recall, deep learning encourages learners to interpret information, connect prior knowledge with new concepts, and apply their understanding to meaningful situations (Fullan et al., 2018; Vosniadou, 2013). Within the Indonesian educational context, this approach can be operationalized through three interconnected principles: mindful, meaningful, and joyful learning (Ambarita et al., 2025). Mindful learning encourages students to focus attention, recognize learning objectives, and reflect on their understanding. Meaningful learning facilitates connections between scientific concepts and students' everyday experiences, while joyful learning promotes positive emotional engagement through stimulating and supportive activities. These principles align with constructivist perspectives emphasizing the active role of learners and social interaction in knowledge development (Vygotsky, 1978).

The effectiveness of these pedagogical principles may be strengthened through interactive digital learning media. Wordwall is a game-based educational platform offering interactive activities, including quizzes, matching exercises, and classification games, that can support student participation and formative assessment. Its immediate feedback and gamification features provide opportunities for students to review concepts, identify misconceptions, and participate actively in learning activities. Previous studies have demonstrated the potential of Wordwall to support vocabulary acquisition, learning interest, and interactive classroom experiences (Faradila et al., 2023; Sari et al., 2024). In elementary science education, Wordwall has also been examined as a medium for facilitating IPAS instruction (Kresnadi et al., 2025). From a cognitive perspective, combining verbal explanations with appropriate visual representations may support conceptual understanding by facilitating the integration of information into existing knowledge structures (Mayer, 2024). Nevertheless, digital media should be integrated with purposeful pedagogical strategies rather than employed merely to increase classroom entertainment.

Previous research has investigated various instructional innovations relevant to elementary science education. Ibrahim et al. (2024) examined project-based learning supported by Wordwall in elementary science instruction, while Lidiawati et al. (2025) explored differentiated instruction through classroom action research to improve students' cognitive abilities in IPAS. Meanwhile, Ambarita et al. (2025) discussed deep learning as a framework for pedagogical transformation in Indonesia. These studies provide valuable insights into technology-supported instruction and student-centered pedagogical approaches. However, the cited literature offers limited classroom-level evidence explaining how mindful, meaningful, and joyful learning principles can be systematically integrated with Wordwall activities through iterative planning, implementation, observation, and reflection in fifth-grade IPAS instruction. Furthermore, the instructional processes associated with changes in student engagement and achievement during successive classroom action research cycles require closer examination.

To address this contextual and empirical gap, the present study integrates a deep learning approach with Wordwall-assisted activities in teaching the human digestive system to fifth-grade students. The proposed integration involves mindful exploration through guided observation and questioning, meaningful learning through collaborative discussions and contextual problem-solving, and joyful learning through interactive games accompanied by immediate feedback. The study employs classroom action research following the reflective framework of Kemmis et al. (2014), allowing instructional practices to be systematically refined based on classroom observations and learning outcomes. Its contribution lies in documenting the implementation and refinement of this integrated instructional strategy while examining changes in students' cognitive achievement and classroom participation across two intervention cycles.

Accordingly, this study aims to describe the implementation of a Wordwall-assisted deep learning approach and examine improvements in fifth-grade students' IPAS learning outcomes on the human digestive system. Specifically, it addresses two research questions: (1) How is the Wordwall-assisted deep learning approach implemented and refined through classroom action research cycles? and (2) How do students' learning outcomes and classroom engagement change following its implementation? The findings are expected to provide context-specific empirical evidence and practical guidance for elementary school teachers seeking to develop interactive, reflective, and meaningful IPAS learning experiences.

2. METHODS

This study employs the Classroom Action Research (CAR) approach. CAR was chosen because it aligns with the study's objective, which is to improve and enhance the quality of the IPAS learning process and outcomes through the collaborative and reflective implementation of specific interventions in the classroom (Kemmis et al., 2014; Abdillah, 2022). This study follows the spiral model proposed by Kemmis and McTaggart, which comprises four stages in each cycle: planning, action, observation, and reflection.

The study was conducted at SD Negeri 131/IV in Jambi City during the even semester of the 2025–2026 academic year, specifically from February through March 2026. The study spanned two learning cycles, with each cycle consisting of two sessions (for a total of four sessions), plus one session for the pretest and one session for the posttest.

The research participants were all 35 students in Class VB, consisting of 17 boys and 18 girls, aged 10–11 years. Class VB was selected based on the results of an initial assessment, which showed the lowest IPAS learning achievement compared to other classes on the same topic, as well as on the recommendation of the homeroom teacher. In addition, the participants also included one Class VB homeroom teacher as a collaborator in implementing the intervention, the principal as the authorizing authority and general supervisor, and one mentor teacher who acted as an observer throughout the learning process.

