SOCIAL SCIENCE REVIEW ARCHIVES

Transforming Classrooms Through Collaboration: Enhancing Engagement and Achievement in Secondary Science Education through Action Research.

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Abstract

This action research investigates the impact of collaborative learning strategies—specifically Think-Pair-Share and Jigsaw—on student engagement and academic performance in secondary science classrooms. Motivated by concerns over low engagement and underachievement due to traditional lecture-based teaching methods, this study explores how shifting to student-centered collaborative approaches can improve behavioral, emotional, and cognitive engagement. The research was conducted with 45 eleventh-grade students over eight weeks using observation checklists, formative assessments, and student feedback. Results revealed significant improvements in participation, critical thinking, communication, and academic performance. Students, including typically passive ones, demonstrated greater motivation, deeper understanding of concepts, and willingness to engage in peer-led learning. The study concludes that collaborative learning not only fosters academic development but also nurtures essential interpersonal skills and classroom inclusivity. It recommends structured collaborative strategies, teacher training, and supportive policies to optimize science education outcomes.

Keywords: Collaborative Learning, Think-Pair-Share, Jigsaw Technique, Action Research, Behavioral Development

1. Introduction

One of the key components of students' academic success and engagement is collaborative learning. Students blame the teaching strategies in science classrooms for their dreary academic performance, per a study by Eniayeju (2010). The lecture style is a popular method in Nigerian science teaching, claims Balogun (2003). This method places more emphasis on memorization and rote learning than it does on providing students with the resources they need to fully understand concepts, ideas, and principles.

Thus, the only way to succeed is to teach science in a way that is focused on the needs of the students. The researchers believe that a collaborative learning strategy could be a helpful means of improving students' cognitive abilities. Collaborative learning is based on the notion that knowledge is a product of society. The traditional lecture or teacher-centered classroom is transformed into a student-centered one through a method called collaborative or active learning. Collaborative learning can occur in large groups or among peers. Peer learning, sometimes referred to as peer instruction, is a type of cooperative learning in which students work in pairs or small groups with an instructor acting as a facilitator to discuss concepts or find solutions. It was developed with the understanding that small-group collaboration and interaction provide practical answers that would not have been feasible to do on one's alone, encouraging the sharing of research for better learning. Collaborative learning fosters a sense of belonging and a secure environment where differing opinions can be valued and discussed. This approach not only enhances cognitive

development but also cultivates critical interpersonal skills like communication, cooperation, and problem-solving, all of which are essential for success in both academic and professional settings. Because they feel free to challenge themselves, ask questions, and take risks without fear of criticism, students who receive both intellectual and emotional support in these environments learn and remember information more thoroughly. Additionally, the social connection that results from collaborative learning strengthens peer relationships by fostering mutual trust and understanding, two attributes that are critical to creating a conducive learning environment.

In other words, studies by (Nkechinyere & Ordu 2018) and Garcia, & Vargas (2021) demonstrated that the use of collaborative learning significantly improves students' academic performance, critical thinking abilities, and overall engagement. As a result, collaborative learning is a great teaching technique that helps students overcome challenges in the real world and enhances their academic performance.

Despite the acknowledged benefits of collaborative learning in raising student engagement, teachers struggle to implement it successfully. While collaborative assignments can significantly increase student engagement, not all students benefit equally from them. For example, there can be significant differences in participation between students since some may decline to actively participate due to personal or cultural reasons. On the other side, teachers find it most difficult to encourage active participation in collaborative learning since they must balance the students' active behaviors. This can occasionally result in boredom or superficial learning.

Additionally, by blurring the lines between involvement, states, and behavioral, emotional, and cognitive engagement, for example, it makes the problem more difficult to understand. By examining the general effects of collaborative learning on student engagement, pinpointing particular issues that could impede its success, and offering solutions to optimize its efficacy, this study fills these gaps. The goal of this research is to provide educators with recommendations on how to use collaborative learning most effectively to boost secondary school students' engagement.

1.1 Research Objective:
Objectives for the study are:
- to investigate how collaborative learning affects students' behavior, emotions, and cognitive engagement and effort in secondary school settings, as well as to identify strategies for boosting their motivation and involvement.
- to investigate how students' academic performance and behavioral engagement are affected by collaborative learning.
- to assess how group work affects motivation and emotional presence.

