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The impact of the Jigsaw cooperative learning model on creative thinking and collaboration in fifth-grade natural and social sciences

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Abstract

This classroom action research (CAR) aimed to investigate the impact of the Jigsaw cooperative learning model on fifth-grade students' creative thinking and collaboration skills in Natural and Social Sciences. Conducted over two cycles at SD Negeri Baturetno in the 2024/2025 academic year, the study involved 12 fifth-grade students. Data were collected through a creative thinking test and a validated collaboration observation sheet. The findings demonstrated significant improvements in both domains. Students' active collaboration increased from 66.7% in the first cycle to 91.7% in the second, while lesson implementation completeness reached 100%. The average score on the creative thinking test rose from 72.5 to 81.25, and the percentage of students achieving mastery increased from 75% to 91.7%. Improvements were observed across all indicators: fluency, flexibility, originality, and elaboration in creative thinking, as well as effective communication, respect for others' opinions, and conflict resolution in collaboration. The study concludes that the Jigsaw model is an effective and innovative pedagogical strategy for enhancing meaningful and collaborative learning in elementary school settings.

Keywords: Jigsaw cooperative learning; creative thinking; collaboration; natural and social sciences; classroom action research

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INTRODUCTION

Elementary education plays a strategic role in developing students' thinking abilities and social skills. At this stage, learners need to be holistically nurtured, including their capacity for creative thinking and collaboration (Raditya et al., 2023). These two abilities form an important foundation for students to understand various scientific concepts and apply them in daily life. In the context of Natural and Social Sciences learning (Sugih et al., 2023), creative and collaborative thinking skills are crucial to help students meaningfully connect natural phenomena with social life. However, the observations in previous research at SD Negeri Baturetno (a public elementary school in Baturetno) indicated that natural and social sciences learning was still dominated by teacher-centered methods. The teacher served as the main source of information while students tend to be passive, merely listening to explanations and taking notes. This pattern leaves students with little opportunity to explore ideas, engage in discussions, or work with peers, resulting in suboptimal development of their creative thinking and collaboration skills. In group

activities, often only a few students are actively participating, whereas others remain passive or not involved at all. This condition shows that the learning model applied so far has not fully supported the development of thinking and teamwork abilities. Therefore, an innovative learning approach is needed, one that can create an active learning atmosphere, foster student interaction, and encourage original thinking (Sunbanu et al., 2019). The Jigsaw cooperative learning model, developed by Elliot Aronson in 1971 , is an approach known to effectively increase cooperation, responsibility, and active student involvement in learning. In this model, each group member independently learns a particular section of the material and is responsible for teaching it to their groupmates. This process not only helps students deepen their understanding of the material but also hones communication and collaboration skills as well as a sense of responsibility to the group (Tika & Suryana, 2021). By positioning students at the center of the learning activities and promoting intensive social interaction, the Jigsaw model aligns with constructivist principles, which emphasize knowledge construction through direct experience and information exchange in a social context. Several studies have demonstrated the effectiveness of the Jigsaw cooperative learning model in improving student learning outcomes and social skills. For example, Saputra et al. (2019) found that Jigsaw increased individual accountability and group interaction.

Research by Giannakos et al. (2019) showed that constructionism- and collaboration-based activities enriched children's learning experiences. Likewise, Kholifah et al. (2022) reported that project-based learning strengthened communication and teamwork skills, while Nugraha and Setiawan, (2024) observed that problem-based and collaborative approaches enhanced active participation and communication skills. Based on this background, the present study aims to improve the creative thinking and collaboration abilities of fifth-grade students through the implementation of the Jigsaw cooperative learning model in natural and social and sciences lessons at SD Negeri Baturetno.

