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The Application of the Buzz Group Discussion-Based Jigsaw Model to Enhance Elementary School Students' Learning Engagement in Integrated Science Lessons

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Abstract
Student engagement is one of the key factors in the success of learning Natural and Social Sciences (IPAS). This study aims to analyze differences in and improvements to student engagement following the implementation of a Buzz Group-style discussion-based Jigsaw learning model. The study employed a quantitative approach using a pre-experimental design in the form of a one-group pretest-posttest design. The research sample consisted of 29 students in Class 5B at SD IT Al-Akhyar, selected using purposive sampling. Data were collected through learning activity observation sheets, Likert-scale questionnaires, multiple-choice tests, and documentation. The data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, a paired-samples t-test, and the N-Gain test with the aid of SPSS version 27. The results showed that the students' average scores increased from 44.28 on the pretest to 71.86 on the posttest. The results of the paired-samples t-test yielded a significance level of $p < 0.001$, indicating a significant difference between the conditions before and after the implementation of the learning model. The average N-Gain score for the pretest-posttest was 0.5010, while the N-Gain for learning engagement based on observation was 0.3300. Both values fall into the moderate category. Improvements were primarily observed in students' engagement in completing tasks, problem-solving, asking questions, participating in discussions, and assessing their own abilities. Thus, the Buzz Group-style discussion-based Jigsaw learning model can increase student engagement in IPAS instruction, although the improvement is not yet optimal and is not consistent across all indicators.

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1. INTRODUCTION

The teaching of Natural and Social Sciences (IPAS) in elementary school is not only focused on mastering facts and concepts, but also on students' ability to observe phenomena, solve problems, communicate ideas, and connect knowledge to everyday life. IPAS instruction also encourages students to think critically and actively explore knowledge through hands-on learning experiences (Lestari et al., 2025). These characteristics call for a learning process that is contextual, collaborative, and provides ample opportunity for student engagement. Selecting a learning model that aligns with students' characteristics and needs can create a more engaging, interactive, and dynamic learning experience and enhance student engagement in learning activities (Naila et al., 2025). The models and methods used by teachers are important factors because they help determine the level of student participation during learning activities.

Conversely, choosing teaching methods that do not align with students' characteristics and needs can lead to less effective learning, resulting in low student motivation and engagement in the learning process (Sari et al., 2025). Student engagement may also decline if instruction only requires students to focus on the teacher's explanations. Therefore, selecting the right instructional model is essential to increase student engagement during the learning process (Novita et al., 2019). Teaching that remains teacher-centered and dominated by lecture-style methods tends not to fully engage students. This situation can cause students to feel bored and hinder the development of their attitudes and skills during the learning process (Aisah et al., 2023). In IPAS instruction, a lack of variety in teaching models and media can also make the learning process feel monotonous and unengaging, resulting in suboptimal student engagement (Aprillia et al., 2026). Learning that is dominated by the teacher's explanations ultimately limits students' opportunities to ask questions, discuss, express their opinions, and develop their own understanding (Kamza & Lestari, 2021).

Active learning is one of the key indicators for assessing the quality of the learning process. Active learning is not only evident through physical activity but also encompasses students' mental, emotional, and social engagement. Students' active learning can be measured through their engagement in completing tasks, solving problems, asking questions, seeking information, participating in discussions, collaborating, and presenting the results of group activities (Nafisyah et al., 2026). This level of engagement is also evident in students' willingness to express their opinions and apply their knowledge to solve problems. The interactions that take place within study groups can help students understand the material, improve their ability to express their opinions, and encourage less active students to participate in the learning process (Ardiyanti et al., 2021). Student engagement does not depend solely on individual motivation, but is also influenced by learning strategies, teacher support, classroom atmosphere, instructional materials, and the opportunities provided to students to participate directly (Febiyanti et al., 2024).