1.2 Research Questions
i   What impact do cooperative learning strategies like Think-Pair-Share and Jigsaw have on the academic achievement and behavioral engagement of secondary school students?
ii   What effects does collaborative learning have on students' motivation and emotional presence in secondary classrooms?

This study is significant as it addresses a critical challenge in science education—low student engagement and underachievement due to predominantly lecture-based, teacher-centered instruction. By focusing on collaborative learning strategies such as Think-Pair-Share and Jigsaw, the research seeks to shift pedagogical practices towards more student-centered and interactive approaches.

Understanding the impact of collaborative learning on students' behavioral, emotional, and cognitive engagement is essential for designing effective science instruction in secondary schools. This study not only explores how collaborative learning improves academic performance but also investigates its role in enhancing motivation, emotional security, and peer relationships—factors vital for holistic student development.

Furthermore, the study provides valuable insights for science educators by identifying specific strategies that can foster active participation, reduce disengagement, and promote a more inclusive and supportive classroom climate. By highlighting both the potential and the challenges of implementing collaborative learning, this research supports the development of evidence-based practices that can make science education more dynamic, equitable, and effective.

In conclusion, collaborative learning holds transformative potential in redefining science education from passive reception to active participation. While challenges in implementation exist—such as ensuring equitable participation and maintaining meaningful engagement—this study offers a timely contribution by examining these complexities and proposing actionable recommendations. By equipping educators with tools and strategies for collaborative instruction, the research aims to create more engaging, motivating, and student-centered science classrooms that nurture critical thinking, interpersonal skills, and academic success.

2. Literature Review
2.1 Constructivist Learning Theory

Constructivist learning theory holds that knowledge is created by the learner via interaction, experience, and reflection on various facets of reality (Ullah, etal.,2023). The best learning occurs when people are working on worthwhile projects that call for cooperation and active critical thinking. Some of the classroom collaboration techniques are supported by the theory. One is called Jigsaw, and the other is called Think-Pair-Share (TPS) (Asad &Qureshi, 2025). These strategies enable students to incorporate and assimilate new material into their preexisting cognitive structures by encouraging peer engagement and offering discussion opportunities. According to recent research by (Niazi, Iqbal, & Jamil, 2025), these methods work well for raising students' comprehension and attention, particularly in secondary school settings.

For example, TPS enables students to think on their own before discussing their ideas with classmates (Ranjhani, Fatima, & Rashid,2025), which improves their understanding of the material. In a similar vein, the Jigsaw method encourages accountability and reinforces learning by allowing students to become subject matter experts and instruct their classmates. These cooperative methods are crucial for encouraging student participation, critical thinking, and knowledge retention in classroom settings since they are grounded in constructivist concepts (Niazi etal.,2025). In diverse educational environments across a range of subject areas, constructivist principles strongly emphasize the use of collaborative approaches, such as Think-Pair-Share and Jigsaw techniques, to significantly increase pupil participation, foster deeper analytical thinking, and enhance long-term knowledge retention in varied educational settings across various subject areas (Tanner, 2009).

2.2 Cooperative Learning Theory

The theory of cooperative learning emphasizes how organized group interactions help students meet learning goals. This theory is predicated on the notion that learning is a social process in which personal responsibility and constructive interdependence are crucial elements (Chandra, 2015). This principle is put into practice through strategies like Jigsaw and Think-Pair-Share, which allow students to collaborate while yet retaining their distinct contributions. Interpersonal skills, respect for one another, and shared accountability are all promoted via cooperative learning. By creating a positive learning atmosphere, these strategies greatly improve students' reading comprehension and academic achievement, claim Marpaung and Pandjaitan (2019). For instance, Think-Pair-Share enables students to express their ideas and acquire a variety of viewpoints through group conversations (Keshavarzi 2015). By dividing work into digestible pieces that the team can then combine, the Jigsaw method encourages specialization and collaboration. These methods offer organized, adaptable frameworks for achieving social and academic goals since they are consistent with cooperative learning theories. By using these techniques, educators can

establish inclusive classrooms and other varied learning settings that prioritize teamwork and community (Marpaung & Pandjaitan2019). These methods produce varied and dynamic learning settings, such as inclusive classrooms that prioritize a feeling of belonging, cultivate respect for one another, stimulate active cooperation, and support shared accountability for accomplishing group educational goals (Gurk,2016).

