

# The Power of Collaborative Learning: How Peer Interaction Improves Student Learning Outcomes?

Aswadi Jaya<sup>1</sup>, Rudi Hartono<sup>2\*</sup>, Sri Wahyuni<sup>3</sup>, Henrikus Joko Yulianto<sup>4</sup>

<sup>1,2,3,4</sup>Universitas Negeri Semarang, Indonesia

\*Corresponding author: [rudi.hartono@mail.unnes.ac.id](mailto:rudi.hartono@mail.unnes.ac.id)

## Abstrak

Penelitian ini menguji dampak pembelajaran kolaboratif dengan interaksi teman sebaya terhadap hasil belajar siswa. Desain kuasi-eksperimental digunakan, melibatkan 35 siswa yang berpartisipasi dalam pretest dan posttest. Hasil penelitian menunjukkan peningkatan yang signifikan dalam kinerja akademik siswa, dengan nilai rata-rata meningkat dari 66,02 menjadi 79,48. Uji Paired Samples T-test mengkonfirmasi signifikansi statistik dari peningkatan ini ( $p = 0,000$ ). Data kualitatif dari wawancara siswa mengungkapkan bahwa interaksi teman sebaya meningkatkan pemahaman, motivasi, dan kepercayaan diri dalam belajar. Siswa merasa lebih terlibat dalam diskusi, merasa lebih mudah memahami konsep melalui penjelasan teman sebaya, dan mengembangkan keterampilan komunikasi yang lebih baik. Penelitian ini menyoroti efektivitas pembelajaran kolaboratif dalam meningkatkan kinerja akademik dan keterampilan sosial. Penelitian ini menunjukkan bahwa interaksi teman sebaya yang terstruktur harus dimasukkan ke dalam strategi pengajaran untuk memaksimalkan keterlibatan dan pemahaman siswa. Penelitian di masa depan dapat mengeksplorasi dampak jangka panjang dari pembelajaran kolaboratif dan penerapannya dalam berbagai mata pelajaran dan tingkat pendidikan. Mengintegrasikan teknologi ke dalam lingkungan pembelajaran teman sebaya juga dapat meningkatkan efektivitasnya. Secara keseluruhan, penelitian ini memperkuat pentingnya pendekatan pembelajaran interaktif dalam pendidikan modern.

**Kata kunci:** Pembelajaran Kolaboratif, Interaksi Teman Sebaya, Hasil Belajar.

## Abstract

*This study examines the impact of collaborative learning with peer interaction on student learning outcomes. A quasi-experimental design was used, involving 35 students who participated in a pretest and posttest. The results showed a significant improvement in students' academic performance, with the average score increasing from 66.02 to 79.48. A Paired Samples T-test confirmed the statistical significance of this increase ( $p = 0.000$ ). Qualitative data from student interviews revealed that peer interaction enhanced understanding, motivation, and confidence in learning. Students felt more engaged in discussions, found it easier to grasp concepts through peer explanations, and developed better communication skills. The study highlights the effectiveness of collaborative learning in improving both academic performance and social skills. It suggests that structured peer interaction should be incorporated into teaching strategies to maximize student engagement and comprehension. Future research could explore the long-term impact of collaborative learning and its application in different subjects and educational levels. Integrating technology into peer learning environments may also enhance its effectiveness. Overall, this study reinforces the importance of interactive learning approaches in modern education.*

**Keywords:** Collaborative Learning, Peer Interaction, Learning Outcomes

## 1. INTRODUCTION

In recent decades, education systems worldwide have witnessed a significant shift in pedagogical strategies, emphasizing the need for students to not only acquire knowledge but to engage in meaningful interactions that foster deep learning. Collaborative learning, a method in which students work together to solve problems and discuss ideas, has emerged as a powerful approach that enhances students' academic achievements and prepares them for

### History:

Received : 1 Januari 2025

Revised : 3 Januari 2025

Accepted : 6 Januari 2025

Published : 10 Januari 2025

**Publisher:** Horizon Edukasi Prima Indonesia

**Licensed:** This work is licensed under a Creative Commons Attribution 4.0 License



the challenges of the 21st century. According to a study by [Johnson & Johnson \(2019\)](#), [Almira \(2016\)](#), [Slavin \(2009\)](#) and [Namaziandost et al. \(2020\)](#), cooperative learning approaches have been proven to improve students' interpersonal skills, critical thinking, and academic performance. In today's increasingly globalized and interconnected world, the ability to collaborate effectively is not just an academic skill but a vital life skill that students must develop for future success.