2.1 Research Procedures (PTK Cycles)

This study was designed in two cycles, with each cycle following the stages below:

Cycle I

a. Planning: Developing a Lesson Plan (RPP) or deep learning-based teaching module for the topic "The Human Digestive System and Its Functions," preparing interactive Wordwall media aligned with the material, creating observation sheets for teacher and student activities, and preparing formative assessment questions for Cycle I.
b. Action: Conducting IPAS lessons using a deep learning approach aided by Wordwall over two sessions. The first session focused on introducing the digestive organs through videos and matching games on Wordwall; the second session focused on the functions of the organs and the digestive process through interactive quizzes and group discussions.
c. Observation: The observer records the activities of the teacher and students using a structured observation sheet and notes qualitative findings throughout the process.
d. Reflection: The researcher and collaborators analyze the results of formative assessments, learning activities, and any challenges that arise. This reflection serves as the basis for improvements in Cycle II.

Cycle II

Based on the results of the Cycle I reflection, improvements were made in the following areas:

a. Allocating additional time for independent exploration of concepts.
b. Using a wider variety of Wordwall games (e.g., anagrams and the random wheel).
c. Increasing the intensity of group guidance for students who were still struggling.

The steps followed were the same as in Cycle I, with the material expanded to include "Disorders and Maintenance of Digestive System Health."

The instructional intervention implemented in this study was a deep learning approach supported by the Wordwall platform, which was carried out through a series of systematic steps in each session. Each session began with a ten-minute introduction, during which the teacher opened the lesson with an apersepsi activity based on the students' daily experiences—such as asking how they felt after eating—and then communicated the learning objectives and provided initial motivation. Moving into the core activity, which lasted fifty minutes, the lesson was designed in four main phases. The first phase was independent exploration (mindful), during which students watched an animated video about the digestive system and jotted down critical questions that arose. The second phase is small-group discussion (meaningful), during which students discuss how to connect new information with their prior knowledge, aided by a game matching organs to their functions using Wordwall. The third phase is an interactive game (joyful), in which students take a Wordwall quiz individually or in groups, using a point system and immediate feedback to reinforce conceptual understanding. The fourth phase is contextual application, in which students complete a simple case study, for example, analyzing what happens when someone eats too quickly and present their findings to the class. The activity concluded with a ten-minute wrap-up session that included a group reflection, reinforcement of concepts by the teacher, and the assignment of Wordwall-based independent work to be completed at home.

2.2 Data Collection Techniques and Instruments

In this study, the data collection techniques used included tests, observations, interviews, and documentation (Sugiyono, 2020). Tests were used to measure students' cognitive learning outcomes, while observations were used to monitor teacher and student activities during the learning process. Interviews were used to elicit responses, identify challenges, and gauge the perceptions of both teachers and students regarding the intervention, whereas documentation was used to collect supporting data such as photos, videos, and grade records. The instruments developed for each of these techniques consist of five types.

First, a learning outcome test comprising 20 multiple-choice questions and 5 short-answer questions, designed based on competency achievement indicators for the topic of the digestive system. Second, a teacher activity observation sheet containing 15 indicators of the implementation of deep learning steps and the use of Wordwall, rated on a 1–4 Likert scale. Third, a student activity observation sheet containing 12 indicators of student participation, collaboration, and active engagement. Fourth, an interview guide containing 8 open-ended questions for teachers and 6 questions for student representatives, developed based on the components of deep learning (mindful, meaningful, joyful). Fifth, documentation of the teaching modules used to verify that on-site practices align with the established plans.

2.3 Validity and Reliability/Credibility of the Instruments

To ensure the quality of the quantitative instruments, the content of the learning outcome test items was first validated through an assessment by two experts—an IPAS lecturer and a senior teacher—resulting in a Content Validity Index (CVI) of ≥ 0.80. Next, the questions were pilot-tested on a limited scale with 15 students outside the research sample to calculate item validity using Pearson's correlation and reliability using Cronbach's Alpha. The pilot test results showed that 18 out of 20 multiple-choice questions were deemed valid, with a calculated r value greater than the table r value, and Cronbach's Alpha reached 0.82, which falls within the high reliability category (Helmiyatun et al., 2025). Meanwhile, for the qualitative instruments—namely, the observation sheet and interview guide—credibility was ensured through three measures. First, source triangulation by comparing information from teachers, students, and observers. Second, member checking by reconfirming findings with teachers and students to ensure data accuracy. Third, peer debriefing through discussions with fellow researchers to minimize interpretive bias.