2.3 Collaborative Learning in Secondary Education
In secondary education, collaborative learning is the primary focus of modern pedagogy. It comprises educating pupils on common achievement objectives, frequently through organized methods that promote collaboration and involvement for reciprocal engagement throughout exercises (Ranjani etal.,2025) In comparison to other academic outcomes, numerous research conducted over many years of collaborative tactics using the Think-Pair-Share, Jigsaw methodology showed that students were more satisfied and achieved superior scholarly outcomes. According to Rashid and Khan (2023), these methods not only increase comprehension but also inspire students and offer them a sense of community. For example, through group activities, students can explore other viewpoints, generate and refine their ideas, and build on each other's strengths to create an engaging and approachable learning environment. Furthermore, because students are obligated to actively contribute to the group's success, collaborative learning fosters accountability and responsibility (Khan etal.,2023). Because of these advantages, collaborative learning is especially successful in secondary education, helping students acquire social and cognitive skills that will be useful in their future academic and professional endeavors. To guarantee that every student is completely involved and getting something out of the experience, though, meticulous preparation, clear goals, and ongoing evaluation are necessary. These advantages work best in secondary school, where students not only strengthen their social and cognitive skills but also acquire the critical thinking and perspective-navigating skills necessary for their future academic and professional pursuits (Tolmie et al., 2010; Pang et al., 2018; Slavin, 1983). By promoting active engagement, collaborative learning exercises help students apply abstract ideas to practical contexts, which enhances their comprehension Lu etal.,2021; Fantuzzo et al., 1992). However, meticulous preparation, specific goals, and a well-organized framework are necessary for successful implementation in order to guarantee fair participation (Zhang etal.,2021 Latorre-Cosculluela etal.,2021). Furthermore, ongoing evaluation and feedback systems are essential for tracking advancement, spotting obstacles, and improving tactics to successfully address a range of learning requirements (Khan etal.,2023).

2.31 Think-Pair-Share Strategy
The Think-Pair-Share (TPS) framework was introduced by Lyman in 1981. It is a collaborative learning method in which students first think through the issues independently before coming up with answers. Then, in couples, they present their responses. Students finally submit their responses to the class as a whole after the pair talks (Ningrum, & Rahmadanti, 2025). This kind of classroom activity fosters an engaging learning environment by encouraging students to interact with the lecturer and one another. Furthermore, it encourages involvement from all students, including the more reserved ones who are less likely to speak up in class unless asked to do so. Studies using this paradigm have shown increased student engagement and better learning outcomes (Sya'diyah & Mulyani, 2025).
One of the most popular collaborative learning strategies that promote critical thinking, and active engagement is Think-Pair-Share. Reflect (Think), talk (Pair), and share (Share) are their three main stages. By breaking the act down into discrete steps, TPS creates a space where students can gradually communicate their ideas. According to (Mardiah,2025), TPS considerably increased reading comprehension among Nigerian secondary school pupils, suggesting that the method works well for encouraging involvement and comprehension. The method's methodical approach

aids pupils in learning from one another, organizing their ideas and developing confidence (Switri etal.,2025). Additionally, TPS promotes diversity by giving students who are more reserved or insecure the opportunity to participate in smaller, less daunting settings prior to presenting to the larger group. TPS is adaptable enough to be used in a variety of topic areas and class sizes (Wijaya, 2025). Students will benefit much from TPS, which will raise their grade level and develop their collaborative, communicative, and thinking skills, provided that the criteria are clearly stated, appropriate facilitation is used, and adequate time is allotted for each phase. Because of its adaptability, it may be used in a variety of subjects and class sizes as long as the needs are specified precisely, the right facilitation is supplied, and enough time is allotted for each phase (Septy etal.,2025). Students' grades, teamwork, and critical thinking skills all improve with this method.