The importance of collaborative learning can be traced to its alignment with the demands of modern education. As educational environments evolve, there is a growing recognition of the limitations of traditional, lecture-based teaching methods. Educators have begun to acknowledge that students' engagement in peer interactions can lead to more meaningful and lasting learning experiences ([Cortázar et al., 2021](#); [Ares, 2010](#); [Lawson, 2024](#); [Huseynli, 2024](#); [Karabuga, F, Kaya, 2013](#)). [Vygotsky \(1978\)](#), [Lantolf \(2000\)](#), [Lantolf et al. \(2014\)](#), sociocultural theory emphasizes the role of social interaction in cognitive development, underscoring the value of peer learning. This shift is also reflected in the rise of student-centered learning approaches, which focus on collaboration, communication, and critical thinking. According to a report by the [OECD \(2020\)](#), countries that invest in collaborative learning strategies tend to see improvements in student motivation and long-term academic outcomes.

However, despite the growing body of research supporting collaborative learning, the effective implementation of peer interaction in classrooms remains a challenge. One of the primary issues is the lack of structured guidance and training for teachers on how to facilitate productive group work. Additionally, some students may struggle with interpersonal dynamics, such as conflicts or unequal participation, which can hinder the potential benefits of collaborative learning. As a result, the academic community continues to explore how best to integrate peer interaction into educational settings to maximize its positive impact.

The aim of this research is to explore how peer interaction within collaborative learning environments influences students' academic performance, social skills, and overall learning experience. Specifically, the study seeks to identify the key factors that contribute to the success or failure of collaborative learning strategies and offer recommendations for improving their implementation in classrooms. By examining recent studies and drawing insights from educators, the research aims to contribute to a more comprehensive understanding of how peer interactions can transform educational practices.

Recent research supports the positive effects of collaborative learning, suggesting that students who engage in peer discussions and group problem-solving develop stronger critical thinking skills, greater motivation, and a deeper understanding of the subject matter ([Boud et al., 2014](#); [Chen et al., 2022](#)). Furthermore, a study by [Williams & Priya \(2016\)](#), [Topping \(2009\)](#), [Jaya et al. \(2023\)](#) and [Tsan et al. \(2023\)](#) demonstrated that peer-assisted learning not only improves academic outcomes but also enhances social cohesion and communication skills among students. As educators continue to embrace collaborative learning as a core component of educational practices, understanding the mechanisms behind effective peer interaction is crucial to ensuring its success.

## 2. METHOD

The research aims to explore the influence of peer interaction within collaborative learning environments on students' academic performance, social skills, and overall learning experience. To achieve this, the study will adopt a mixed-methods approach, integrating both quantitative and qualitative data to offer a comprehensive understanding of the subject (Fraenkel et al., 2014; Creswell & Creswell, 2017). This methodological framework will allow for a holistic analysis of the factors influencing the effectiveness of peer interaction in educational settings. The following sections outline the design, participants, data collection techniques, and data analysis procedures.

### 2.1 Research Design

This study will employ a quasi-experimental design combined with qualitative case study methods. The quasi-experimental approach will allow for the investigation of causal relationships between peer interaction and academic outcomes, while the qualitative case study will provide deeper insights into students' perceptions, experiences, and social dynamics in collaborative learning environments. The design will be implemented in two phases: the first phase will focus on the collection of quantitative data, while the second phase will involve qualitative analysis.

### 2.2 Participants

The participants consisted of XI grade students of SMA 1 PGRI Palembang, 35 students in total. Furthermore, in sampling the authors used Purposive sampling technique. Purposive sampling is a sampling technique based on certain considerations designed to obtain samples with the properties or characteristics needed or required for research.

