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Implementing Jigsaw Model with Learning Cards to Improve Fifth Graders' Natural Resources Learning Outcomes in Surabaya

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This action research aims to improve student learning outcomes in the subject of Natural Resources (SDA) in Indonesia by applying the jigsaw learning model combined with learning cards. This combination is rarely used in the context of action research in natural and social science learning in elementary schools. The study was conducted using the Kemmis and McTaggart spiral model in two cycles, covering the stages of planning, action implementation, observation, and reflection. The research subjects were 34 students in class VA of Santa Maria Elementary School in Surabaya. Data were collected through learning outcome tests, observations of student and teacher activities, and field notes. The results showed a significant increase in academic achievement, with the average score increasing from 66.61 in the first cycle to 93.32 in the second cycle, and learning completeness rising from 38.2% to 97.1%. Student activities during learning also showed improvement, especially in cooperation, individual responsibility, and the ability to explain the material. The application of Jigsaw, supported by learning cards, aligns with constructivism, cognitivism, and meaningful learning theories that emphasise the process of knowledge construction through interaction and elaboration. By combining cooperative techniques and simple visual media, this study makes a new contribution: a practical, structured, and easily replicable action model to improve science and social studies learning in elementary schools.

Keywords: Jigsaw; Flashcards; Learning Outcomes; Natural Resources; Cooperative Learning

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INTRODUCTION

Basic education plays a strategic role in shaping the quality of future human resources. At the elementary school level, the learning process should not only focus on imparting knowledge but also actively involve students in building understanding through meaningful learning experiences. Student-centered active learning is very important at this stage because it supports cognitive development, social skills, and long-term conceptual understanding (Martin-Alguacil et al., 2024; Martín-Alguacil & Avedillo, 2024; Martinez & Gomez, 2025; Morris et al., 2025). Therefore, elementary school teachers are required to conduct learning that is not only informative but also active, creative, and enjoyable, so that students can understand concepts meaningfully rather than memorize them. In this context, Natural and Social Sciences (IPAS) play an important role because through IPAS learning, students can understand natural and social phenomena in their surroundings while developing a sense of responsibility towards the environment (Hanum et al., 2024; Luthfiyah et al., 2025; Ruhani, 2020).

IPAS is one of the main subjects in elementary education that integrates the study of natural and social phenomena. Through IPAS, students are guided to understand their surroundings while developing a sense of responsibility for the use of natural resources. Meaningful IPAS learning requires Students' active involvement in exploring the concepts being studied. In addition, students are encouraged to relate the material to real-life contexts through discussion and collaboration. This process aligns with constructivist learning theory, which views learning as an active, social process (Choi & Lee, 2021; Gannar & Kilani, 2025). However, in practice, IPAS learning in many elementary classrooms in Indonesia still tends to be teacher-centered, limiting students' opportunities to actively construct knowledge, particularly in conceptually demanding topics such as natural resources.

One important topic in fifth-grade IPAS is Natural Resources (SDA) in Indonesia, covering the types, distribution, utilization, and conservation of these resources. However, classroom observations in class VA at Santa Maria Surabaya Elementary School show that students have difficulty understanding these concepts conceptually. Student learning activities tend to be passive, with most students acting as listeners rather than active participants in discussions. As a result, many students fail to meet the minimum passing grade of 75. This situation reflects a broader challenge in teaching, where the abstract and contextual nature of IPAS content is not supported by learning strategies that promote active engagement and conceptual understanding.

From a constructivist perspective, low student activity directly affects conceptual understanding because knowledge is not effectively constructed when learners are positioned as passive recipients (Junco et al., 2023; Mintzes & Walter, 2020). Learning environments that do not provide opportunities for interaction, explanation, and reflection tend to limit students' cognitive engagement, especially in concept-heavy subjects such as natural resources. Therefore, learning strategies that can increase collaborative and responsible student engagement are needed. One appropriate strategy is the Jigsaw cooperative learning model, which allows students to become "experts" on certain parts of the material and then teach it to their original group members, thereby fostering positive interdependence and individual responsibility (Ali et al., 2024; Gede Widayana & Kevin Balsono, 2023). Compared to conventional group work, the Jigsaw model emphasizes structured peer instruction and individual accountability, making it highly effective for increasing participation and conceptual understanding in elementary school classrooms.

The Jigsaw cooperative learning model is based on constructivist and social learning theories that emphasize positive interdependence, individual accountability, and peer interaction for learning (Darabi et al., 2025; Supiarti et al., 2025). In applying the Jigsaw model, each student acts as an "expert" on a specific subtopic and is responsible for conveying their understanding to other group members. This process encourages deeper understanding through explaining the material and social interaction among students. These characteristics effectively address the problems of low participation and superficial understanding in the classroom, as students are required to be actively involved, communicate ideas, and take responsibility for their own learning process (Nurliyan et al., 2026). However, most of this research has been conducted in the context of general science or at the secondary education level, with limited focus on integrated science education in Indonesian elementary schools, particularly on topics related to natural resources that require contextual and interdisciplinary understanding.