2.3.2 Jigsaw Technique

The Jigsaw Method is a collaborative learning approach that emphasizes active participation, teamwork, and accountability (Banaruee et al., 2025). It requires students to become "experts" on a subject so they can subsequently instruct their peers, with the hope that they will impart their knowledge to one another. Building interdependence and improving pupils' understanding of difficult subjects are two areas in which the Jigsaw approach excels. In their comparison of the Jigsaw technique and TPS (Karadeniz, & Doymuş,2025) showed that both methods significantly improved students' reading comprehension. By promoting leadership and communication and removing conflict, the former method not only strengthens subject matter but also cultivates essential soft abilities by encouraging effective communication, leadership and eliminating disagreement (Vives etal.,2025). By breaking up activities into smaller parts, it gives pupils a cognitive breakdown of the work and allows them to concentrate on mastering a few key areas. Teaching peers improves learning as well; at the same time, it boosts confidence. However, rigorous preparation, unambiguous goals, and constant observation guarantee equal participation and accountability among groups when incorporating the Jigsaw technique into the classroom. A classroom can become a collaborative learning community when the Jigsaw technique is used effectively. According to (Koçak 2025), cooperative learning necessitates extensive planning, a precise set of expectations, and ongoing oversight to guarantee that participants are treated equally and held responsible. In fact, according to Marpaung and Pandjaitan (2019), cooperative learning techniques greatly boost student involvement, especially in courses involving libraries and research, where teamwork fosters critical thinking and engagement. The study underlined how crucial it is to create an atmosphere that promotes learners' active engagement so they may successfully exchange ideas and viewpoints.

Research on the use of collaborative learning strategies in various educational environments is lacking, despite the fact that these tactics have been extensively investigated. The majority of current research focuses on certain geographic areas or student demographics, which restricts how broadly the results may be applied. To give a more thorough picture of their effects, future studies should look into how well Think-Pair-Share and Jigsaw approaches work in various institutional and cultural contexts. Future research should examine TPS and Jigsaw techniques in a range of institutional and cultural contexts (Alhabeedi, 2015).

Training teachers, classroom management, and providing sufficient resources for the implementation of collaborative learning methodologies are all real obstacles. Teachers may cite resistance as a justification to oppose new teaching methods, even when students are against them. All of these issues must be resolved by professional training programs that are specifically created and backed by institutions to make curriculum implementation easier. To solve these problems and successfully integrate these strategies into classes, professional development programs and institutional support are required (Lu etal.,2025).

3. Research Methodology

Action research is used in this study, and the researcher has been using collaborative tactics in the classroom for roughly two months. Action research blurs the line between research and social action by seeing information as a source of power (Neuman 2014, p. 42). Action research is a practice-oriented methodology that aims to enhance social action, according to (Saifuddin, & Mohammad ,2024) Action research is frequently utilized in education to solve issues that teachers, counsellors, and administrators confront in their classroom practices (Bäckstrand etal.,2025). Better procedures and solutions may result from it.

3.1 Sampling Techniques

In order to select participants who could provide rich, diverse, and helpful data pertaining to the study's objectives, purposeful sampling was employed in this action research project. Purposive sampling is a non-probability sampling technique in which the researcher specifically selects participants or groups based on specific characteristics or properties that suit the study's objective. It is also known as judgmental or selective sampling. This approach ensures that the sample is information-rich and closely relevant to the subject under study.

Two sets of eleventh-grade students were specifically selected, and a total of 45 participants, 17 boys and 28 girls, all between the ages of 15 and 16 were involved. These categories were purposely chosen so that both males and females of the specified age range were included, which allowed an in-depth study of the use of cooperative learning strategies in a group representing both the sexes.

3.2 Instrument Development

In this study, observation checklists, students feedback and formative assessments were used to assess student involvement and learning outcomes immediately after incorporating group activities.

3.21 Observation Checklist

As students participated in group work activities, their group work behavior was captured and recorded by means of an observation checklist. This technique paid close attention to such important variables as role assignment, effective communication, productive participation and active collaboration in solving the issue. These behaviors were observed and recorded, which helps in understanding how individual members and groups interact with each other. This is in line with some educational materials that teach having clean methodical small group projects which allow group processes to be observed. The following observation checklist is used to assess students' involvement, understanding and active participation during learning events.

Table 3.1

Observation sheet for Jigsaw:

Criteria	Observed Behaviors
Expert Group Work	Engage actively in learning their assigned topic.
	Works with peers to present key points
	Demonstrates an understanding of the assigned material.
	Prepares to share with others (uses examples, diagrams etc)
Teaching in Jigsaw Groups	Clearly presents their portion to peers
	Responds to questions and clears doubts.

	Using visual aids or examples for better understanding
Learning from Peers	Attentively listens to other members of group
	Asks relevant and insightful questions
	record the information
Class Discussion	Engage with the class discussion
	Brings new insights or relates ideas

Criterion	Indicators/Description	Rating (%)	Comments
Understanding of topic	Demonstrate deep understanding of topic with accurate explanation.		
Participation	Engages consistently		
Clarity of communication	Use appropriate terminology and explain concepts clearly.		
Collaboration	Actively listens; adopts others' ideas for presentations		
Creative thinking	Produces new solutions or problem-solving techniques.		