2.4 Data Analysis Techniques

Data analysis in this study was conducted separately for quantitative and qualitative data. Quantitative data obtained from test results were analyzed descriptively by calculating the mean, the classical percentage of mastery, and the standard deviation. In addition, to measure the extent of improvement in learning outcomes across cycles, normalized gain (N-Gain) analysis was used with the formula N-Gain = (Posttest Score – Pretest Score) / (Maximum Score – Pretest Score), which was then categorized as high ($g > 0.7$), moderate ($0.3 \leq g \leq 0.7$), or low ($g < 0.3$) based on (Hake & Reece, 1999) criteria. Quantitative data were also analyzed comparatively across cycles to identify trends in improvement. Qualitative data obtained from observations and interviews were analyzed using thematic analysis through the stages of data reduction, categorization, interpretation, and drawing conclusions. Specifically, data on activity observations were analyzed by calculating the percentage of implementation and categorized into four levels: Very Good, Good, Fair, and Poor (Assyakurrohim et al., 2022).

2.5 Indicators Of Success

The success indicators in this study were established quantitatively and qualitatively based on clear justifications. Quantitatively, the study is considered successful if the classical mastery of student learning outcomes reaches at least 85%, meaning that at least 30 out of 35 students achieve a score equal to or above the Learning Objective Achievement Criteria (KKTP) of 70. Additionally, an improvement in learning outcomes is considered meaningful if the average N-Gain falls into the moderate (≥ 0.3) to high category. The setting of an 85% classical mastery target is based on the minimum mastery standard established by the Jambi City Department of Education and is supported by Slavin's (2015) recommendation, which states that the effectiveness of a learning intervention is indicated by a mastery rate above 80%. Qualitatively, success indicators are marked by teachers' activities falling into the "Good" category (≥ 75%) and students' activities falling into the "Good" category (≥ 75%) based on observation sheets, as well as positive responses from teachers and students regarding the implementation of the Wordwall-assisted deep learning approach, as revealed through interviews.

2.6 Ethical Aspects of the Research

This research was conducted with strict adherence to ethical standards. Before the study began, the researcher submitted an official request for permission to the Principal of SD Negeri 131/IV in Jambi City via a research request letter numbered 001/PNL/UNJA/2026 and received written approval. All participants, including both teachers and students, were provided with a complete explanation of the research's objectives, procedures, and duration before voluntarily signing the informed consent form. Specifically for students under the age of majority, consent was obtained from parents or guardians via a notification letter and a signed consent form. The researchers also ensured that all students' personal data, including names and grades, were kept confidential by using initials in the reports and were used solely for research purposes. Teachers and students were given full freedom to withdraw from the study at any time without facing any academic or administrative consequences.

3. FINDINGS AND DISCUSSION

3.1 Findings

This classroom action research was conducted in two cycles to improve student learning outcomes in the subject of IPAS (Natural and Social Sciences) on the topic of the human digestive system through the application of a deep learning approach assisted by the interactive media Wordwall. The research was conducted at SD Negeri 131/IV Jambi City in the even semester of the 2025/2026 academic year, with 35 students of class VB as the research subjects.

3.1.1 Student Learning Outcomes

Data on student learning outcomes were obtained through formative tests administered at the end of each cycle. The recapitulation of learning outcomes from the pre-cycle, cycle I, and cycle II stages is presented in Table 1 below.

Table 1. Recapitulation of Student Learning Outcomes in Pre-Cycle, Cycle I, and Cycle II

Stage	Average Score	Number of Students Achieving Mastery (≥ KKTP 70)	Mastery Percentage	Category
Pre-Cycle	55.42	13	37.1%	Low
Cycle I	69.71	24	68.5%	Moderate
Cycle II	86.00	31	88.5%	Very High

Source: *Primary data processed, 2026*

Based on Table 1, there was a gradual improvement in student learning outcomes from the pre-cycle to cycle II. In the pre-cycle stage, only 13 out of 35 students (37.1%) achieved the KKTP, with an average score of 55.42. After the implementation of the action in cycle I, the number of students who achieved mastery increased to 24 students (68.5%) with an average score of 69.71. In cycle II, mastery reached 31 students (88.5%) with an average score of 86.00, which exceeded the predetermined success indicator of 85%.

3.1.2 N-Gain Analysis Between Cycles

To measure the magnitude of the improvement in learning outcomes more accurately, a normalized gain (N-Gain) analysis was conducted between cycles. The N-Gain was calculated using the following formula:

N-Gain = (Posttest Score – Pretest Score) / (Maximum Score – Pretest Score)

The interpretation criteria for N-Gain refer to (Hake & Reece, 1999):

- N-Gain > 0.7 : High
- 0.3 ≤ N-Gain ≤ 0.7 : Moderate

- N-Gain < 0.3 : Low

Table 2. Results of N-Gain Analysis Between Cycles

Period	Average Pretest Score	Average Posttest Score	N-Gain	Category
Pre-Cycle → Cycle I	55.42	69.71	0.32	Moderate
Cycle I → Cycle II	69.71	86.00	0.54	Moderate
Pre-Cycle → Cycle II	55.42	86.00	0.69	Moderate (approaching High)

Source: *Primary data processed, 2026*

Based on Table 2, the N-Gain from pre-cycle to cycle I was 0.32 (moderate category), indicating that the intervention in cycle I began to have a positive impact, although it was not yet optimal. The N-Gain from cycle I to cycle II increased to 0.54 (moderate category), indicating that the improvements made in cycle II resulted in a greater increase. Overall, the N-Gain from pre-cycle to cycle II reached 0.69 (moderate category approaching high), which means that the intervention as a whole was effective in significantly improving student learning outcomes.