Various studies show that the Jigsaw learning model is effective when applied at the elementary and secondary school levels. In science education, the application of the Jigsaw model has been shown to significantly increase student engagement, as evidenced by increases in learning activities from 57.6% to 90.9% and in learning outcomes from 83.3% to 100% (Fricticarani & Maksum, 2020). In addition, 86.4% of students responded positively to Jigsaw learning, reporting greater motivation, better understanding of the material, and improved ability to work with peers. At the same time, observations also showed active student engagement, especially during peer explanations and group discussions (Ula

& Mulis, 2025). Further literature reviews indicate that the Jigsaw method has a more positive impact on student engagement and learning outcomes than conventional learning approaches (Triansyah et al., 2023). However, most of these studies still focus on secondary education or science subjects in general, so research specifically examining the application of the Jigsaw model in IPAS learning in elementary schools, especially with natural resource materials, remains relatively limited.

In addition to learning models, learning media also play an important role in supporting students' conceptual understanding. Flashcards, or learning cards, present information concisely through a combination of visual and verbal representations, making them suitable for elementary school students who find it easier to understand concepts through concrete, visual forms (Ma'rifatul Khasanah & Sigit Yulianto, 2024; Maharani & Ramadan, 2023). Various studies show that the use of visual learning media can improve memory and facilitate discussion in cooperative learning (Fitamen et al., 2024; Fitriana et al., 2021). Flashcards are widely recognized as an effective learning tool to help students understand concepts related to natural resources in a more engaging and memorable way, as they combine visuals, key terms, and brief summaries of important ideas (Briliyanti & Setiawan, 2025). This approach not only facilitates understanding but also encourages students to actively participate in discussions and exchange ideas. Although research specifically integrating flashcards with the Jigsaw learning model in elementary science education remains limited, existing studies suggest that combining concrete learning media with cooperative strategies can significantly improve students' conceptual understanding and memory. However, in practice, flashcards are often used merely as supplementary tools rather than being systematically integrated into a cooperative learning framework that promotes active knowledge construction.

Based on the results of the literature review, a clear research gap is evident. First, most studies still examine the Jigsaw model and instructional media separately, rather than as an integrated instructional design. Second, empirical research combining cooperative learning structures with visual media in science education at the elementary school level, particularly in the Indonesian context, remains relatively limited. Third, there is a scarcity of classroom-based research implementing such integration to address authentic learning challenges, particularly within developing education systems that still face resource constraints and the dominance of teacher-centered approaches. This gap underscores the importance of contextual research that not only tests effectiveness but also offers practical implementation strategies.

Based on the actual conditions in class VA at Santa Maria Elementary School, Surabaya, low student activity and learning outcomes are real problems that require immediate attention. In this context, Classroom Action Research (CAR) is considered an appropriate approach because it allows teachers to systematically plan, implement, observe, and reflect on efforts to improve learning through a continuous cycle. The application of learning innovations, in the form of the Jigsaw cooperative learning model combined with learning cards, has never been used in this class, thus opening up opportunities for teachers to make more targeted learning improvements. Through the CAR approach, teachers can adjust learning strategies based on authentic classroom problems to optimize student activities and learning outcomes. This approach also strengthens the practical impact of this research by directly linking learning innovations to real-world classroom needs.

Thus, this classroom action research aims to improve the learning outcomes of fifth-grade students at Santa Maria Elementary School in Surabaya regarding the concept of natural resources through the application of the Jigsaw cooperative learning model, supported by flashcards. The application of this model and media is expected to increase student participation, strengthen student collaboration, and facilitate a deeper understanding of the concept. The novelty of this study lies in the systematic integration of the cooperative learning structure (Jigsaw) with visual learning media (flashcards) within the framework of Classroom Action Research in science education. This integrated approach not only expands upon existing cooperative learning frameworks and the use of learning media but also offers practical insights relevant to elementary education in Indonesia and other developing educational contexts facing similar challenges.

METHOD

This study applied a Classroom Action Research (CAR) design using a spiral model that includes the stages of planning, action implementation, observation, and reflection (Kemmis et al., 2014). The selection of CAR was based on the theoretical foundation of reflective practice, which views teachers as reflective practitioners who systematically evaluate and improve classroom learning practices in response to real classroom problems. Through repeated cycles of action, this model enables continuous improvement of learning strategies in response to challenges encountered during the learning process. This approach is considered relevant to addressing low student learning outcomes in natural resource materials. In addition, the dual role of teachers as practitioners and researchers can be justified theoretically because improving the quality of learning will be more effective when teachers are

directly involved in planning, implementing, and reflecting on their own teaching practices, so that the interventions carried out are contextual and responsive to students' learning needs.

The study was conducted at Santa Maria Elementary School in Surabaya on fifth-grade students in the 2024/2025 academic year. Thirty-four students participated in the study, including 15 males and 19 females. The selection of this class was based on preliminary observations indicating low student participation and learning outcomes in IPAS, making it a relevant context for a classroom-based intervention. Pre-intervention data showed that only 47% of students achieved the minimum passing score of 75, and classroom observations revealed that most students were passive during discussions and heavily relied on the teacher's explanations. These baseline conditions were used to design an intervention that emphasized active participation, peer interaction, and visual aids.