Criteria	Observed behavior	Feedback			
		(90-100%)	(70-89%)	(50-69%)	(less than 50%)
Individual thinking	Students read the material without taking notes				
	Students read material while taking notes				
	Demonstrate good understanding				
	Link the previous knowledge with the activity				
Pair discussion	Listen to partner attentively				
	Present pertinent thoughts and examples				
	Pose appropriate questions for clarity				
	Co-operate in achieving a common point or new insight				
Class sharing	Participates in the class discussion through effective articulation				
	Develop the points or even raise new questions				

Table 3.2
Observation sheet for Think Pair and Share

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3.2.2 Formative assessments:

To evaluate the students' understanding and retention of the subject matter, formative assessments were given. The formative assessment consisted of group presentations and was intended to provide teachers and students with immediate feedback. The use of formative assessments is supported by educational research, which emphasizes how important they are for improving student learning and shaping instructional strategies. The following rubric is used to evaluate the group presentation.

Table 3.3
Rubric for Presentation

criteria	excellent	good	Fair	Needs improvement
Understanding				
Presentation				
Eye contact				
Body language				
confidence				
Students' engagement				
Integration of Real -life examples				

3.2.3 Students' feedback

A student feedback form was used to evaluate how well collaborative learning tactics worked. The purpose of this form was to collect students' opinions regarding their participation, comprehension, and general experience during group projects. The input that was gathered helped identify possible areas for instructional improvement and offered insightful information about how collaborative learning affects student results.

By putting these tools into practice, it became possible to assess collaborative learning activities in real time and provide prompt assistance and interventions to enhance learning results.

3.3 Plan of Action Research

Data will be gathered over the course of eight weeks in order to evaluate the effect of collaborative learning practices on the academic performance and engagement of eleventh-grade students. Jigsaw and Think-Pair-Share are two examples of cooperative activities that will be incorporated into the intervention phase. To evaluate immediate learning outcomes, formative evaluations will be given after each session. During group activities, structured observation checklists will be used to track behavioral indicators of involvement and cooperation. After every activity, students will also fill out feedback questionnaires to express how they feel about the collaborative learning experience. Student presentations will be used as formative evaluations in place of summative exams, and they will be assessed using a predetermined criterion to assess comprehension, involvement, and engagement.

4.Data Analysis and Findings

This chapter presents the data analysis and results of the study on using collaborative learning strategies in senior classrooms. A thematic analysis was conducted on the outcomes of the activity based on teacher's observation, students' feedback and formative assessment.

Table 4.1
Demographic Table

Class/section	Boys	Girls	Total
XI-A	9	13	22
XI-D	8	15	23

4.1 Overall analysis and findings
4.11 jigsaw activity Observation

Criteria	Observed Behaviors	Comment /Notes	%
Expert Group Work	Engage actively in learning their assigned topic.	All of them	100%
	Works with peers to present key points	All of them	100%
	Demonstrates an understanding of the assigned material.	Most of them	70%
	Prepares to share with other (uses examples, diagrams etc)	most of them	50%
Teaching in Jigsaw Groups	Clearly presents their portion to peers	Most of them	70%
	Responds to questions and clears doubts.	Most of them	70%
	Using visual aids or examples for better understanding	Some how	50%
Learning from Peers	Attentively listens to other members of group	Except for few	98%
	Asks relevant and insightful questions	rare	50%
	record the information	few	60%
Class Discussion	Engage with the class discussion	Mostly	100%
	Brings new insights or relates ideas	rare	50%

Criterion	Indicators/Description	Rating(%)	Comments
Understanding of topic	Demonstrate deep understanding of topic with accurate explanation.	70%	Depends on the clarity of concept
Participation	Engages consistently	100%	
Clarity of communication	Use appropriate terminology and explain concepts clearly.	50%	Some students have more cognitive

				abilities to generate ideas.
Collaboration	Actively listens; adopts others' ideas for presentations	70%		Same as above
Creative thinking	Produces new solutions or problem-solving techniques.	50%		Some students display more creative and critical thinking skill