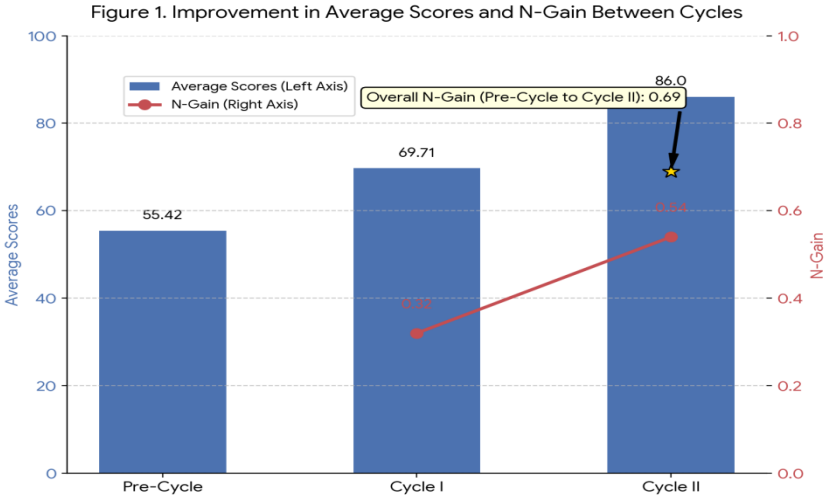


Figure 1. Improvement in Average Scores and N-Gain Between Cycles

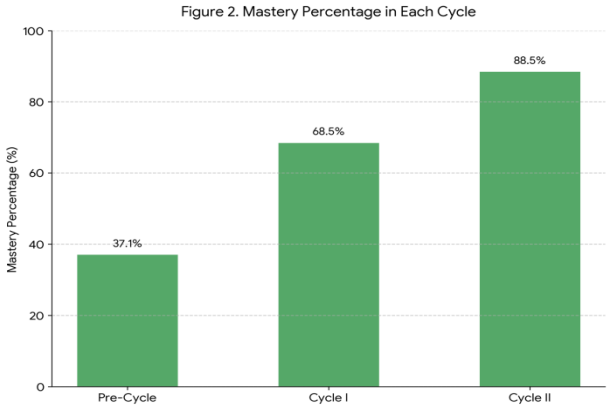


Figure 2. Mastery Percentage in Each Cycle

3.1.3 Teacher and Student Activities

In addition to learning outcomes, teacher and student activities during the learning process were also measured through observation sheets. The recapitulation of the observation results is presented in Table 3.

Table 3. Recapitulation of Teacher and Student Activities in Cycle I and Cycle II

Aspect Observed	Cycle I	Cycle II	Improvement
Teacher Activities	65.7% (Moderate)	86.8% (Very High)	+21.1%
Student Activities	63.4% (Moderate)	84.2% (Very High)	+20.8%

Source: Primary data processed, 2026

Based on Table 3, teacher activities increased from 65.7% in cycle I to 86.8% in cycle II, while student activities increased from 63.4% to 84.2%. This improvement indicates that the learning process became increasingly effective and participatory along with the refinements made in each cycle.