METHODS

This research employed a Classroom Action Research (CAR) design. This design was a systematic inquiry conducted by teachers in their own class by planning, implementing, observing, and reflecting on an action through multiple cycles, with the goal of improving the quality of the teaching-learning process (Pahleviannur et al., 2022). The CAR design in this study followed the self-reflective spiral model of Kemmis and McTaggart, which involves repeated cycles of planning, acting, observing, and reflecting (Yaumi & Damopolii, 2016). The model was adapted flexibly to provide the needs of the study.

Participants and Setting

The participants of this study were 12 students in the fifth grade at SD Negeri Baturetno (academic year 2024/2025). The research was carried out in two cycles. Each cycle consisted of two natural and social and sciences lessons (meetings), following the phases outlined in the lesson plans. The teacher and a collaborator implemented the planned jigsaw learning activities while observing the process.

Data Collection

The instruments for data collection were a natural and social and sciences-based creative thinking test and a student collaboration observation sheet. The creative thinking test was written as a test designed to assess students' creative thinking skills in the context of the natural social and sciences material. The observation sheet, which had been validated, was used to record students' collaborative behaviors during learning activities. The observation focused on indicators of collaboration, including active participation, group work productivity, responsibility, flexibility, compromise, and mutual respect among group members. Observers

(including the teacher and collaborator) rated each indicator using a dichotomous scale (Yes = 1, No = 0) for various observed behaviors.

Procedure

In Cycle I, the teacher introduced natural and social and sciences topics using the Jigsaw model without additional interventions. Students were divided into jigsaw groups and expert groups to learn different sub-topics and teach each other. In Cycle II, improvements were made based on Cycle I reflections: the teacher employed more engaging learning media (such as posters, experiment videos, and a balloon model of lungs to provide concrete visual experiences) and provided explicit training on teamwork and constructive idea-sharing. Each cycle included: (1) Planning, developing lesson plans incorporating Jigsaw, preparing materials and instruments; (2) Action (Implementation), teaching the natural and social and sciences lessons using the Jigsaw model; (3) Observation, observing and recording student activities (both cognitive and collaborative) and teacher's adherence to the lesson plan; and (4) Reflection, evaluating the process and outcomes to plan the next cycle.

Data Analysis

Data were analyzed with descriptive quantitative and qualitative techniques. The written test scores for creative thinking were analyzed by calculating the average score and the percentage of students meeting the minimum mastery criterion. The average score was obtained by summing all students' scores and dividing by the number of students. The mastery percentage was calculated as the proportion of students scoring at or above the minimum mastery criterion (set at 75) multiplied by 100%. Meanwhile, the collaboration observation data were analyzed qualitatively and quantitatively by comparing results from Cycle I and Cycle II. For each collaboration indicator observed, the percentage of "Yes" scores was calculated against the ideal score (i.e. if all students demonstrated that behavior). An overall collaboration performance percentage was also computed for each cycle. This percentage reflects how much of the maximum possible collaboration score was achieved by the class. The increase in this percentage from Cycle I to Cycle II was used to gauge improvement in collaboration skills. The action was considered successful if at least 75% of the students achieved mastery on the creative thinking test and if the overall student collaboration score reached ≥75% in the observation. These criteria were set as benchmarks indicating a substantial improvement in both creative thinking and collaborative learning outcomes.

RESULTS AND DISCUSSION

Results

The classroom action research showed significant improvements in students' creative thinking and collaboration after the implementation of the Jigsaw cooperative learning model. Overall, the results in Cycle II were markedly better than those in Cycle I. Based on the creative thinking test (written test) scores, the class average in Cycle I was 72.5, which increased to 81.25 in Cycle II. In Cycle I, 75% of students (9 out of 12) achieved the mastery criterion (KKM), categorized as "Good," whereas in Cycle II the mastery rate rose to 91.7% (11 out of 12 students), categorized as "Very Good." This 16.7% increase in mastery indicates that the use of the Jigsaw model effectively improved students' creative thinking performance in natural and social and sciences learning. Table 1 presents the individual student scores in Cycle I and Cycle II, which show that most students' scores increased from the first to the second cycle.