The researcher acted as the implementer, while a colleague acted as an observer during the learning process. The involvement of external observers is an important methodological component of CAR, as it helps reduce subjectivity and increase the credibility and reliability of observational data. Observers provide independent notes on teacher performance and student activities, enabling more objective reflection and evaluation of each cycle of action. Observers use structured observation sheets with predefined indicators of student participation (e.g., asking questions, explaining ideas, contributing to group work) and teacher performance (clarity of instruction, facilitation of discussion, classroom management), which are rated on a four-point scale ranging from very low to very high.

The research procedure was conducted in two cycles. Each cycle follows the standard CAR stages: (1) planning, (2) action, (3) observation, and (4) reflection. Each cycle consisted of two meetings (2 × 35 minutes), including one meeting for learning implementation and one meeting for evaluation and reflection.The first cycle focused on implementing the Jigsaw cooperative learning model without the use of learning cards, with the aim of developing students' collaboration skills in expert and home groups while observing students' levels of participation and conceptual understanding of the types and utilization of natural resources in Indonesia. Students are divided into heterogeneous groups of 4–5 members. The Jigsaw procedure involves: (1) forming core groups, (2) assigning subtopics to each member, (3) discussing within expert groups, (4) returning to the core group to teach peers, and (5) group discussion and conclusion. The results of the reflection in this cycle showed that student involvement remained uneven, and some students had difficulty understanding key concepts independently.

Based on these findings, the second cycle was designed to improve by integrating learning cards as a supporting medium. In this cycle, students collaboratively designed and compiled learning cards containing images, keywords, and summaries of natural resource concepts. The use of learning cards aimed to provide visual support that facilitated peer explanation and increased conceptual clarity during Jigsaw discussions, while encouraging more equitable participation and more effective group collaboration. It is important to note that the improvements observed in Cycle II may have been influenced by various factors, including students' growing understanding of the Jigsaw model, improved classroom management, and the addition of learning cards as visual aids.

The instruments used in this study included learning outcome tests, observation sheets for teacher and student activities, field notes, and reflective interview guides. The learning outcome tests were designed to assess students' conceptual understanding of natural resources, aligned with the learning objectives and minimum passing grade criteria. The test consisted of 15 items combining multiple-choice and short-answer questions that measured understanding of types, distribution, utilization, and conservation of natural resources. The instruments were reviewed by two experts in elementary science education to ensure content validity. Observation sheets were used to systematically record the implementation of the Jigsaw model and student engagement during learning activities. At the same time, field notes and interviews captured contextual and reflective data about the learning process.

Data was collected at the end of each cycle through learning outcome tests to assess students' academic achievement. Observation data were collected during the learning process by observers using structured observation sheets. Field notes and reflective interviews were conducted after each cycle to document classroom dynamics, challenges encountered, and student responses to learning activities, thereby enriching the interpretation of quantitative findings.

Quantitative data were analyzed by calculating the average student score and the percentage of students who achieved the predetermined minimum passing grade of 75. This indicator was used to evaluate the improvement in learning outcomes throughout the cycle. The criteria for success in this study were defined as (1) at least 75% of students achieving the minimum passing grade and (2) an increase in student participation scores reaching the "high" category. Qualitative data from observations, field notes, and interviews were analyzed descriptively through data reduction, categorization, interpretation, and conclusion drawing to identify patterns of student engagement and teaching effectiveness throughout the action cycle. Therefore, the results are interpreted as showing a clear improvement rather than a statistically significant increase, as no inferential statistical tests were applied.

RESULT AND DISCUSSION

Results

This classroom action research aims to improve the learning outcomes of fifth-grade students on the topic of Natural Resources in Indonesia by applying the Jigsaw learning model, supported by learning cards. The research results are presented sequentially, starting with the pre-cycle, then the first cycle, and finally the second cycle.

Pre Cycle

Before implementation, pre-cycle observations were conducted to identify the initial learning conditions in the classroom. The observations showed that the learning process was still dominated by conventional methods, with low levels of student interaction and limited group activities. Most students played the role of passive listeners, while collaborative learning was not yet being implemented optimally. Quantitatively, the pre-cycle data showed that the average student score was 62.18, with 16 out of 34 students (47.1%) achieving the Minimum Passing Grade (MPG ≥ 75). Observation results indicated that student activity was categorized as low, particularly in indicators such as asking questions, expressing opinions, and participating in group discussions. Teacher activity was categorized as moderate, as instruction was still dominated by explanation rather than facilitation. Initial learning outcomes showed significant variations in understanding among students, with many students not meeting the Minimum Passing Grade (MPG ≥ 75). These conditions indicated the need for improvements in learning and served as the basis for applying the Jigsaw cooperative learning model as an intervention. Further field notes revealed that students tended to rely on the teacher's explanations and showed limited confidence in explaining concepts on their own, indicating low engagement and weak conceptual understanding at the start of the study.

First Cycle

The first cycle focused on implementing the Jigsaw cooperative learning model without the support of learning cards.

[Figure 1 about here.]