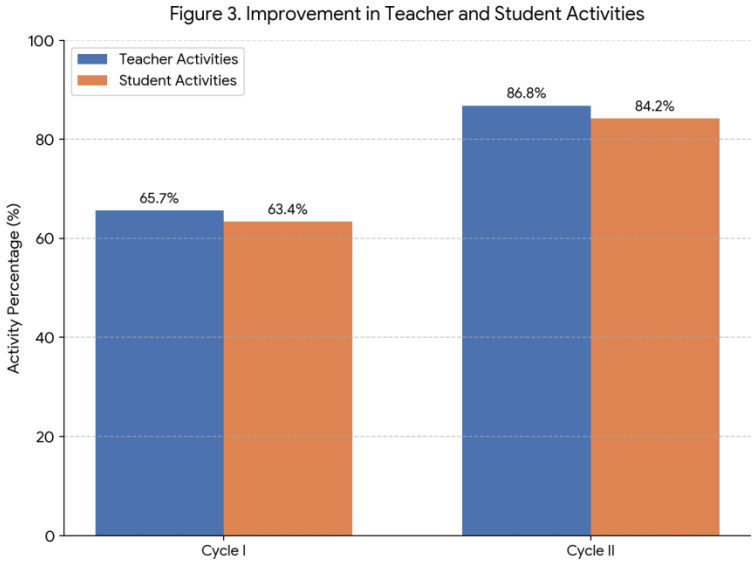


Figure 3. Improvement in Teacher and Student Activities

3.1.4 Qualitative Findings

Qualitative findings derived from classroom observations and interviews with the teacher and student representatives provided additional insights into the implementation of the Wordwall-assisted deep learning approach. The findings highlighted changes in classroom engagement, instructional practices, and students' learning experiences across the two action research cycles. Three interconnected themes emerged from the reported observations and interviews: increased student engagement, improved instructional implementation, and more positive learning experiences through interactive activities.

The first theme concerned students' engagement in the learning process. During Cycle I, classroom observations indicated that student participation remained relatively limited, particularly in asking questions, contributing to group discussions, and completing interactive activities. Some students required additional guidance to understand the learning tasks and participate effectively. Following instructional refinements in Cycle II, students demonstrated greater willingness to ask questions, collaborate with peers, and participate in Wordwall-based learning activities. These changes were consistent with the increase in observed student activity from 63.4% in Cycle I to 84.2% in Cycle II. Interviews with student representatives further indicated that interactive games made learning more enjoyable and helped them remember concepts related to the human digestive system.

The second theme reflected improvements in instructional implementation through systematic reflection. During Cycle I, the teacher encountered challenges related to limited instructional time and insufficient variation in interactive learning activities. These challenges affected the opportunities available for independent exploration and guided discussion. Based on the reflection conducted after Cycle I, several instructional adjustments were introduced, including additional time for conceptual exploration, more varied Wordwall activities, and increased group guidance for students experiencing learning difficulties. Classroom observations in Cycle II indicated improvements in instructional organization and student participation. The teacher also reported that the deep learning approach helped students maintain attention and develop their understanding of the material progressively. These findings corresponded with the increase in observed teacher activity from 65.7% to 86.8%.

The third theme concerned students' perceptions of interactive and meaningful learning experiences. Interview findings indicated that Wordwall activities encouraged enthusiasm and created a more enjoyable classroom atmosphere. Students perceived the interactive games as helpful for remembering the learning material, while the teacher emphasized the contribution of structured learning activities to students' attention and gradual conceptual understanding. The combination of independent exploration, collaborative discussion, interactive quizzes, and contextual applications provided opportunities to engage students through mindful, meaningful, and joyful learning activities.

Overall, the qualitative findings suggest that the instructional refinements implemented between cycles were accompanied by improvements in classroom participation, teaching practices, and students' reported learning experiences. These findings complement the quantitative results by illustrating how reflective instructional adjustments and interactive learning activities supported the implementation of the Wordwall-assisted deep learning approach. Nevertheless, the interview findings primarily reflect participants' perceptions and should not be interpreted as independent evidence of causal effects on conceptual understanding.

3.2 Discussion

3.2.1 Improvement in Learning Outcomes and Factors of Intervention Success

The research findings indicate that the application of the deep learning approach assisted by Wordwall consistently improved student learning outcomes in each cycle. This improvement was not merely quantitative but also reflected a change in the quality of students' understanding of the human digestive system material. The results of the N-Gain analysis strengthened this evidence, with an increase from the moderate category in cycle I (0.32) to the moderate category approaching high in cycle II (0.69). The increase in N-Gain by 0.37 points indicates that the refinements made between cycles had an increasingly greater impact on students' conceptual understanding.

The success of this intervention can be explained through three main mechanisms. First, the deep learning approach with the mindful principle encouraged students not merely to memorize, but to understand the context and meaning of the material through self-exploration activities and recording critical questions. This is in line with constructivist theory, which states that knowledge is actively constructed by students through experience and reflection (Vygotsky, 1978; Piaget et al., 2013). Second, the meaningful principle was realized through group discussions and matching games between organs and their functions, which connected new material with students' prior knowledge. This connection strengthened retention and conceptual understanding, as expressed by (Mayer, 2024) that meaningful learning occurs when new information is integrated with existing cognitive structures. Third, the joyful principle through quizzes and interactive Wordwall games created a positive learning atmosphere and reduced academic anxiety, thereby increasing student motivation and engagement (Bieleke et al., 2023;Seehagen et al., 2025).