Issues regarding student engagement were identified in the IPAS lessons in Class 5B at SD IT Al-Akhyar. The results of the researcher's preliminary observation of 29 students showed that the average level of student engagement was only 68%, placing it in the "moderately active" category. This percentage remains below the ideal criterion for active learning, which is at least 75% (Bidari et al., 2021). The findings also show that during group activities, some students still rely on other group members, while discussions tend to be dominated by a few students. This situation reveals a gap between actual learning engagement and the desired outcome. Therefore, a learning strategy is needed that can foster individual responsibility while providing more equal opportunities for participation to every student.

The cooperative learning model organizes students into learning groups to discuss and solve problems presented during the lesson (Nisa et al., 2020). One instructional model that has the potential to address these issues is the Jigsaw cooperative learning model. The Jigsaw instructional model positions students as active participants in the learning process. Nadia et al., (2023) explains that the Jigsaw model organizes students into small, heterogeneous groups of four to six students. Each student is responsible for mastering a specific portion of the material and presenting it to the other group members. This learning structure fosters positive interdependence and individual responsibility in achieving learning objectives. In practice, students participate in both their home group and an expert group, with different material assignments and responsibilities. Each student is required to master a specific portion of the material within the expert group and then explain that

material to the members of their home group. This learning structure fosters positive interdependence, individual responsibility, communication, and cooperation among students (Anitra, 2021). Nevertheless, discussions in expert groups can still be dominated by certain students if they are not supported by discussion techniques that ensure equitable participation. Therefore, expert group activities in the Jigsaw method need to be supplemented with Buzz Group-style discussions.

A Buzz Group is a small-group discussion method that is brief, intensive, and focused on a specific issue. The limited number of participants gives each student more opportunities to speak, ask questions, offer feedback, and exchange information. This method can also create a more conducive atmosphere for discussion, as each group discusses a specific subtopic and presents its findings to the larger group on its own (Kamza & Lestari, 2021). The integration of the Buzz Group into the Jigsaw expert-group phase is expected to strengthen interactions among students before they return to present the material to their original groups. In this structure, students go through a process of mastering the material individually, reinforcing their understanding through micro-discussions, and disseminating knowledge through peer-tutoring activities.

A number of previous studies have provided evidence of the potential of both the Jigsaw and Buzz Group methods to increase student engagement. A study conducted by Mahmudah (2022) shows that the implementation of the Jigsaw method increased student engagement from 37% in the initial cycle to 74% and subsequently reached 88%. However, the study used a classroom action research design in a single class and did not integrate the Jigsaw method with other discussion methods. Another study conducted by Hidayati (2025) A systematic literature review also shows that the Buzz Group approach can improve elementary school students' learning outcomes and engagement. However, these studies have not conducted direct empirical testing in classroom learning settings and have not examined the integration of the Buzz Group approach with other instructional models.

Other research conducted by Katarina (2021) found an engagement rate of 73.55% in Jigsaw learning, but that study was conducted at the high school level and compared Jigsaw with Numbered Heads Together, rather than combining it with small-group discussion techniques. A study conducted by Pinasthika & Kaltsum (2022) shows that the experimental method can enhance elementary school students' learning experiences, critical thinking skills, and curiosity, but its focus is more on practical activities than on fostering equitable social interaction within groups. Meanwhile, research conducted by Normaya (2023) has successfully enhanced learning activities through a combination of Problem-Based Learning and TPACK, but has not yet examined responsibility-sharing structures such as Jigsaw or intensive small-group interactions such as Buzz Groups. These findings indicate that research on active learning has employed various models and methods, but the integration of Jigsaw and Buzz Groups into IPAS instruction in elementary schools remains limited.

The scientific uniqueness of this study lies in the integration of Buzz Group-style discussions, specifically during the expert group stage of the Jigsaw model. This integration creates a learning process that connects knowledge construction through individual responsibility, reinforces interaction through brief and intensive micro-discussions, and facilitates the restatement of knowledge within the home groups. This approach does not merely place the Jigsaw and Buzz Group methods side by side but leverages the characteristics of both within a single, integrated learning phase. The Jigsaw method assigns responsibility for mastering the material to each student, while the Buzz Group method expands opportunities to speak, ask questions, respond, and build consensus within the expert groups. This integration is expected to reduce the dominance of certain students and enhance student engagement cognitively, socially, and communicatively.