Although all students were involved in learning activities, the observation revealed that student participation in group discussions remained relatively low. Several students had difficulty understanding their roles in both the expert group and their original group. Still, they showed a high degree of dependence on the teacher's guidance during the discussion. The observational data indicate that student activity increased to a moderate level, particularly during expert group discussions, although participation remained uneven among group members. Teacher activity increased to a good level, particularly in organizing group work and guiding students during discussions. However, field notes indicate that some students were still confused when explaining the material within their groups and relied more on reading than on understanding. As a result, the learning outcomes in the first cycle did not show optimal results, with a class average score of 66.61. Of the total 34 students, only 13 (38.2%) achieved the Minimum Passing Grade, while 21 (61.8%) did not, indicating that the learning outcomes remained below the expected target.

Second Cycle

Based on the reflection results from the first cycle, improvements were made to the learning process in the second cycle by integrating learning cards into the application of the Jigsaw cooperative learning model. In the initial stage of learning, students worked collaboratively in groups to design and compile flash cards containing images, keywords, and summaries of natural resource material.

[Figure 2 about here.]

This activity was designed to strengthen conceptual understanding while supporting students' discussion during learning.

During the learning process, student activities and teacher performance were systematically observed. The results of the observation showed an increase in student engagement in discussions, a better understanding of their roles in expert and home groups, and the ability to explain the material using flashcards as a supporting medium.

[Figure 3 about here.]

Observation results indicated that student activity reached a high level, with most students actively participating in discussions, explaining concepts, and contributing to group work. Teacher activity was categorized as very good, particularly in facilitating discussion and guiding the use of learning cards. Field notes and interviews showed that students felt more confident explaining concepts because the learning cards helped them organize ideas and remember key information. The improvement in the quality of the learning process had an impact on student learning outcomes, as indicated by an increase in the average score to 93.32. Of the 34 students, 33 (97.1%) achieved learning completeness, while only 1 (2.9%) did not meet the minimum passing score, indicating a significant improvement in learning outcomes.

Comparison of Learning Outcomes Between Cycles

A comparison of student learning outcomes across the pre-cycle, first cycle, and second cycle shows a clear and consistent

improvement. A detailed summary of student learning outcomes is presented in Table 1, which shows that the average student score increased by 26.71 points, from 66.61 in the first cycle to 93.32 in the second cycle.

[Table 1 about here.]

In addition, the percentage of students who achieved learning completeness increased substantially, from 38.2% in the first cycle to 97.1% in the second cycle, representing a 58.9% increase. This increase is also illustrated in Figure 4, which compares learning outcome improvements between the first and second cycles.

[Figure 4 about here.]

Overall, the results show a substantial improvement in student learning outcomes, with the most significant gains occurring in the second cycle, both in average scores and in learning completeness.

Discussion

The results showed that the application of the jigsaw learning model with learning cards successfully increased student activity and learning outcomes in natural resources material in grade VA at Santa Maria Surabaya Elementary School. This increase was evident in the higher average scores and the higher percentage of mastery in the second cycle compared to the first. More specifically, findings in the classroom indicate that the main difference between Cycle I and Cycle II lies in how students are able to explain and discuss concepts. In Cycle I, many students relied on reading materials and teacher guidance, making peer-to-peer instruction less effective. In Cycle II, the use of learning cards allowed students to convey explanations more clearly because the cards provided structured information in the form of images, keywords, and summaries. This made discussions more focused and easier to follow. The increase in students' courage to express their opinions and their self-confidence aligns with previous research findings, which confirm that the Jigsaw model encourages active participation and more lively interaction in the learning process (Herwindo et al., 2025; Pase et al., 2025; Widyanto et al., 2025). The learning cards also support Jigsaw activities by serving as a reference tool during peer-to-peer learning. Students use the cards to guide explanations, address uncertainties, and ensure that key concepts are conveyed. As a result, participation is more evenly distributed among group members, and more students are involved in explaining and asking questions compared to Cycle I.

However, the improvement observed in Cycle II should not be attributed solely to the use of learning cards. Other factors, such as students' increased understanding of the Jigsaw procedure, enhanced teacher guidance following reflection, and better classroom organization, also contributed to these results. Therefore, this improvement should be interpreted as the result of a combination of several factors, not just a single intervention.

In addition, several challenges remain. Some students are still not very active and tend to rely on their peers during discussions. Time management during group activities also requires further improvement to ensure that all students have an equal opportunity to participate.

From a constructivist perspective, improved learning outcomes can be explained by students constructing their own understanding through discussion, re-explanation, and information exchange. Constructivism emphasises that knowledge is built through direct experience rather than passively acquired from teachers (Do et al., 2023; Muhajirah, 2020). In the jigsaw learning model, each student becomes an "expert" on a specific subtopic and must construct that knowledge before sharing it with the group. These findings reinforce the argument that structured peer teaching plays an important role in facilitating deeper conceptual understanding in elementary school students. This process aligns with the modern constructivist view that emphasises active, collaborative learning (Choi & Lee, 2021; Muhajirah, 2020; Wibowo et al., 2025). When students have to re-explain information to their friends, they elaborate and process meaning more deeply. Therefore, the application of Jigsaw reinforces meaningful learning based on the construction of student experiences.