The improvement in learning outcomes from cycle I to cycle II (from 68.5% to 88.5%) also demonstrates the effectiveness of action refinements based on reflection. In cycle II, the teacher provided longer exploration time and used more diverse Wordwall templates (anagram and random wheel), which provided cognitive challenges as well as varied play experiences. This is consistent with (Hake & Reece, 1999) findings that significant improvements in learning outcomes (N-Gain in the moderate to high category) require strategy adjustments based on feedback from the previous cycle.

3.2.2 Improvement in Teacher and Student Activities

The increase in teacher activities from 65.7% to 86.8% indicates that the teacher became increasingly skilled in implementing the steps of deep learning and integrating Wordwall effectively. In cycle I, the teacher still experienced difficulties in managing time and facilitating group discussions, as reflected in the observation scores on the indicators of "time management" and "group guidance," which remained low. After reflection and improvement in cycle II, the teacher succeeded in increasing time efficiency and the quality of guidance, which had an impact on the smooth implementation of all learning stages. The increase in teacher activities by 21.1% indicates that the teacher increasingly mastered the deep learning approach and was able to adapt it to students' needs.

The increase in student activities from 63.4% to 84.2% indicates that students became increasingly active and engaged in learning. In cycle II, indicators such as "courage to ask questions," "collaboration in groups," and "enthusiasm in participating in games" increased significantly. This aligns with the findings of (Fredricks et al., 2004) that student engagement—emotional, cognitive, and behavioral—is a strong predictor of learning outcomes. The Wordwall media, with its immediate feedback features and gamification elements, proved effective in increasing students' behavioral engagement. The correlation between the increase in student activities (20.8%) and the improvement in learning outcomes (from N-Gain 0.32 to 0.54) indicates that active engagement directly contributes to better conceptual understanding.

3.2.3 Comparison with Previous Studies

The findings of this study reinforce and extend the results of previous research. In line with the findings of (Warta et al., 2025), which reported that the deep learning approach improves conceptual understanding and active participation at the elementary school level, this study provides additional evidence that integration with interactive media such as Wordwall produces greater improvements (88.5%) compared to the application of deep learning alone. This indicates a synergistic effect between pedagogical approaches and technological media.

In contrast to the studies by (Faradila et al., 2023), which only focused on the use of Wordwall to increase learning interest without associating it with a specific pedagogical approach, this study integrated Wordwall within a structured deep learning framework, thereby not only increasing motivation but also measurable conceptual understanding. Thus, this study fills the research gap mentioned in the introduction, namely the absence of studies that combine deep learning with Wordwall simultaneously in the IPAS subject.

However, in contrast to the study by (Lidiawati et al., 2025), which highlighted the still-dominant conventional approach, this study demonstrates that with systematic design and intensive mentoring, innovative approaches can be effectively implemented even in the context of elementary schools with limited resources. This finding is also in line with the views of (Osborne & Dillon, 2008) that effective science learning requires active engagement and direct experience, which in this study was realized through interactive games and group discussions.

3.2.4 Research Limitations

Although this study shows positive results, there are several limitations that need to be acknowledged. First, the small sample size (one class with 35 students) limits the generalizability of the findings to a wider population. Further research with larger and more diverse samples is needed to test the

effectiveness of this intervention more comprehensively. Second, the relatively short intervention duration (two cycles with a total of four meetings) is insufficient to measure the long-term impact of this approach on knowledge retention and the development of students' scientific attitudes. Third, this study was limited to one topic (the human digestive system) and one grade level (grade V), so the effectiveness on other IPAS topics or different grade levels cannot be ascertained. Fourth, the potential Hawthorne effect—where students and teachers may perform better because they are aware that they are being observed—needs to be considered in interpreting the results. Future research is recommended to use a quasi-experimental design with a control group to minimize such bias.

3.2.5 Implications and Clarification of Research Focus

It is important to emphasize that the deep learning approach in this study refers to a pedagogical approach that emphasizes mindful, meaningful, and joyful learning (Fullan et al., 2018), not to artificial intelligence technology (AI-based deep learning). The success of the intervention was more due to the systematic design of learning activities and active student engagement, rather than sophisticated technology. Thus, these findings provide practical contributions for teachers and curriculum developers in designing interactive and student-centered IPAS learning without relying on expensive technological infrastructure.

4. CONCLUSION

Based on the results of the classroom action research conducted over two cycles, it can be concluded that the application of the deep learning approach aided by the interactive Wordwall media is effective in improving student learning outcomes in the IPAS subject on the topic of the human digestive system in Class VB at SD Negeri 131/IV in Jambi City. The improvement in learning outcomes is reflected in the increase in the percentage of students meeting the mastery criteria and the consistent average scores across each cycle, exceeding the established success indicator of 85%. Furthermore, the N-Gain analysis showed an improvement in students' conceptual understanding ranging from moderate to near-high levels, indicating that the intervention not only improved scores quantitatively but also strengthened meaningful mastery of the material.