Based on this gap, the research question is whether there is a significant difference in students' learning engagement before and after the implementation of the Buzz Group-type discussion-based Jigsaw learning model, and to what extent this model increases learning engagement. The research hypothesis states that there is a difference in the average level of student learning engagement before and after the intervention and that the implementation of the Buzz Group-style discussion-based Jigsaw learning model is effective in increasing the learning engagement of 5th-grade students in Class 5B at SD IT Al-Akhyar in the IPAS subject.

This study aims to analyze differences in students' learning engagement scores before and after the implementation of the Buzz Group-style discussion-based Jigsaw learning model, as well as to measure the increase in students' learning engagement following the implementation of this model in IPAS instruction at the elementary school level.

2. RESEARCH METHODS

This study employed a quantitative approach with a pre-experimental design in the form of a one-group pretest-posttest design. The quantitative approach was chosen because the study aimed to measure the effectiveness of the Buzz Group-style discussion-based Jigsaw learning model in enhancing student engagement through a comparison of scores before and after the intervention. This design involves a single research group without a control group, following the O_1-X-O_2 pattern: initial measurement, intervention, and final measurement. Comparing the pretest and posttest results allows the researcher to identify changes that occurred after the intervention was administered (Dyan Yuliana, 2021). The study was conducted at SD IT Al-Akhyar, Gondangmanis Village, Bae Subdistrict, Kudus Regency, Central Java, from April to July 2026. The study sample consisted of 29 students in Class 5B, including 16 boys and 13 girls. The sample was selected using purposive sampling based on the alignment of the class's characteristics with the study's objectives.

The research procedure began with initial observations, the development and validation of instruments, the administration of a pretest, the implementation of the Buzz Group-style discussion-based Jigsaw learning model, the administration of a posttest, and data analysis. During the study, students were divided into home groups and expert groups to study, discuss, and explain parts of the material to their group members. Data were collected through learning activity observation sheets, Likert-scale questionnaires, multiple-choice tests, and documentation. The research instruments were first validated by experts to ensure content appropriateness and suitability for measuring the research variables (Rosita et al., 2021). The data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, a paired-samples t-test, and the N-Gain test using SPSS version 27. The paired-samples t-test was used to determine differences in learning engagement before and after the intervention, while the N-Gain test was used to measure the degree of improvement in students' learning engagement following the implementation of the learning model.

3. RESULTS AND DISCUSSION

3.1.Research Results

The study was conducted with fifth-grade students in Class 5B at SD IT Al-Akhyar during the first semester of the 2026/2027 school year. The study sample consisted of 29 students, including 16 boys and 13 girls. The study was carried out over five sessions, which included a pretest, three sessions applying the Buzz Group-style discussion-based Jigsaw learning model, and a posttest.

The results of the analysis show an increase in scores following the implementation of the jigsaw learning model based on buzz group discussions. The average pretest score of 44.28 increased to 71.86 on the posttest, resulting in an average difference of 27.59 points. The average posttest score also exceeded the school's Learning Objective Achievement Criteria (KTTP) of 70, although there were still some students who scored below that criterion.

Tabel 1. Students' average pretest and posttest scores

Average *pretest* Score	Average *posttest* Score
44,28	71,86

Source: Researchers, 2026

Normality Test

A normality test was conducted on the pretest and posttest data using the Shapiro–Wilk test because the sample size was less than 50 (n = 20). Based on the calculations, the results of the normality test are as follows.

Tabel 2. Normality Test Results

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest	.202	29	.004	.941	29	.105
posttest	.129	29	.200*	.941	29	.107

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Source: SPSS 27, Researchers, 2026

The results of the normality test show that the significance value for the pretest was 0.105 and for the posttest was 0.107. Both values are greater than 0.05, so the learning outcome data are considered to be normally distributed. Therefore, hypothesis testing in this study can proceed with a parametric statistical analysis using a paired-sample t-test.