In addition to constructivism, this study aligns with cognitivism, particularly its theory of information processing. In Jigsaw learning, students go through the stages of receiving information from texts or flashcards, then organizing, storing, and using it to explain to their friends. Modern cognitivism emphasizes the importance of elaboration, retention, and retrieval strategies in improving memory and understanding (Alahmad, 2020; Taqa, 2025). The significant improvement observed in the second cycle shows that flash cards function not only as an additional medium but also as a cognitive tool that supports information processing and retrieval. The flashcards in this study provide visual and verbal stimuli that support dual processing, making it easier for students to understand concepts. These results are reinforced by recent research findings that simple text-based media can improve information processing in elementary school students (Corrigan et al., 2025; Dwi Cahyani et al., 2024). Thus, the jigsaw learning model, supported by flashcards, facilitates the cognitive processes involved in understanding the material.

The findings of improved learning outcomes are also consistent with Ausubel's meaningful learning theory, which

emphasises that new information must be linked to the knowledge structure students already possess. In this study, students connected their prior knowledge about natural resources with new explanations explored through expert groups. The principle of advance organisers in meaningful learning is evident in the use of flashcards that facilitate linking core concepts to concrete examples. Contemporary research shows that meaningful learning can be enhanced through collaborative activities that provide space for concept elaboration (Kostiainen et al., 2025; Pandey et al., 2025). The significant improvement in learning outcomes in the second cycle indicates that students are better able to integrate new concepts into their existing cognitive structures through targeted peer interactions. The increase in scores in the second cycle shows that students can build a stronger understanding of new concepts through mutual explanation and group learning. Thus, the jigsaw learning model serves as an effective means of meaningful learning for elementary school students.

Increased learning activity also shows that students are more emotionally and socially engaged when learning using Jigsaw. Collaboration in small groups has been shown to strengthen individual responsibility, increase social awareness, and develop students' communication skills (Mckay & Sridharan, 2024). With increased engagement, students become more motivated to understand the material rather than memorise it. Within the framework of social constructivism, interactions between students serve as a mechanism for constructing shared meaning (Junco et al., 2023). These findings indicate that social interaction is not only a supporting factor but also a core mechanism in improving learning outcomes through cooperative learning. Therefore, the social aspect of Jigsaw also contributes to improving the quality of learning.

The reflection process in each cycle also had a positive effect on improving results in the second cycle. In the first cycle, some students did not fully understand their roles as members of expert groups, so discussions remained ineffective. The teacher then improved the instructions, optimised task allocation, and simplified the content of the learning cards to make them easier to understand. These improvements were in line with the CAR Kemmis & McTaggart principle, which emphasises changing actions through reflection. Recent research shows that reflective cycles in CAR can gradually and systematically improve the quality of learning (Slade & Cummings, 2025). These findings highlight the importance of repeated reflection in refining teaching strategies and ensuring their effectiveness in real classroom contexts.

The findings of this study are also consistent with previous studies on Jigsaw's effectiveness in improving learning outcomes. The difference in academic achievement between the Jigsaw model and conventional learning is significant across various studies, demonstrating the superiority of this cooperative approach in improving student learning outcomes (Chen, 2025; Stanczak et al., 2022). Similar findings are supported by a recent study that found that Jigsaw consistently improves students' conceptual understanding and communication skills (Lumbantoruan & Herman, 2025). Compared to previous studies, this study provides contextual evidence from a real elementary classroom, showing how the integration of cooperative learning and simple visual media can address low participation and limited conceptual understanding. Thus, this study provides an additional contribution to the literature by demonstrating that Jigsaw is relevant to thematic learning in elementary schools.

In terms of scientific contribution, this study provides empirical evidence that integrating cooperative learning models with visual learning media can result in substantial improvements in learning outcomes in the context of IPAS in elementary schools. These findings support integrating constructivist, cognitivist, and meaningful learning perspectives into a single learning design. In practice, this study offers learning strategies that elementary school teachers can apply to increase student engagement and achievement through cooperative and media-based learning.

However, this study has several limitations. First, it was conducted in a single class with a relatively small number of participants, which limits the generalizability of the findings. Second, it focused primarily on student learning outcomes and activities, without examining long-term retention or higher-order thinking skills. Third, the intervention lasted only two action cycles, which may not fully capture the sustainability of the observed improvements. Therefore, these findings should be interpreted with caution and are primarily applicable to similar classroom contexts, rather than being broadly generalized.

Given these limitations, future research should involve more participants from various schools, examine the long-term impact of Jigsaw learning supported by learning cards, and explore its influence on other learning outcomes such as critical thinking, problem-solving skills, and conceptual transfer. Further studies could also investigate integrating digital learning cards to enhance flexibility and scalability in elementary school learning environments.

CONCLUSION

This classroom action research shows that the application of the jigsaw learning model, combined with flashcards, was effective in improving the learning outcomes of fifth-grade students at Santa Maria Elementary School in Surabaya in the

subject of Natural Resources in Indonesia. The improvement was evident in the increase in average scores and the percentage of learning completeness in the second cycle compared to the first. In addition to improving academic achievement, the Jigsaw model also encouraged student participation, strengthened group cooperation, and improved students' ability to explain the material through the expert and home group mechanisms. Theoretically, the success of this action is in line with the principles of constructivism, cognitivism, and meaningful learning. In the constructivist approach, students build understanding through discussion and social interaction; in the cognitivist perspective, flashcards support visual and verbal information processing; and in meaningful learning, mutual explanation activities allow students to connect new concepts with prior knowledge. Thus, combining the jigsaw learning model with flashcards not only improves conceptual understanding but also enriches students' overall learning experience.