The success of this intervention is supported by a significant increase in teacher and student engagement, demonstrating that the deep learning approach—based on the principles of mindfulness, meaningfulness, and joy—along with the support of Wordwall as a gamification tool, is capable of creating an interactive, enjoyable, and student-centered learning environment. Thus, the research objective of analyzing the implementation of the Wordwall-assisted deep learning approach in improving IPAS learning outcomes has been achieved.

In practical terms, these findings have implications for elementary school teachers, particularly in designing IPAS lessons that integrate a deep understanding-based pedagogical approach with easily accessible interactive technology. Teachers are advised to systematically implement deep learning strategies—ranging from independent exploration, meaningful discussions, interactive games, to contextual applications—and to utilize Wordwall as an effective tool to enhance student engagement and understanding.

However, the results of this study should be interpreted with consideration of its limitations, namely a sample size limited to a single class, a short intervention duration, and a specific scope of material. Therefore, future research is recommended to involve a larger sample, a longer duration, and different topics and grade levels to test the consistency and generalizability of these findings.

REFERENCES

Abdillah, L. (2022). Pengertian Penelitian Tindakan Kelas (Class Action Research Definition). *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4014860

Alfarisi, M., Prasasti, A. R., & Sarwendah, T. (2025). Analysis of Student Interest in Natural and Social Sciences Integration Learning (IPAS): Study of Grade IV Students at SDN 8 North Metro. *Jurnal Dimensi Pendidikan Dan Pembelajaran*, *13*(SI1). https://doi.org/10.24269/dpp.v13i0.11365

Ambarita, J., Purnamasari, U., & Siahaya, A. (2025). Deep Learning as A Pathway to Pedagogical Transformation in Indonesia. *Jurnal Penelitian Kebijakan Pendidikan*, *18*(1). https://doi.org/10.24832/jpkp.v18i1.1229

Assyakurrohim, D., Ikhram, D., Sirodj, R. A., & Afgani, M. W. (2022). Metode Studi Kasus dalam Penelitian Kualitatif. *Jurnal Pendidikan Sains Dan Komputer*, *3*(01). https://doi.org/10.47709/jpsk.v3i01.1951

Bieleke, M., Goetz, T., Yanagida, T., Botes, E., Frenzel, A. C., & Pekrun, R. (2023). Measuring emotions in mathematics: the Achievement Emotions Questionnaire—Mathematics (AEQ-M). *ZDM - Mathematics Education*, *55*(2). https://doi.org/10.1007/s11858-022-01425-8

Faradila, N., Lapita, Y., & Fadhli, M. (2023). Improving Junior High School Students' Vocabulary Mastery through Wordwall.net Media. *TRIADIK*, *22*(2). https://doi.org/10.33369/triadik.v22i2.33582

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. In *Review of Educational Research* (Vol. 74, Issue 1). https://doi.org/10.3102/00346543074001059

Fullan, M., Quinn, J., & McEachen, J. (2018). *Praise for Deep Learning: Engage the World Change the World.* In Corwin; The Ontario Principals'Council (OPC).

Hake, R. R., & Reece, J. (1999). Analyzing Change/Gain Scores. AREA-D American education research association's devision. D. *Measurement and Reasearch Methodology*, *1*(4).

Helmiyatun, Taqiudin, M., & Ahmad. (2025). Content Validity of Student Perception Instrument on School Educational Management. *Journal of Practice Learning and Educational Development*, *5*(1). https://doi.org/10.58737/jpled.v5i1.422

Ibrahim, R. N. A., Saleh, M., & Arif, R. M. (2024). Pengaruh Penggunaan Model Project based learning Berbantuan Media Wordwall terhadap Hasil Belajar Siswa Sekolah Dasar pada Pembelajaran IPA. *Cokroaminoto Journal of Primary Education*, *7*(2). https://doi.org/10.30605/cjpe.722024.4340

Kelly, N. (2014). Teaching Science in Elementary and Middle School: A Project-Based Approach. *Interdisciplinary Journal of Problem-Based Learning*, *8*(1). https://doi.org/10.7771/1541-5015.1489

Kemendikbudristek. (2024). *Peraturan Menteri Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia Nomor 8 Tahun 2024 Tentang Standar Isi Pada PAUD,Jenjang pendidikan Dasar dan Jenjang Pendidikan Menengah*. In Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Kemmis, S., McTaggart, R., & Nixon, R. (2014). The action research planner: Doing critical participatory action research. In *The Action Research Planner: Doing Critical Participatory Action Research*. https://doi.org/10.1007/978-981-4560-67-2