### 2.3 Data Collection Technique

Data will be collected through two approaches. For quantitative data, pre-test and post-test will be used to measure changes in students' academic performance, as well as self-administered questionnaires to assess improvements in communication, teamwork, and problem-solving skills. For qualitative data, semi-structured interviews will be conducted with students from both groups, as well as observations during group activities to identify patterns of interaction and collaboration.

### 2.4 Data Analysis Technique

- a. Quantitative Analysis: The quantitative data will be analyzed using statistical methods. A paired sample t-test will compare pre- and post-test scores within both the experimental and control groups to assess the impact of collaborative learning on academic performance. Descriptive statistics (mean, standard deviation) will summarize the overall performance of both groups.
- b. Qualitative Analysis: For qualitative data, thematic analysis will be used to identify common themes and patterns in the interview responses. This will involve categorizing responses into themes and interpreting them within the context of collaborative learning. Additionally, observational notes will be analyzed to identify recurring behaviors, such as communication patterns, conflict resolution strategies, and participation levels.

## 3. RESULT AND DISCUSSION

### Result

#### 3.1 The Student Learning Outcomes through Collaborative Learning

Based on the data of pretest and posttest scores of 35 students in the table below (table 1), there is an increase in student learning outcomes after collaborative learning is applied. This shows that this method has a positive impact on students' understanding and mastery of the material.

**Table 1. The Result of Pretest and Posttest**

No	Name	Pretest	Post-test
1	Student 1	73	80
2	Student 2	75	88
3	Student 3	71	88
4	Student 4	67	79
5	Student 5	50	59
6	Student 6	56	66
7	Student 7	79	90
8	Student 8	61	70
9	Student 9	65	80
10	Student 10	77	93
11	Student 11	53	67
12	Student 12	69	85
13	Student 13	74	86
14	Student 14	63	78
15	Student 15	55	70
16	Student 16	80	95
17	Student 17	70	85
18	Student 18	66	79
19	Student 19	59	71
20	Student 20	62	75
21	Student 21	68	82
22	Student 22	72	88
23	Student 23	60	73
24	Student 24	64	79
25	Student 25	78	91
26	Student 26	57	72
27	Student 27	55	69
28	Student 28	76	92
29	Student 29	71	85
30	Student 30	58	70
31	Student 31	75	89
32	Student 32	67	80
33	Student 33	52	66
34	Student 34	79	94
35	Student 35	54	68
<b>Mean</b>		<b>66,02</b>	<b>79,48</b>

Based on the pretest and posttest score data from 35 students, there was a significant improvement in learning outcomes after implementing the collaborative learning method. The average pretest score before applying this method was 66.02, while the average posttest score increased to 79.48 after the implementation of collaborative learning. This indicates that students experienced an enhancement in their understanding and mastery of the subject matter through this approach.

Furthermore, none of the students showed a decrease in their posttest scores, meaning that the method had a positive impact on all learners. Students who initially had low pretest scores (e.g., scores ranging from 50–60) also showed considerable improvement in the posttest, with most achieving scores above 70. This suggests that the collaborative learning method effectively supports students with a lower initial understanding in improving their academic performance.

One of the key factors contributing to this improvement is peer interaction during the collaborative learning process. In this method, students not only receive explanations from the teacher but also exchange ideas, explain concepts to one another, and discuss materials in small groups. This process allows students who have a better grasp of the subject to assist their peers, while those who struggle with understanding receive the opportunity to learn more actively and interactively. Peer interaction motivates students to learn, boosts their confidence in expressing their thoughts, and helps them grasp concepts more easily through discussion and problem-solving.

These findings align with Hayati et al. (2023) research, which found that implementing the STAD cooperative learning model improved students' collaboration skills and learning outcomes. In her study, students' collaboration skills increased from 69.10% to 98.57%, and the number of students achieving good scores also rose significantly.

Furthermore, a study by Darmawan & Pujiastuti (2023) confirmed that the collaborative learning model effectively enhances high school students' mathematics learning outcomes. Students who engaged in this model demonstrated better conceptual understanding and higher evaluation scores compared to those who learned individually.