***Paired sample T-Test* Test**

Hypothesis testing using a paired-sample t-test was conducted to determine the difference in mean scores before and after instruction using a buzz-group-based discussion jigsaw learning model. The test results are shown in the following table:

Tabel 3. Results of the *Paired-Sample T-Test*

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PRETEST - POSTTEST	-27.586	9.760	1.812	-31.299	-23.874	-15.221	28	<.001

Source: SPSS 27, Researchers, 2026

The results of the analysis showed a significance level of $p < 0.001$. Since this value is less than 0.05, it can be concluded that there is a significant difference between the pretest and posttest scores for IPAS learning engagement among students in Class 5B at SD IT AL-AKHYAR.

N-Gain Test Results

Hypothesis testing using the N-Gain test was conducted to determine the learning engagement of 5B students using a jigsaw learning model based on buzz group discussions on the topic "Where Is Indonesia Located?" The test results are shown in the following table:

Tabel 4. N-Gain Test Results

N-Gain Test Of *Pretest Posttest*

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ngain_Score	29	.11	.83	.5010	.16312
Ngain_Persen	29	11.11	83.33	50.0991	16.31248
Valid N (listwise)	29				

Source: SPSS 27, Researchers, 2026

N-Gain Test of Student Learning Engagement

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ngain_Score	29	.18	.53	.3300	.07233
Ngain_persen	29	18.00	52.94	32.9953	7.23330
Valid N (listwise)	29				

Source: SPSS 27, Researchers, 2026

Based on the table above, an analysis of the 29 students shows that the average N-Gain score for the pretest and posttest was 0.5010, or 50.10%, with a minimum value of 0.11 and a maximum of 0.83. Meanwhile, the average N-Gain value for student learning engagement was 0.3300, or 32.9953%, with a minimum value of 0.18 and a maximum of 0.53. These results indicate an increase following the implementation of the buzz-group discussion-based jigsaw learning model, although the increase in student learning engagement was lower than the increase in pretest and posttest scores. The following is an analysis of the N-Gain test results for each indicator of student learning engagement.

Tabel 5. Results of the N-Gain Analysis of the Learning Engagement Indicator

NO	Indicators of Student Engagement in Learning	Average		N-Gain	Criteria
		Pretest	Posttest		
1	Carrying out their studies	93,10	100,00	1,00	Tall
2	Engaged in problem-solving	86,21	100,00	1,00	Tall
3	Ask a friend or teacher if you don't understand	21,38	47,59	0,33	Currently
4	Trying to find information	29,66	74,48	0,63	Currently
5	Conducting a group discussion	26,21	51,72	0,34	Currently
6	Able to assess their own abilities	96,55	100,00	1,00	Tall

7	Practice solving problems	32,41	53,10	0,30	Currently
8	Applying what has been learned to complete the tasks at hand	25,52	52,41	0,36	Currently
		Session 1	**Session 2**	**N-Gain**	**Criteria**
1	Carrying out their studies	63,79	81,90	0,50	Currently
2	Engaged in problem-solving	56,90	75,86	0,44	Currently
3	Ask a friend or teacher if you don't understand	64,66	80,17	0,43	Currently
4	Trying to find information	66,38	66,38	0,0	Low
5	Conducting a group discussion	62,07	79,31	0,45	Currently
6	Able to assess their own abilities	56,03	75,86	0,45	Currently
7	Practice solving problems	67,24	71,55	0,13	Low
8	Applying what has been learned to complete the tasks at hand	52,59	66,38	0,29	Low

Based on the table of N-gain test results, most of the IPAS learning engagement indicators showed an increase. This indicates that instruction using the jigsaw learning model specifically the buzz group discussion method is effective in enhancing student learning engagement in the IPAS subject, specifically on the topic "Where Is Indonesia Located," among 5th-grade students in Class 5B at SD IT AL-AKHYAR.

3.2.Discussion

The results of the study indicate that the implementation of the Jigsaw learning model based on Buzz Group-style discussions is associated with increased student engagement and learning outcomes. The increase in the average pretest score from 44.28 to 71.86 indicates a change in student achievement following the instruction. This finding is supported by the increase in observation scores from 57.07 in the first session to 70.68 in the third session. Statistical test results with a p-value < 0.001 for both types of data indicate that the differences before and after the intervention are statistically significant.