Tabel 1. Students' creative thinking test scores in cycle I and cycle II

No.	Cycle I Score	Cycle II Score	Remark
1	75	80	Increased
2	75	85	Increased
3	80	85	Increased
4	60	75	Increased
5	80	85	Increased
6	55	75	Increased
7	85	90	Increased
8	80	90	Increased
9	80	80	Stable
10	85	90	Increased
11	75	80	Increased
12	40	60	Increased

As shown in Table 1, each student's creative thinking test score in Cycle II was equal to or higher than in Cycle I, with one student's score remaining the same and all others improving. The improvement in class average and mastery percentage reflects both higher individual performance and a more even understanding of the material among students in Cycle II. Based on the test results and observations, the overall level of students' creative thinking ability improved from *"Good" in Cycle I to "Very Good" in Cycle II*. In addition to student test results, improvements were observed in the teaching and learning process itself. Teacher observation data indicated that the implementation of the lesson plan became more effective in Cycle II. Table 2 shows a summary of the teacher's performance (lesson implementation) across the two cycles. In Cycle I, the teacher's implementation of planned activities was 88.8% in the first meeting and 90% in the second meeting. These numbers increased to 92.6% in Cycle II (Meeting 1) and reached 100% in Cycle II (Meeting 2). By the final meeting, all planned steps in the lesson were executed completely. This suggests that the teacher improved in facilitating the Jigsaw learning process after reflecting on Cycle I, leading to a fully implemented lesson in Cycle II.

Table 2. Teacher's lesson implementation in cycle I and cycle II

Meeting	Cycle I	Cycle II
Meeting 1	88.8%	92.6%
Meeting 2	90%	100%

Based on Table 2, there was a clear increase in the teacher's implementation of the lesson plan from Cycle I to Cycle II. The teaching process in Cycle II was carried out in strict accordance with the designed scenario, indicating that the teacher had adjusted and improved the facilitation of the jigsaw model to address issues encountered in Cycle I. Student collaboration skills also showed significant growth with the use of the Jigsaw model. According to the collaboration observation sheets, students became much more actively involved in group discussions and teamwork in Cycle II compared to Cycle I. In Cycle I, the overall collaboration performance (measured by the observation score percentage) was about 75%, which falls in the "Good" category. By Cycle II, this figure had increased to 91.7%, which is classified as "Very Good." This improvement of approximately 16.7 percentage points demonstrates that the cooperative learning environment of the Jigsaw model created a more balanced and active participation for all students. Table 3 below details the improvement in several specific collaboration indicators from Cycle I to Cycle II.

Table 3. Student collaboration indicators in cycle I and cycle II

Collaboration Indicator	Cycle I	Cycle II
Students actively listen to others	68%	85%
Students contribute ideas	70%	88%
Students work together to complete tasks	72%	91%
Overall collaboration score (average)	70%	88.3%

The Table 3 shows that all measured indicators of collaborative behavior improved in Cycle II. For instance, the percentage of students actively listening to group members rose from 68% to 85%, and the percentage of students contributing ideas increased from 70% to 88%. Similarly, the indicator for working together on tasks went up from 72% in Cycle I to 91% in Cycle II. The overall average collaboration score improved from 70% to about 88.3%. These gains indicate a more equitable and effective involvement of students in group work during Cycle II. From the observation notes, it was evident in Cycle I that students had just begun to participate actively in group discussions and cooperate, achieving an observation score of about 75% ("Good"). By Cycle II, however, their participation became much more active and responsible. Students in Cycle II demonstrated greater responsibility in group tasks and more effective teamwork, reaching an observation score of 91.7% ("Very Good"). In summary, the implementation of the jigsaw cooperative learning model not only enhanced students' creative thinking abilities but also strengthened their collaborative skills, both are critical factors in successful learning.