Based on this analysis, it can be concluded that collaborative learning is an effective approach to improving student learning outcomes. Through peer interaction, group discussions, and collective problem-solving, students can build a deeper understanding and significantly enhance their academic performance. This interaction not only benefits cognitive aspects but also fosters social skills, self-confidence, and communication abilities, all of which are crucial for both education and everyday life. To see the exposure of significant results between pretest and posttest student learning outcomes, can be seen in the table below (Table 2 and 3).

Table 2. Descriptive Statistics

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	66,03	35	8,883	1,502
	Posttest	79,49	35	9,590	1,621

Table 3. Paired Sample T-test

Paired Samples Test					
		Paired Differences	t	df	Sig. (2-

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				tailed)
				Lower	Upper			
Pair 1 Pretest - Posttest	-13,457	2,227	,377	-14,222	-12,692	-35,743	34	,000

Paired Samples Test results show a significant difference between pretest and posttest scores after the implementation of collaborative learning. The average score increase was 13.46 points with a t-count value of (-35.743) and Sig. (2-tailed) 0.000, which indicates that this improvement is not a coincidence, but rather a real effect of the applied method.

This finding is in line with [Hayati et al. \(2023\)](#) research, which showed an increase in collaboration skills and student learning outcomes through the STAD model, as well as [Darmawan & Pujiastuti \(2023\)](#) research, which found that collaborative learning improved students' understanding of mathematical concepts. Overall, these results strengthen the evidence that collaborative learning methods are effective in improving students' learning outcomes and skills.

### 3.2 Students' perspectives on Collaborative Learning with Peer Interaction in Improving Student Learning Outcomes

Based on the conducted interviews, the majority of students stated that collaborative learning with peer interaction helped them understand the material better than individual learning. Students felt more comfortable asking questions and discussing with their peers when they encountered difficulties in understanding concepts. One student stated, *"I often get confused when listening to the teacher's explanation, but when discussing with friends, I find it easier to understand"* (Student 1). This indicates that group interaction allows students to receive various perspectives and simpler explanations from their peers, ultimately enhancing their understanding of the material being studied.

In addition, students also revealed that collaborative learning increases their motivation and engagement in the learning process. They tend to be more active in discussions and classroom activities when they feel the learning environment is more interactive. One student shared, *"I feel more excited to learn because the atmosphere is more relaxed, and I can discuss with my friends"* (Student 2). Moreover, this method helps shy students become more confident in expressing their opinions. Another student added, *"I used to be afraid to speak in class, but after frequently engaging in group discussions, I feel more confident"* (Student 3). This shows that collaborative learning not only positively impacts academic achievement but also contributes to the development of students' social skills.

These interview findings align with the study [Qureshi et al. \(2023\)](#), which highlights that peer interaction in collaborative learning enhances students' comprehension, engagement, and communication skills. The research found that students who actively participate in group discussions achieve higher learning outcomes compared to those who study individually. Additionally, factors such as social support from peers and a more interactive learning environment significantly contribute to students' academic success. Therefore, it can be concluded that collaborative learning with peer interaction is an effective strategy for improving learning outcomes, motivation, and social skills among students.

In addition, according to [Er et al. \(2021\)](#) this study emphasizes that peer interaction and feedback promote deeper understanding, critical thinking, and academic success. The dialogic peer feedback approach allows students to construct knowledge actively, improving their understanding and communication skills. Thus, collaborative learning with peer interaction is proven to be an effective strategy in improving student learning outcomes.

## Discussion

The findings of this study provide strong evidence that collaborative learning with peer interaction significantly improves student learning outcomes. The increase in posttest scores, as indicated by the Paired Samples T-test, confirms that the improvement is statistically significant, not random. The mean score increase of 13.46 points demonstrates that students benefit academically from engaging in discussions, exchanging ideas, and solving problems together.

These results align with previous research, such as [Hayati et al. \(2023\)](#), who found that the STAD cooperative learning model enhanced both students' collaboration skills and academic performance, with a notable increase in students achieving higher scores. Similarly, [Darmawan & Pujiastuti \(2023\)](#) confirmed that collaborative learning is effective in improving conceptual understanding in mathematics, showing that students learning collaboratively performed better than those learning individually.