Kresnadi, H., Irasandi, Y., & Rahmadayanti, D. (2025). Analisis Penggunaan Media Pembelajaran Wordwall pada Pembelajaran IPAS di Sekolah Dasar. *Jurnal Sosial Dan Sains*, *5*(9). https://doi.org/10.59188/jurnalsosains.v5i9.32479

Lidiawati, Haryanto, E., & Habibi, A. (2025). Classroom Action Research in IPAS Learning: Enhancing Students' Cognitive Abilities through a Differentiated Approach in Elementary Schools. *Lembaran Ilmu Kependidikan*, *54*(1). https://doi.org/10.15294/lik.v54i1.22158

Lin, C. H., & Chen, C. H. (2022). Review of "Deep Learning: Engage The World Change The World" and "Dive Into Deep Learning: Tools For Engagement." In *Contemporary Educational Research Quarterly* (Vol. 30, Issue 4). https://doi.org/10.6151/CERQ.202212_30(4).0004

Mayer, R. E. (2024). The Past, Present, and Future of the Cognitive Theory of Multimedia Learning. *Educational Psychology Review*, *36*(1). https://doi.org/10.1007/s10648-023-09842-1

Mubarok, M., Yulandra, R., & Iskandar, B. A. (2025). The Effect of Collaborative Learning Model on Improving Science Concept Understanding among Prospective Elementary School Teachers at Lambung Mangkurat University Student. *EDUKASIA Jurnal Pendidikan Dan Pembelajaran*, *6*(2). https://doi.org/10.62775/edukasia.v6i2.1716

OECD. (2023). PISA 2022 *Assessment and Analytical Framework*. In OECD Publishing.

Osborne, J., & Dillon, J. (2008). *Science education in Europe: Critical reflections.* London: Nuffield Foundation, January.

Piaget, J., Holloway, G. E. T., & Mackenzie, M. J. (2013). Child's conception of movement and speed. In *Child's Conception of Movement and Speed*. https://doi.org/10.4324/9780203715635

Rodriguez, A. J. (2015). What about a dimension of engagement, equity, and diversity practices? A critique of the next generation science standards. *Journal of Research in Science Teaching*, *52*(7). https://doi.org/10.1002/tea.21232

Sari, Y., Marini, A., Rahmawati, Y., Fitriasari, E., Wardhani, P. A., Safitr, D., Dewiyani, L., & Muda, I. (2024). Emerging Technologies of Interactive Learning Media with Wordwall for Students' Interest as an Impact on SDGS. *Journal of Lifestyle and SDGs Review*, *5*(2). https://doi.org/10.47172/2965-730x.sdgsreview.v5.n02.pe03268

Seehagen, S., Bartnick, C., Kärtner, J., Krasko, J., Luhmann, M., Schaal, N., Schneider, S., Witt, S., & Zmyj, N. (2025). Belong, Broaden, and Build: The Role of Positive Emotions in Early Human Development. *Child Development Perspectives*, *19*(4). https://doi.org/10.1111/cdep.70002

Sirait, A. A., Basri, H., & Ab Rahman, Z. (2024). The Concept of Merdeka Curriculum Implementation: Realizing Humanistic Islamic Education Learning. *Educative: Jurnal Ilmiah Pendidikan*, *2*(1). https://doi.org/10.37985/educative.v2i1.210

Sugiyono. (2020). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. ALFABETA.

Tari, D. K., & Rosana, D. (2019). Contextual Teaching and Learning to Develop Critical Thinking and Practical Skills. *Journal of Physics: Conference Series*, *1233*(1). https://doi.org/10.1088/1742-6596/1233/1/012102

Ventista, O. M., & Brown, C. (2023). Teachers' professional learning and its impact on students' learning outcomes: Findings from a systematic review. In *Social Sciences and Humanities Open* (Vol. 8, Issue 1). https://doi.org/10.1016/j.ssaho.2023.100565

Vosniadou, S. (2013). International handbook of research on conceptual change. In *International Handbook of Research on Conceptual Change*. https://doi.org/10.4324/9780203154472

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Warta, W., Gunawan, A., Huda, W. S., Datau, S., Maryam, Saepudin, E., Narkum, Nafisah, I. J., Nurlaela, N., & Muharam, C. A. (2025). Evaluation of Deep Learning Curriculum Management in High School: Case Study in SMPT Baiturrahman Ciparay, Bandung Regency. *International Journal of Sustainable Social Science (IJSSS)*, *3*(2). https://doi.org/10.59890/ijsss.v3i2.14

Zuhro, A. R., Cahyandaru, P., Sumiyati, & Fidianingsih, A. (2025). Analisis Kebutuhan Media Pembelajaran Seni Budaya Berbasis Pendekatan Deep Learning Dalam Kurikulum Merdeka Pada Jenjang Operasional Formal. *Epistema*. https://doi.org/10.21831/ep.v6i2.89879