From a practical perspective, this study shows that teachers can effectively implement the Jigsaw model by organizing students into small, heterogeneous groups, clearly defining roles within expert and core groups, and providing structured learning supports such as flashcards containing key concepts, images, and summaries. Teachers are also encouraged to actively facilitate discussions, ensure equal participation among students, and allocate sufficient time for peer explanations and reflection.

Furthermore, this model can be adapted for various grade levels and subject areas. For lower-grade levels, flashcards can be simplified by using more visuals and less text, while for higher-grade levels, flashcards can cover more complex concepts and problem-based prompts. In other subjects such as mathematics or social studies, the same approach can be applied by adjusting the content of the flashcards and the subtopics used within the Jigsaw structure. This flexibility makes the model applicable in a wide range of learning contexts

However, this study has limitations, particularly in its scope, which involved only one class and two cycles of action, limiting the generalizability of the results. Therefore, further research should expand the subjects, increase the duration of the actions, test other variations of supporting media, and compare Jigsaw with other cooperative models to obtain a more comprehensive understanding of the effectiveness of cooperative learning strategies in IPAS materials in elementary schools.

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REFERENCES

Alahmad, M. (2020). Strengths and Weaknesses of Cognitive Theory. Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences, 3(3), 1584–1593. https://doi.org/10.33258/birci.v3i3.1088

Ali, M., Sutarto, S., Nurhayati, R., Wantu, H. M., Amri, M., & Santosa, T. A. (2024). The Effectiveness of Jigsaw Model Based on Flipped Classroom to Improve Students' Critical Thinking Ability in Islamic Religious Education Learning. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *8*(5), 1069–1078. https://doi.org/10.31004/obsesi.v8i5.6190

Briliyanti, A. R., & Setiawan, D. (2025). Jigsaw Type Cooperative Learning Model Assisted by Flashcard Media in Social Science Learning. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *9*(1), 151–158. https://doi.org/10.23887/jipp.v9i1.92287

Chen, L. (2025). A Protocol for Evaluating Learning Outcomes Using Reverse Jigsaw and Edpuzzle in Doctoral Business Education: A Q-Methodology Study. *International Journal of Qualitative Methods*, *24*. https://doi.org/10.1177/16094069251326412

Choi, S. E., & Lee, S. (2021). Applying Constructivism in Neurodiverse Classrooms. *Review of Educational Theory*, *4*(4), 6. https://doi.org/10.30564/ret.v4i4.3876

Corrigan, M. W., Wong, J. T., Grove, D., Andersen, S., & Hughes, B. S. (2025). Enhancing Elementary Students Conceptual Understandings of Scientific Phenomena: The Impact of STEAM-First and STEM-First Approaches. *Science Education*, *109*(5), 1336–1364. https://doi.org/10.1002/sce.21942

Darabi, F., Karimian, Z., & Rohban, A. (2025). Putting the pieces together: comparing the effect of jigsaw cooperative learning and lecture on public health students' knowledge, performance, and satisfaction. *Interactive Learning Environments*, *33*(1), 495–512. https://doi.org/10.1080/10494820.2024.2351157

Do, H. N., Do, B. N., & Nguyen, M. H. (2023). How do constructivism learning environments generate better motivation and learning strategies? The Design Science Approach. *Heliyon*, *9*(12), e22862. https://doi.org/10.1016/j.heliyon.2023.e22862

Dwi Cahyani, W., Irawati, R., & Sunaengsih, C. (2024). Media Cards Line Up to Improve Primary School Students' Understanding of The Concept of Place Value. *Riemann: Research of Mathematics and Mathematics Education*, *6*(2), 177–187. https://journal.sanagustin.ac.id/index.php/reimann

Fitamen, C., Blaye, A., & Camos, V. (2024). Enhancing visuo-spatial working memory: the role of visual support in preschoolers and adults. *Journal of Cognitive Psychology*, *36*(8), 898–915. https://doi.org/10.1080/20445911.2024.2401043

Fitriana, R. O., Hadi, M. S., & Izzah, L. (2021). Improve Students' English Vocabulary Skills With Flashcard Media. *Jurnal Ilmiah Pendidikan Profesi Guru*, *4*(3), 521–530. https://doi.org/10.23887/jippg.v4i3.39029

Fricticarani, A., & Maksum, H. (2020). Improving Student Activity and Learning Outcomes by Applying the Jigsaw Type Learning Model in PPHP Skills Study. *Journal of Education Research and Evaluation*, *4*(4), 296. https://doi.org/10.23887/jere.v4i4.30240

Gannar, S., & Kilani, C. (2025). Contextualized Learning and Social Constructivism: Implementing a Project-Based Approach in Information Systems Development Education. *Journal of Science Learning*, *8*(1), 15–24. https://doi.org/10.17509/jsl.v8i1.72667