Beyond academic improvements, student interviews revealed that peer interaction enhances engagement, motivation, and confidence. Many students reported that they understood concepts better when discussing them with peers rather than learning alone. This supports the findings of [Qureshi et al. \(2023\)](#), which emphasized that students involved in group discussions exhibit higher comprehension, engagement, and communication skills compared to those who study individually.

Moreover, [Er et al. \(2021\)](#) highlighted that peer feedback plays a crucial role in fostering critical thinking and deeper understanding. Their study demonstrated that collaborative learning environments allow students to actively construct knowledge and refine their ideas through discussion.

Thus, this study reinforces the growing body of research supporting collaborative learning as a powerful pedagogical strategy. It not only improves academic outcomes but also cultivates essential 21st-century skills such as critical thinking, communication, and teamwork, making it a valuable approach for modern education.

## 4. CONCLUSION

The findings of this study indicate that collaborative learning with peer interaction significantly enhances student learning outcomes. The increase in the average pretest score from 66.02 to a posttest score of 79.48 demonstrates a substantial improvement in students' understanding and mastery of the material. Statistical analysis through the Paired Samples T-test confirms that this improvement is significant, with a p-value of 0.000, meaning the effect is not due to chance. Additionally, qualitative data from student interviews reveal that peer interaction fosters a deeper understanding, increases motivation, and boosts confidence in learning. Students feel more comfortable asking questions, engaging in discussions, and

expressing their ideas, which contributes to both academic success and the development of social skills.

To maximize the benefits of collaborative learning, teachers should incorporate structured peer interaction methods, such as small-group discussions and peer-assisted learning, to enhance engagement and comprehension. Schools should also support this approach by providing training and resources to help teachers implement collaborative learning effectively. Students are encouraged to take an active role in discussions, as it helps reinforce their understanding and strengthens communication skills.

Future studies could expand the scope of research by applying collaborative learning strategies to different subjects and grade levels to assess their effectiveness across various educational contexts. Longitudinal studies are recommended to examine the long-term impact of peer interaction on student achievement. Additionally, integrating technology into collaborative learning, such as digital platforms for group discussions, could be explored to enhance engagement. Further research on classroom dynamics, including group composition and leadership roles, could provide deeper insights into optimizing peer learning environments. By refining and adapting collaborative learning methods, educators can create more effective and interactive learning experiences that support student success.

## **5. REFERENCES**

Almira, A. (2016). Pembelajaran Matematika Dengan Menggunakan Model Kooperatif Tipe Talking Stick. *Logaritma*, 4(1), 1–16.

Ares, N. (2010). Appropriating roles and relations of power in collaborative learning. *International Journal of Qualitative Studies in Education*, 21(2), 99–121. <https://doi.org/https://doi.org/10.1080/09518390701256472>

Boud, D., Cohen, R., & Sampson, J. (2014). *Peer Learning in Higher Education: Learning from and with Each Other*. Routledge.

Chen, C.-M., Wang, J.-Y., & Zhao, R.-H. (2022). An effective method for incentivizing groups implemented in a collaborative problem-based learning system to enhance positive peer interaction and learning performance. *Interactive Learning Environments*, 30(3), 435–454. <https://doi.org/https://doi.org/10.1080/10494820.2019.1663435>

Cortázar, C., Nussbaum, M., Harcha, J., Alvares, D., López, F., Goñi, J., & Cabezas, V. (2021). Promoting critical thinking in an online, project-based course. *Computers in Human Behavior*, 119. <https://doi.org/10.1016/j.chb.2021.106705>

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Darmawan, G., & Pujiastuti, H. (2023). Efektivitas Model Pembelajaran Kolaboratif dalam Meningkatkan Hasil Belajar Matematika Siswa Sekolah Menengah Atas. *Lentera: Multidisciplinary Studies*, 1(4), 244–248.