This improvement is related to a shift in teaching methods from a previously teacher-centered approach to one that directly involves students. Before the intervention, students tended to wait for the teacher's explanations, were less active in asking questions, and were not yet accustomed to building their understanding through interaction with their peers. These conditions are consistent with the explanation Aditama et al., (2025) that learning dominated by lecture-based methods can lead to boredom and encourage students to become passive.

In the Jigsaw method, each student serves as a member of both their home group and an expert group. In the expert group, students study a specific section of the material, read learning resources, compare answers, exchange information, and align their understanding. Upon returning to their home group, each student is responsible for explaining the material they have studied to the other group members. This structure fosters individual accountability because the group's understanding depends on the contribution of each member.

Explaining the material to members of their home groups also encourages students to organize information using their own words. Students do not merely receive information; they must convey, defend, examine, and refine their understanding based on their peers' questions and responses. This process aligns with constructivist theory,

which views students as active agents who construct knowledge through experience, interaction, and reflection.

The findings of this study on the IPAS subject are supported by research Adha et al., (2025) which shows that the implementation of the Jigsaw cooperative learning method can improve elementary school students' IPAS learning activities and outcomes. Research by Sihite et al., (2025) namely, the positive and significant effect of the Jigsaw model on IPAS learning outcomes. The consistency of these results indicates that the division of material, the presence of expert groups, and the responsibility to restate relevant material are effectively applied in IPAS instruction, which involves various interrelated concepts.

The use of Buzz Group-style discussions reinforces the Jigsaw phase because discussions take place in small groups. This setting provides each student with more opportunities to speak. Students who are not yet comfortable expressing their opinions in a whole-class setting can first share their ideas with peers in a small group. This helps reduce the fear of making mistakes and allows students to prepare their responses before presenting them to their home group.

Maulidiya et al., (2023) It also explains that the Buzz Group can foster active and interactive learning and help students who were previously passive become more confident in expressing their opinions. Mauizdati et al., (2021) It also states that Buzz Group discussions can help students practice exchanging opinions, build self-confidence, and actively engage during learning. In this study, small groups served not only as a seating arrangement but also as a space for communication that allowed for more equitable student participation.

The decrease in the standard deviation of the observed scores from 10.173 to 9.039 indicates that participation in the third session was more evenly distributed. This means that learning activities were not dominated solely by a few students who were particularly confident in speaking up. The division of responsibilities within the expert groups and home groups encouraged each member to carry out their tasks. These findings support the view that Zuriatun Hasanah (2021) that individual responsibility, direct interaction, communication, and group evaluation are key elements of cooperative learning.

Nevertheless, the standard deviation of the posttest scores increased from 9.25 to 11.63. This indicates that the extent of improvement varied among students. These differences may be influenced by students' initial ability, motivation, interest, readiness, confidence in speaking, peer support, and their ability to adapt to new learning procedures. Payon et al., (2021) classifies the factors that influence learning engagement into internal factors, external factors, and learning approach factors. Therefore, applying the same model does not necessarily result in the same level of progress among all students.

The N-Gain results provide further insight into the magnitude of the improvement. The pretest–posttest N-Gain score of 0.5010 and the observational N-Gain of 0.3300 both fall into the moderate category. These results are consistent with the significant t-test. The t-test was used to determine the presence of statistically significant differences, while N-Gain describes the magnitude of the improvement relative to the maximum score that can be achieved. Thus, a change in learning engagement was evident, but the rate of improvement was not yet optimal and was not consistent across all indicators.

The main intervention, which took place over three sessions, should also be taken into account when interpreting the study results. Although this duration produced significant differences, it may not have been sufficient to establish stable, active habits. Behaviors such as asking questions, seeking information independently, practicing problem-solving, assessing understanding, and applying information require repeated learning experiences. Saputro & Radia (2023) It also shows an increase in student engagement and learning achievement from the initial stage through to the next cycle.