4.12 Observation sheet for Think-Pair –share Activity

Criteria	Observed behavior	Feedback			
		(90-100%)	(70-89%)	(50-69%)	(less than 50%)
Individual thinking	Students read the material without taking notes	100%			
	Students read material while taking notes		70%		
	Demonstrate good understanding			65%	
	Link the previous knowledge with the activity		70%		
Pair discussion	Listen to partner attentively		100%		
	Present pertinent thoughts and examples		70%		
	Pose appropriate questions for clarity		70%		
	Co-operate in achieving a common point or new insight		70%		
Class sharing	Participates in the class discussion through effective articulation		70%		
	Develop the points or even raise new questions		50%		

4.2 Findings of the Study
4.21 Behavioral Development
Students' behavior significantly improved as a result of the exercises. Every participant (100%) shown a great sense of accountability and dedication to the learning process by actively engaging with the topics they were given, even students who are typically reluctant to participate have done so. The majority (70%) successfully summed up the main ideas, demonstrating their ability to convey information succinctly and clearly. Additionally, 70% of the students contributed pertinent to the discussions, demonstrating their capacity for teamwork and openness to considering alternative viewpoints. It's interesting to note that 98% of them paid close attention while speaking, and 60% of them respected and effectively communicated with others by incorporating their thoughts into the conversation.

4.2.2 Academic Progress

Notable academic progress was made as a result of the collaborative learning techniques used. A sizable percentage of students (70%) demonstrated critical thinking and strong involvement by asking insightful questions to elucidate or elaborate on concepts. In order to demonstrate their inventiveness and knowledge application, half of the participants (50%) presented novel concepts and ways to solve problem. Furthermore, 50% demonstrated a thorough understanding of the subject matter and proficient communication skills by using the appropriate vocabulary and providing clear explanations of concepts. Notably, during teacher-centered sessions, students who had not previously participated in class discussions started to try to participate, suggesting a favorable change in the dynamics of the classroom.

4.2.3 Student Engagement:

Student involvement has increased as a result of the use of cooperative learning activities. Every student (100%) demonstrated complete involvement by actively participating in the study of the subjects they were given. Most (70%) did a good job of summarizing the main ideas, indicating that they understood and were interested in the content. Additionally, 70% actively participated in debates, expressing insightful opinions and demonstrating a thorough understanding of the subject matter. The high percentage of active listening (70%) further demonstrates how deeply engaged the students were, as they valued and expanded upon their peers' comments in addition to sharing their own opinions.

4.2.4 Analysis of Formative Assessment

An efficient method for assessing student involvement, academic achievement, and behavioral development was the use of formative assessment in the form of a presentation, which was based on well-defined rubrics. Students were able to comprehend expectations and the evaluation process by being given judgement criteria in advance. Given that they knew they were being evaluated on particular performance metrics, this openness probably inspired them to work harder.

Students benefited greatly from the mixed ability grouping because it enabled them to collaborate with peers who had varying degrees of subject mastery. Students were able to teach and learn from one another in addition to exchanging ideas because to this peer engagement. Even pupils who had trouble with the material at first demonstrated significant progress as a result. Every student was pushed beyond their own limit by this team effort, which resulted in observable academic improvement.

Over the course of the exercise, student participation increased dramatically. Since everyone in the group had to participate, even the most reluctant students were motivated to get involved. This method most likely created a safe space where students felt more at ease expressing their ideas, which improved their body language. Numerous pupils were clearly more self-assured and eager to participate, indicating that the activity was crucial in encouraging constructive behavioral improvements.

Furthermore, several students showed a deeper degree of understanding by including examples from real-world situations. Students demonstrate that they are not just taking in the material but are also capable of applying it in a meaningful way when they relate theoretical knowledge to real-world situations. Because students apply the subject to their own lives and environments, this method shows a better degree of knowledge.

Conclusion and Recommendation

The overall analysis demonstrates how collaborative learning strategies that prioritize student-centered learning over teacher-centered approaches significantly improve behavioral development, academic advancement, and student engagement. The impact of collaborative

learning was successfully measured through the use of well-guided presentations as a formative assessment technique.

Even hesitant participants actively participated, and students showed enhanced accountability, responsibility, and teamwork. A more inclusive learning environment was promoted via enhanced communication and attentive listening. Students demonstrated critical thinking, asked perceptive questions, and successfully utilized their topic knowledge in the classroom. Peer learning was promoted by mixed-ability groups, which pushed all students above their comfort zones while assisting difficult kids in improving. There was a good change in classroom involvement as previously passive students became more engaged.