Discussion

Implementing the Jigsaw cooperative learning model in natural and social and sciences significantly and positively impacted the improvement of fifth graders' creative thinking abilities and collaborative skills. The two-cycle action research revealed tangible improvements in both the learning process and outcomes. The Jigsaw model was able to transform the initially passive learning dynamics into an active, communicative, and meaningful experience by assigning each student a distinct role and responsibility that are interdependent in achieving the group's common goal. This finding is consistent with cooperative learning principles reported by (Made & Widarta, 2020), who noted that Jigsaw can reconstruct classroom dynamics to be more engaging and student-centered through structured peer interactions. During Cycle I, the students' average score for creative thinking was 72.5, with 75% of students (9 out of 12) meeting the learning mastery criteria. The highest score achieved was 85, while the lowest was 40, indicating a gap in material mastery among students. Observation in Cycle I also showed that many students struggled to articulate original ideas in detail and were not very active in group discussions. Previous research has noted that elementary students often are not yet trained to participate effectively in group-based learning activities without appropriate guidance or strategies (Kusuma & Aisyah, 2012). This lack of active engagement in group learning can hinder the development of critical thinking and collaborative skills that students should acquire. As an improvement measure in Cycle II, several strategic enhancements were introduced.

The teacher incorporated more attractive instructional media, such as informative posters, experiment demonstration videos, and a balloon lung model, to provide visual and concrete experiences that enriched students' understanding. In addition, the division of roles among group members was clarified, and students received explicit training on how to collaborate and how to express their ideas constructively. These efforts yielded gratifying results: the class average creative thinking score increased to 81.25, and the number of students achieving mastery rose to 11 out of 12 (91.7%). The highest score also increased to 90, and the lowest score improved to 60. These improvements suggest that the learning became more evenly effective across students, and the teaching interventions in Cycle II successfully addressed the weaknesses identified in Cycle I. The observed improvements align well with theories of cooperative learning Yamin (2005) that emphasize the development of higher-order thinking skills (HOTS) such as creativity and collaboration. Sutiman et al. (2014) have asserted that cooperative learning can enhance the quality of students' thinking, especially in terms of creativity, which requires students to generate new ideas and innovative solutions to problems. In this study, creative thinking among students showed significant progress in the four key indicators defined by Torrance's framework: fluency (the ability to produce a number of ideas), flexibility (the ability to approach problems from different perspectives), originality (the ability to produce novel or unique ideas), and elaboration (the ability to develop and detail ideas). The

increase in these areas suggests that students were not only able to come up with ideas but also to expand on them in depth.

This outcome is in line with the findings of (Marliani, 2015), who reported that structured cooperative learning models like Jigsaw can improve students' creative thinking by encouraging them to generate and elaborate on ideas within a group setting. On the collaborative aspect, there was a marked enhancement in students' active participation in their groups. In Cycle I, only 8 students (66.7%) were actively engaged in their groups, whereas in Cycle II this number rose to 11 students (91.7%). This indicates that students began to develop more mature collaboration skills, including the ability to communicate effectively, appreciate their peers' opinions, resolve conflicts constructively, and divide tasks fairly. Such improvements support the development of essential 21st-century soft skills. This finding is exemplified by the Partnership for 21st Century Skills (Rohmat et al., 2019; Subiyantari et al., 2019) framework, which underscores the importance of collaboration skills in achieving group objectives. The increase in the number of actively participating students demonstrates that through the Jigsaw model, the classroom moved closer to that ideal of every student contributing meaningfully to group work.

The improvement in collaboration was also reflected in the lesson implementation levels, which reached an overall 96.3% completeness, with 100% implementation in the final meeting. This success can be interpreted through Vygotsky's theoretical lens of social interaction within the Zone of Proximal Development (ZPD) (Suparno, 2020). According to Vygotsky's theory, students can reach higher levels of understanding and skill when they engage in social interactions with peers or teachers than they would achieve individually. In this study, the intense peer interaction within Jigsaw groups likely enabled students to scaffold each other's learning, allowing them to grasp concepts more effectively than if they were working alone. Group interaction also fostered critical thinking and helped reinforce each student's understanding of the material through explanation and discussion.