Based on the indicators, a fairly significant improvement was observed in activities such as carrying out learning tasks, engaging in problem-solving, asking questions, discussing, and assessing one's own abilities. This improvement in the indicators is directly related to the Jigsaw structure, which assigns tasks and responsibilities to each student. Students need to study their assigned section of the material because they will have to explain it back to their home group. The need to present the material leads students to read more carefully, take notes, ask questions, and check their understanding.

The information-seeking indicator yielded an N-Gain observation score of 0.00. Although the instrument score increased, information-seeking behavior did not show any significant changes during the observation period. Students still largely relied on sources provided by the teacher and were not yet accustomed to identifying and seeking out other sources independently. These findings suggest that future lessons should provide a wider variety of sources, such as atlases, maps, information cards, IPAS books, and short readings. Each student can also be assigned different information-searching tasks so that their independence in information seeking can be observed.

The indicator for practicing problem-solving achieved an observed N-Gain of 0.13, while the indicator for applying information achieved an N-Gain of 0.29. Both indicators remain in the low category. Learning activities are primarily focused on discussions, information exchange, and the presentation of material, so time for individual practice and the application of concepts in new contexts remains limited. The understanding gained through group discussions needs to be followed up with individual practice so that students can solve problems without relying on group members.

Teachers can reinforce both of these indicators by assigning three to five individual questions at the end of the discussion. The questions should be contextual in nature for example, determining the time difference between two regions, identifying the geographical boundaries of an island, or explaining how Indonesia's location affects people's lives. This activity can help students apply the information they gained in small groups to solve problems independently.

The differences in results between the pretest-posttest instruments and the observation sheets highlight the importance of using more than one instrument to measure learning engagement. Pretest–posttest scores reflect changes in achievement based on students' responses to the instruments, whereas observation sheets reveal the behaviors that actually occur during learning. For the indicators of seeking information, practicing problem-solving, and applying learning outcomes, the increase in instrument scores has not been fully accompanied by an increase in observable behaviors.

Overall, the Buzz Group-style discussion-based Jigsaw learning model is able to create a more active, interactive, and collaborative learning experience. This model provides students with the opportunity to study the material in expert groups, explain the material back to their home groups, discuss it in small groups, and take responsibility for the portion of the material they have studied. However, its effectiveness in improving learning remains in the moderate category; therefore,

implementation should be carried out over a longer period, accompanied by a more structured division of roles, varied learning resources, individual practice, and contextual application tasks.

This study used a single class without a control group. Therefore, the results should be interpreted as an increase in student engagement that occurred following the implementation of the Buzz Group-style discussion-based Jigsaw model and is strongly associated with the implementation of that model. The results cannot yet prove that all changes were caused solely by the treatment, as other factors such as students' prior knowledge, motivation, confidence in speaking, and learning experiences also played a role.

4. CONCLUSION

The implementation of the Buzz Group-style discussion-based Jigsaw learning model resulted in a significant increase in student engagement and learning outcomes for 5th-grade Class B students at SD IT Al-Akhyar in their IPAS lessons. This improvement is evidenced by a change in the average score from 44.28 to 71.86 and the results of a paired-samples t-test with a significance level of $p < 0.001$. The N-Gain score for the pretest-posttest was 0.5010, and the N-Gain for learning engagement was 0.3300, indicating that the improvement falls into the moderate category. This learning model provides every student with the opportunity to study the material in expert groups, engage in intensive discussions, re-explain the material to their home groups, and take responsibility for the portion of the material they have learned. The most noticeable improvements were observed in the activities of completing tasks, engaging in problem-solving, asking questions, discussing, and self-assessment. However, the indicators of seeking information, practicing problem-solving, and applying knowledge still require reinforcement. This model should ideally be implemented over a longer period with structured role assignments, the use of more varied learning resources, and the provision of individual practice and contextual assignments. Since the study involved only one class without a control group, the results should be interpreted as improvements that occurred following the implementation of the model and do not yet fully prove a cause-and-effect relationship.

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