All students were actively participating in conversations, summarizing important ideas, and exhibiting comprehension, indicating an improvement in student involvement. Learning was strengthened and concepts were more applicable through the use of real-world experiences. All things considered, effective collaborative learning techniques improved classroom dynamics, conceptual understanding, and student motivation.

To encourage student-centered learning, educators should use collaborative learning techniques like well-guided instruction. Teamwork, critical thinking, and engagement can all be improved by using mixed-ability groups and clear rubrics. A more dynamic and inclusive learning environment will be created by promoting active engagement, integrating real-world applications, and regularly modifying instructional strategies in response to student input.

To strengthen learning, parents should support a growth mentality, foster teamwork at home, and stay in constant contact with teachers. Students' confidence can be increased by fostering a supportive learning atmosphere that encourages dialogue and teamwork. Children will be much more inspired to participate fully in their education if their behavioral and academic achievements are acknowledged and celebrated.

Policymakers should guarantee access to contemporary educational materials, train teachers in collaborative learning, and support student-centered curricula. Assessment frameworks must gauge students' abilities in problem-solving and collaboration in addition to their academic achievement. In addition to promoting student achievement, strengthening parent-teacher collaboration policies will make the educational system more efficient.

References:

- Asad, M. M., & Qureshi, A. (2025). Impact of technology-based collaborative learning on students' competency-based education: insights from the higher education institution of Pakistan. Higher Education, Skills and Work-Based Learning.
- Bäckstrand, J., Fredriksson, A., & Halldórsson, Á. (2025). Middle-range theorising supporting and supported by action research: focusing on practitioner preparedness. Production Planning & Control, 36(2), 222-235.
- Banaruee, H., Farsani, D., & Khatin-Zadeh, O. (2025, May). Empowering teacher education with jigsaw techniques: insights from language learners' listening tasks. In Frontiers in Education (Vol. 10, p. 1503888). Frontiers Media SA.
- Chandra, R. (2015). Collaborative Learning for Educational Achievement. IOSR
- Eniayeju, A. A. (2010). Effects of cooperative learning strategy on the achievement of primary six boys and girls in mathematics. ABACUS. The Journal of Mathematics Association of Nigeria, 35(1), 1-9.'
- Fantuzzo, J. W., King, J. A., & Heller, L. R. (1992). Effects of reciprocal peer tutoring on mathematics and school adjustment: A component analysis. Journal of educational psychology, 84(3), 331.
- Garcia, H., & Vargas, D. (2021). Collaborative Learning Activities and Academic Performance of Grade 8 in Values Education. Available at SSRN 3837916.