Er, E., Dimitriadis, Y., & Gasevic, D. (2021). A collaborative learning approach to dialogic peer feedback: a theoretical framework. *Assessment & Evaluation in Higher Education*, 46(4), 586–600. <https://doi.org/https://doi.org/10.1080/02602938.2020.1786497>

- Fraenkel, J. R., Wallen, N. E., & Hyun, H. h. (2014). *How To Design And Evaluate Research In Education* (Eighth Edi). McGraw-Hill Education.
- Hayati, U., Saifuddin, K., & Arafah, K. (2023). Meningkatkan Keterampilan Kolaborasi melalui Model Pembelajaran Project Based Learning dengan Alur Merdeka di SMA Negeri 1 Soppeng. *Jurnal Pemikiran dan ...*, 5(2), 555–559. <http://ejournal-jp3.com/index.php/Pendidikan/article/view/512%0Ahttps://ejournal-jp3.com/index.php/Pendidikan/article/download/512/416>
- Huseynli, A. (2024). The Power of Pairs: Strategies for Promoting Collaborative Learning. *International Scientific Conference.*, 69–72. <https://conference-w.com/wp-content/uploads/2024/11/USA.P-2122112024.pdf#page=70>
- Jaya, A., Hartono, R., Wahyuni, S., & Yulianto, H. J. (2023). Literacy Practice on Project Bassed Learning (PBL) Assisted by Peer Assessment in Hybrid Learning to Improve the Students' Critical Thinking Ability in Tertiary Level of Education. *International Conference on Science, Education and Technology (ISET)*, 9, 972–978. <https://proceeding.unnes.ac.id/ISET/article/view/2552%0Ahttps://proceeding.unnes.ac.id/index.php/ISET/article/download/2552/2039>
- Johnson, D. W., & Johnson, R. T. (2019). Cooperation and the Use of Technology in Education. *Journal of Educational Psychology*, 111(4), 567–578.
- Karabuga, F, Kaya, E. (2013). Collaborative strategic reading practice with adult EFL learners: A collaborative and reflective approach to reading. *Elsevier*, 106, 621–630.
- Lantolf, J. P. (2000). *Sociocultural Theory and Second Language Learning*. OUP Oxford.
- Lantolf, J. P., Thorne, S. L., & Poehner, M. E. (2014). *Sociocultural theory and the genesis of second language development*. Routledge.
- Lawson, S. (2024). *Deepening Self-Development: a Collaborative Model Incorporating Nature-Based and Peer-Led Learning in Social Work Education for Latiné Undergraduate Youth*. California Baptist University.
- Namaziandost, E., Homayouni, M., & Rahmani, P. (2020). The impact of cooperative learning approach on the development of EFL learners' speaking fluency. *Cogent Arts & Humanities*, 7(1). <https://doi.org/https://doi.org/10.1080/23311983.2020.1780811>
- OECD. (2020). *The Future of Education and Skills 2030: OECD Education* (216).
- Qureshi, M. A., Khaskheli, A., Qureshi, J. A., Raza, A., & Yousufi, S. Q. (2023). Factors affecting students' learning performance through collaborative learning and engagement. *Interactive Learning Environments*, 31(4), 2371–2391. <https://doi.org/10.1080/10494820.2021.1884886>
- Slavin, R. E. (2009). *Cooperative Learning Theory*. Nusa Media.
- Topping, K. J. (2009). Peer assessment. *Theory Into Practice*, 48(1), 20–27. <https://doi.org/https://doi.org/10.1080/00405840802577569>
- Tsan, J., Butler, C., Maldonado, D.-G., Liu, J., Thomas, C., & Franklin, D. (2023). An Analysis of Gallery Walk Peer Feedback on Scratch Projects from Bilingual/Non-Bilingual Fourth Grade Students. *ICER '23: Proceedings of the 2023 ACM Conference on International Computing Education Research*, 1, 236–244.

<https://doi.org/https://doi.org/10.1145/3568813.3600137>

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

Williams, B., & Priya, R. (2016). Does peer-assisted learning improve academic performance? A scoping review. *Nurse Education Today*, 42, 23–29. <https://doi.org/https://doi.org/10.1016/j.nedt.2016.03.024>