Furthermore, Bruner (2021) regarding the importance of concrete and visual representations in learning is very relevant in this context. Bruner posits that using visual and manipulative media can facilitate students' comprehension of abstract concepts. In the improved Cycle II, the use of visual aids (like the lung model and experiment videos) provided concrete representations of scientific ideas, which helped students conceptualize and internalize the natural and social and sciences content in a more applied manner. These media likely supported students who have various learning styles and made the learning experience more engaging, thereby contributing to the better outcomes observed. In the context of 21st-century education, the Jigsaw model also reinforces principles of learner agency and ownership of learning, meaning that students are not merely objects of instruction but active subjects responsible for their group's success (Jajang, 2021). This resonates with the values of the *Profil Pelajar Pancasila* (the Profile of Pancasila Students) promoted in the Indonesian curriculum, which emphasizes the development of creative and collaborative character traits.

Through the Jigsaw model, students not only developed academic skills but also learned to work together, share responsibility, and appreciate each member's contribution to achieving the group's goals. This is implicitly supported by modern revisions of educational objectives, such as those by Anderson and Krathwohl (2020) which encourage moving beyond rote learning to developing higher-order thinking and social skills. Slavin (2021) states that cooperative learning is effective not only in improving academic outcomes but also in building important soft skills such as interpersonal communication, empathy, and joint decision-making. The consistent and reflective application of the Jigsaw approach in this study serves as a pedagogical solution relevant for educating a generation that must adapt and collaborate in an increasingly complex and interconnected era. The social interaction and interdependence fostered by the Jigsaw model prepare students to work in teams and appreciate diverse skills that are invaluable both inside and outside the classroom (Fildzati, 2022). In summary, the implementation of the Jigsaw cooperative learning model in Cycle II not only remedied the shortcomings observed in Cycle I

but also significantly enhanced the quality of both the learning process and outcomes for students. All the success indicators cognitive achievements and social-emotional skills were met by the end of Cycle II. Consequently, no further action cycles were deemed necessary. The strategies employed proved effective, and the Jigsaw model can be recommended for broader application in natural and social and sciences learning and other subjects that demand active student interaction and creative thinking.

CONCLUSION

The findings of this classroom action research indicate that the jigsaw cooperative learning model can significantly transform a previously passive learning process into one that is more active, collaborative, and meaningful. By implementing the model, students are encouraged to depend on one another to achieve learning goals through clearly defined roles and responsibilities. The cooperative structure of Jigsaw created an engaging learning environment where students became active agents in their education. In Cycle I, some students showed low involvement in discussions and had difficulty expressing ideas. However, after strategic improvements in Cycle II (such as utilizing attractive learning media and providing explicit group work training), student engagement increased dramatically. This is evidenced by the rise in active group participation from 66.7% of students in Cycle I to 91.7% in Cycle II. Additionally, the implementation of planned learning activities improved, reaching 100% in the final meeting of Cycle II, which signifies that the lesson was executed fully as designed. The students' creative thinking ability also improved substantially: the average creative thinking test score increased from 72.5 in Cycle I to 81.25 in Cycle II. The percentage of students achieving the mastery criterion rose from 75% to 91.7%. Students showed progress in all four indicators of creative thinking (fluency, flexibility, originality, elaboration). Likewise, their collaborative skills advanced, as seen in the enhancement of behaviors like effective communication, appreciation of peers' opinions, and constructive conflict resolution during group work. Overall, the Jigsaw cooperative learning model proved to be an effective approach to enhance both creative thinking and collaboration among fifth-grade students in natural and social and sciences lessons. The use of Jigsaw not only increased academic performance but also fostered important 21st century skills in students. Given these positive outcomes, the Jigsaw model is recommended as an innovative alternative for creating meaningful and collaborative learning experiences in elementary education.

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