Gede Widayana, & Kevin Balsono. (2023). Jigsaw Learning Model Improves Student Learning Outcomes In Mechanical Engineering Basic Knowledge. *Journal for Lesson and Learning Studies*, *6*(1), 101–108. https://doi.org/10.23887/jlls.v6i1.61166

Hanum, C. B., As'ary, Y., Komariah, M., & Maftuh, B. (2024). the Implementation of Ipas (Natural Science and Social Studies) in Elementary School: Learning Plot and Teacher Consideration. *EduHumaniora | Jurnal Pendidikan Dasar Kampus Cibiru*, *16*(1), 105–114. https://doi.org/10.17509/eh.v16i1.58361

Herwindo, R., Noer, S. H., & Sutiarso, S. (2025). Development of interactive learning media based on the JIGSAW model to enhance students' understanding of mathematical concepts. *Journal of Advanced Sciences and Mathematics Education*, *5*(1), 15–25.

https://doi.org/https://doi.org/10.58524/jasme.v5i1.536
Junco, E., Vaughn, R., Karimova, G., & Duffy, M. (2023). Constructivist learning practices & culturally responsive teaching: A post-secondary developmental literacy program's multimodal response to the pandemic. *CRES Journal Critical Reviews in Educational Sciences*, *4*(2), 93–104. https://doi.org/10.59320/alanyazin.12401
Kemmis, S., McTaggart, R., & Nixon, R. (2014). *The Action Research Planner*. Springer Singapore. https://doi.org/10.1007/978-981-4560-67-2
Kostiainen, E., Nousiainen, T., & Näykki, P. (2025). From a bitter start to meaningful learning in online teacher education. *Scandinavian Journal of Educational Research*, *3831*, 1–18. https://doi.org/10.1080/00313831.2025.2459404
Lumbantoruan, J. H., & Herman, T. (2025). The effectiveness of the logarithm module equipped with a Jigsaw-type cooperative model in improving learning outcomes. *Journal of Education and Learning (EduLearn)*, *19*(1), 24–33. https://doi.org/10.11591/edulearn.v19i1.21486
Luthfiyah, H., Nusantara, T., Faizah, S., Kusumaningrum, S. R., & Mardhatillah. (2025). The Implementation of Deep Learning to Improve the Effectiveness and Quality of IPAS Learning in Elementary School. *ELSE (Elementary School Education Journal)*, *9*(2), 293–301. https://journal.um-surabaya.ac.id/index.php/pgsd
Ma'rifatul Khasanah, & Sigit Yulianto. (2024). Using Flashcard Media is Seen from the Result of the Skill in Writing Narrative Texts Fifth-Grade Elementary School Students. *JPI (Jurnal Pendidikan Indonesia)*, *13*(3), 562–570. https://doi.org/10.23887/jpiundiksha.v13i3.76685
Maharani, S. A., & Ramadan, Z. H. (2023). Development of Flash Card Media for Early Reading Student. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8446–8455. https://doi.org/10.29303/jppipa.v9i10.5491
Martín-Alguacil, N., & Avedillo, L. (2024). Student-Centered Active Learning Improves Performance in Solving Higher-Level Cognitive Questions in Health Sciences Education. *International Medical Education*, *3*(3), 346–362. https://doi.org/10.3390/ime3030026
Martin-Alguacil, N., Avedillo, L., Mota-Blanco, R., & Gallego-Agundez, M. (2024). Student-Centered Learning: Some Issues and Recommendations for Its Implementation in a Traditional Curriculum Setting in Health Sciences. *Education Sciences*, *14*(11). https://doi.org/10.3390/educsci14111179
Martinez, M. E., & Gomez, V. (2025). Active Learning Strategies: A Mini Review of Evidence-Based Approaches. *Acta Pedagogia Asiana*, *4*(1), 43–54. https://doi.org/10.53623/apga.v4i1.555
Mckay, J., & Sridharan, B. (2024). *Studies in Higher Education Student perceptions of collaborative group work (CGW) in higher education*. *5079*. https://doi.org/10.1080/03075079.2023.2227677
Mintzes, J. J., & Walter, E. M. (2020). Active Learning in College Science: The Case for Evidence-Based Practice. In *Active Learning in College Science: The Case for Evidence-Based Practice*. https://doi.org/10.1007/978-3-030-33600-4
Morris, T. H., Bremner, N., & Sakata, N. (2025). Self-directed learning and student-centred learning: a conceptual comparison. *Pedagogy, Culture and Society*, *33*(3), 847–866. https://doi.org/10.1080/14681366.2023.2282439
Muhajirah. (2020). Basic of Learning Theory (Behaviorism, Cognitivism, Constructivism and humanism). *International Journal of Asian Education*, *Vol.1*(June 2020), 37–42. https://media.neliti.com/media/publications/319060-basic-of-learning-theory-behaviorism-cog-05a8f817.pdf
Nurliyan, Rahman, A., Nuraini, Nashrullah, & Rini, E. S. (2026). The Effect of the Jigsaw Cooperative Learning Model on Improving Communication Skills of Fourth-Grade Students at SD Inpres 2 Tondo. *Journal of Educational Sciences*, *10*(1), 1265–1279.
Pandey, D., Sunar, P. K., Manadhar, N. K., & Pant, B. P. (2025). Integrated projects for meaningful learning: a collaborative action research from Nepal. *Education 3-13*, 1–15. https://doi.org/10.1080/03004279.2025.2495969
Pase, M. I., Wilade, S., Aqil, M., & Hariana, K. (2025). Implementing Jigsaw Cooperative Learning to Improve Fourth-Grade Indonesian Language Outcomes. *Journal of Innovation and Research in Primary Education*, *4*(4), 3752–3760. https://doi.org/10.56916/jirpe.v4i4.2483
Ruhani, A. (2020). Meningkatkan Hasil Belajar Materi Sumber Daya Alam (SDA) IPA Melalui Penerapan Media Gambar Siswa Kelas IV SD Inpres 34 Pacore Kabupaten Barru. *Jurnal Studi Guru Dan Pembelajaran*, *3*(3), 370–376. https://www.e-journal.my.id/jsgp/article/view/357
Slade, J., & Cummings, M. (2025). From reflective practice to action research and positive change: securing high levels of wellbeing among learners with autism spectrum condition in the mainstream setting. *Educational Action Research*, *33*(4), 711–730. https://doi.org/10.1080/09650792.2024.2355925
Stanczak, A., Darnon, C., Robert, A., Demolliens, M., Sanrey, C., Bressoux, P., Huguet, P., Buchs, C., & Butera, F. (2022). Do jigsaw classrooms improve learning outcomes? Five experiments and an internal meta-analysis. *Journal of Educational Psychology*, *114*(6), 1461–1476. https://doi.org/10.1037/edu0000730
Supiarti, S., Selvi, N., & Fajrin, S. N. (2025). Problem Solving and Cooperative Learning Model of the Jigsaw Type: IPAS Learning Outcomes in Elementary School. *ETDC: Indonesian Journal of Research and Educational Review*, *5*(1), 665–680. https://doi.org/10.51574/ijrer.v5i1.4407
Taqa, A. R. (2025). The Psychology of Learning: Cognitive Science Insights into Education. *Research Journal Article*, 112–123. https://www.researchgate.net/publication/388803255
Triansyah, F. A., Suwatno, S., & Machmud, A. (2023). Trends and Research Focus of the Jigsaw Learning Model in Economic Learning: Bibliometric Review and Analysis. *Jurnal Penelitian Pendidikan*, *23*(1), 1–15. https://doi.org/10.17509/jpp.v23i1.54820
Ula, N. A., & Mulis, M. (2025). Jigsaw Method in Increasing Students' Interest in English Language Learning at MA Al-Khoirot. *Jurnal Riset Rumpun Ilmu Bahasa*, *4*(2), 446–463. https://doi.org/10.55606/jurribah.v4i2.5948
Wibowo, S., Wangid, M. N., & Firdaus, F. M. (2025). The Relevance of Vygotsky's Constructivism Learning Theory With the Differentiated Learning Primary Schools. *Journal of Education and Learning*, *19*(1), 431–440. https://doi.org/10.11591/edulearn.v19i1.21197
Widyanto, Z., Qomarrullah, R., & Tebai, S. (2025). The Implementation of the Jigsaw-Type Cooperative Learning Model to Enhance Students' Motivation and Participation in Physical Education. *Journal of Physical Education, Sport, Health and Recreations*, *14*(2), 679–685.

Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

LIST OF TABLES

TABLE 1 / Summary of Student Learning Outcomes Across All Cycles

Cycle	Average Score	Passing Students	Percentage (%)	Non-Passing Students	Percentage (%)
First Cycle	66.61	13	38.2	21	61.8
Second Cycle	93.32	33	97.1	1	2.9

LIST OF FIGURES

FIGURE 1 / The Learning Atmosphere of Students in the First Cycle

FIGURE 2 / Students Making Flashcards in Groups

FIGURE 3 / Students' Learning Atmosphere in the Second Cycle

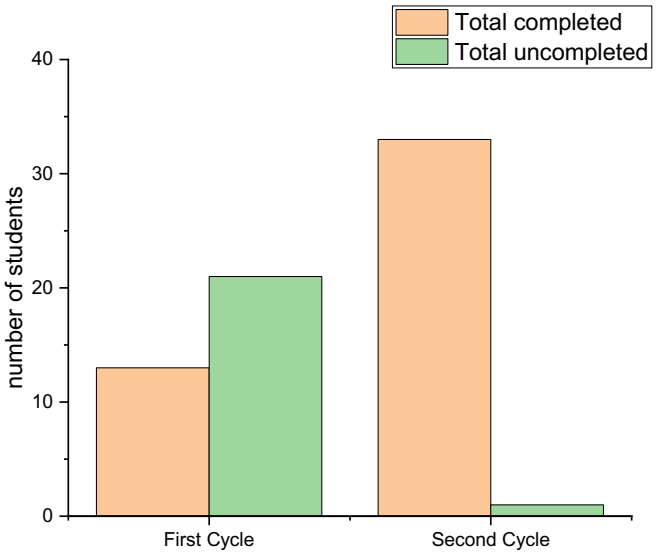

FIGURE 4 / Comparison of Student Learning Outcome Improvement between the First Cycle and the Second Cycle