- Gurk, N. K. (2016). The Effect of Cooperative Learning Techniques on Intermediate Iranian EFL Learners' Reading Comprehension And Reading Strategies. Journal of Studies in Education.
- Karadeniz, Y., & Doymuş, K. (2025). Effect of Cooperative Jigsaw II and Subject Jigsaw Techniques on Learning in Science Class. Hurrian Education, 6(1), 1-18.
- Keshavarzi, A. (2015). The Effect of Cooperative Learning on Reading Comprehension and Reading Anxiety of Pre-University Student.
- Khan, A. B., Ramanair, J., & Rethinasamy, S. (2023). Perceptions of Pakistani undergraduates and teachers of collaborative learning approaches in learning English. Journal of Applied Learning and Teaching, 6(1), 180-197.
- Koçak, D. (2025). Effect of the Jigsaw Technique on Achievement and Attitude in Teaching Statistics to Nursing Students: An Experimental Study. Nurse Educator, 50(4), E207-E212.
- Latorre-Cosculluela, C., Sierra-Sánchez, V., & Vázquez-Toledo, S. (2025). Gamification, collaborative learning and transversal competences: analysis of academic performance and students' perceptions. Smart Learning Environments, 12(1), 2.
- Lu, K., Pang, F., & Shadiev, R. (2021). Understanding the mediating effect of learning approach between learning factors and higher order thinking skills in collaborative inquiry-based learning. Educational Technology Research and Development, 69(5), 2475-2492.
- Mardiah, A. (2025). Efektivitas Model Pembelajaran Problem Posing Setting Think Pair Share pada Materi Bangun Ruang Sisi Datar terhadap Kemampuan Berpikir Kritis dan Kepercayaan Diri. Indo-MathEdu Intellectuals Journal, 6(1), 981-987.
- Marpaung, G. D. B., & Pandjaitan, N. B. (2019). A Comparative Study Between TPS (Think-Pair-Share) And Jigsaw Techniques to Enhance Students' Reading Comprehension Ability. Acuity: Journal of English Language Pedagogy, Literature and Culture, 4(1), 10-22.
- Niazi, S., Iqbal, S., & Jamil, M. (2025). Influence of teacher-student interaction on learning behavior at secondary level in Karachi Pakistan. Journal of Political Stability Archive, 3(2), 256-271.
- Nkechinyere, O. M., & Ordu, O. K. (2018). Impact of collaborative learning strategy on the academic achievement of senior secondary school chemistry students in Obio-Akpor Local Government Area. International Journal of Education and Evaluation, 4(2), 11-18.
- Neuman, W. L. (2014). Social Research Methods: Qualitative and Quantitative Approaches: Pearson New International Edition. Harlow Pearson Education Limited.
- Ningrum, F. V., & Rahmadanti, W. (2025). Pengaruh Model Think Pair Share (TPS) Terhadap Kemampuan Berpikir Kritis Materi Statistika. Eksponen, 15(1), 1-8.
- Pang, C., Lau, J., Seah, C. P., Cheong, L., & Low, A. (2018). Socially challenged collaborative learning of secondary school students in Singapore. Education Sciences, 8(1), 24.
- Ranjhani, I., Fatima, N., & Rashid, F. (2025). ESL GAME-BASED LEARNING IN PUBLIC SCHOOLS AT THE PRIMARY LEVEL IN PAKISTAN. Journal of Applied Linguistics and TESOL (JALT), 8(1), 15-27.
- RASHID, R., & KHAN, M. A. (2023). Teaching secondary school students' social science by integrating Fishbowl, Think Pair Share and Jigsaw learning strategies: An experimental study. Mazedan International Journal of Social Science and Humanities, 4(1), 1-4.
- Saifuddin, T., & Mohammad, R. F. (2024). Collaborative Action Research: An Approach to Develop School Based Community of Practice. Spry Contemporary Educational Practices, 3(1).
- Septy, A. P., Angelina, Y., & Adzanil, F. N. (2025). Students' Collaborative Learning Strategy of Think-Pair-Share toward Writing Skill Improvement:(A Study at SMKN 3 Payakumbuh Vocational High School of Fashion Department). Journal of Education and Culture, 5(1), 9-20.

- Slavin, R. E. (1983). When does cooperative learning increase student achievement? Psychological bulletin, 94(3), 429.
- Switri, E., Safrina, S., Gofur, A., & Apriyanti, A. (2025). Teknik Think, Pair, and Share dalam Pembelajaran PAI. AKM: Aksi Kepada Masyarakat, 5(2), 863-870.
- Sya'diyah, H., & Mulyani, P. K. (2025). The Effect of the Think Pair Share for Elementary School Students in Learning Changes in Matter. Jurnal Penelitian Pendidikan IPA, 11(1), 473-481.
- Tanner, C. K. (2009). Effects of school design on student outcomes. Journal of Educational Administration, 47(3), 381-399.
- Tolmie, A. K., Topping, K. J., Christie, D., Donaldson, C., Howe, C., Jessiman, E., ... & Thurston, A. (2010). Social effects of collaborative learning in primary schools. Learning and instruction, 20(3), 177-191.
- Ullah, S., Khatoon, M., Abbas, M. M., Chaudhery, F. R., Kaleem, M. F., & Akhtar, M. (2023). Effect of Collaborative Learning on Elementary School Students' Academic Achievement in Science. Journal of Hunan University Natural Sciences, 50(10).
- Vives, E., Poletti, C., Robert, A., Butera, F., Huguet, P., ProFAN Consortium, & Régner, I. (2025). Learning with jigsaw: A systematic review gathering all the pieces of the puzzle more than 40 years later. Review of Educational Research, 95(3), 339-384.
- Wijaya, K. F. (2025). AN INTERNALIZATION OF THINK-PAIR-SHARE STRATEGY TO ELEVATE INDONESIAN EFL LEARNERS' SPEAKING SKILLS. ELTR Journal, 9(1), 42-54.
- Zhang, J., & Pang, N. S. K. (2016). Exploring the characteristics of professional learning communities in China: A mixed-method study. The Asia-Pacific Education Researcher, 25, 11-21.