

Social Media Integration in the Jigsaw Model: Innovative Solutions to Improve Students' Communication Skills

Ngatmini^{1*}

Muhajir²

Ade Ricky Rozzaqi³

¹²³Indonesian Language and Literature Education, Universitas PGRI Semarang, Semarang, Indonesia

*Corresponding Authors: ngatmini@upgris.ac.id

Abstract

This study aims to analyze the effectiveness of the social media-based jigsaw learning model in improving the communication skills of students of the Indonesian Language and Literature Education Study Program (PBSI) Universitas PGRI Semarang. The method used is an experiment with the design of prates and posts. The experimental group received learning using a jigsaw model integrated with social media, while the control group was taught conventionally. Data were obtained through tests of communication skills, observations, and interviews, which were analyzed descriptively, quantitatively, and qualitatively. The results of the study showed a significant increase in students' communication skills. The average score increased from 65 on prates to 86 on posts. The distribution of scores also shifted drastically, from the majority in the low category (60–65) to dominant in the high category (80–90). This increase is associated with the active role of students in group discussions as well as increased comfort and access to information through social media. The jigsaw model facilitates meaningful collaborative interactions, while social media flexibly expands the discussion space. This technology-based learning has proven to be effective in building essential communication skills for aspiring educators. However, the implementation of this model still requires strict supervision so that the use of social media remains focused on academic goals. This research contributes to the development of innovative learning strategies in the digital age, and opens up opportunities for further exploration in other educational contexts.

Keywords: *jigsaw model, social media, student communication, collaborative learning*

Introduction

Communication competence is a fundamental skill that must be possessed by prospective professional teachers, because it is directly related to the effectiveness of the learning process in the classroom (Alshumaimeri & Alhumud, 2021; Karasheva et al., 2021). These skills include the ability to communicate clearly, convey ideas in a structured manner, and interact effectively in a learning context (Zhumash et al., 2021). However, the results of observations show that the communication skills of prospective teachers, especially Indonesian Language and Literature Education (PBSI) students of PGRI University Semarang, are still at a low level. This is reflected in the low confidence of students when giving speeches, limitations in vocabulary mastery, and lack of fluency in speaking. Students often lack confidence in speaking, are limited in vocabulary, and are not fluent in conveying ideas, leading to low participation in class and decreased learning quality. As a result, the learning process often focuses on lecturers without

active participation from students. This situation can affect a student's ability to become a competent educator in the future.

This problem shows that there is a gap between the communication competence expected of prospective teachers in the 21st century and the reality of the abilities possessed by students. According to Eggen and Kauchak (2012), the development of students' communication skills is significantly influenced by the role of instructors, especially in fostering an interactive learning environment (FENG, 2021). A conducive learning environment can encourage students to be more courageous in conveying ideas and actively participating in discussions. According to the Law of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers, the development of teachers' professionalism is a crucial aspect of their duties and responsibilities (Rahayu et al., 2023). However, previous research by Karki (2021) shows that the teacher-centric learning model still dominates in universities. Limited interaction, both between lecturers and students as well as between students, results in students not being trained in developing their communication skills (Mutohhari et al., 2021; Supena et al., 2021). This situation indicates the need for modifications in learning methods so that students participate more actively.

To overcome these problems, the jigsaw model is one of the cooperative approaches that encourages interaction between students in small groups, as well as placing them as the owners of responsibility for certain parts of the material. This model not only strengthens communication skills, but also trains the courage to speak and convey ideas systematically. The relevance of this model is even stronger when combined with the use of social media as a tool to support collaboration and digital reference. By utilizing platforms that are familiar to students, such as online discussion groups or digital presentation features, learning becomes more flexible, interactive, and in accordance with the needs of today's digital generation. Therefore, this research is relevant because it directly responds to student communication challenges through the integration of jigsaw learning strategies and social media.

For this, students as prospective educators must be able to develop knowledge through efficient communication. Communication processes that support learning include an environment where students feel valued, their ideas are appreciated, and there is a strengthening of their contributions (Ordu, 2021). In addition, lecturers need to encourage collaboration among students so that they can interact more intensively. Fauzi and Subyantoro (2017) stated that students who can develop knowledge independently through discussion and collaboration are crucial investments in the field of education (Elbyaly & Elfeky, 2023; Lestari et al., 2023). However, many college students still feel anxious to speak up or think their ideas are not valuable enough, so they tend to be passive. This condition can be improved through learning strategies that allow students to communicate and discuss actively.

In addition to creating an interactive environment, it is important to integrate technology in the learning process. The use of smartphones as a social media platform that is very familiar to students can serve as an innovative educational support tool (Hanun et al., 2025; Wong et al., 2022). Smartphones, as tools used daily, can be optimized to support digital media-based learning. Social media not only facilitates access to information for students, but also creates a collaborative space that allows them to share ideas more efficiently (Fitrianto, 2024; Taufik & Pamungkas, 2025). In a jigsaw-like cooperative learning model, smartphones can be used to find references, discuss online, and present the results of discussions (Ayu et al., 2021; Pamungkas et al.,

2023). This is in line with the requirements of 21st century learning, which emphasizes proficiency in digital technology as a fundamental competency.

Although the jigsaw model has been widely applied, research on its application based on social media on PBSI students has not been carried out comprehensively. The majority of previous research only focused on the application of the conventional jigsaw model without the integration of technology in learning strategies. In fact, according to Sulfemi & Kamalia (2020), the integration of technology in the jigsaw model can increase student involvement and responsibility in group discussions. Similarly, research by Rigamonti et al. (2020) confirms that social media is able to create a collaborative learning environment that is more inclusive, flexible, and stimulates students' courage to express ideas. Through the use of social media, students can access learning resources more flexibly and support more dynamic interactions (Akour & Alenezi, 2022; Stuart O'Neill, 2024; Saleem et al., 2022). This research is crucial to assess the effectiveness of the social media-based jigsaw learning model in improving the communication skills of PBSI students, Universitas PGRI Semarang. In addition, the results of this research are expected to make a significant contribution to improving the quality of learning in higher education and preparing students as prospective educators who are able to communicate effectively in the future.

The use of social media as a learning support tool can expand access to learning resources, accelerate information exchange, and create more dynamic interactions (Sari & Ardianti, 2021). In the context of higher education, this approach is particularly relevant to the characteristics of the digital generation who are familiar with technology and tend to be more responsive to online platform-based learning (Dvorak et al., 2011). Therefore, it is important to assess the effectiveness of the combination of jigsaw models and social media in improving students' communication skills, especially in the context of PBSI learning. This study seeks to fill this gap by analyzing the integration of the two in the context of collaborative learning. The results of this research are expected to make a real contribution to improving the quality of academic interaction, as well as preparing students as prospective educators who are not only competent in communicating, but also adaptive to the use of today's educational technology.

Method

This research begins with a problem identification process that aims to understand the main problems related to students' low communication skills. Based on this identification, it is determined that the treatment to be given is the use of a jigsaw learning model based on social media (Sulfemi & Kamalia, 2020). Next, students were divided into two groups: an experimental group that received a social media-based jigsaw model treatment, and a control group that used conventional learning methods.

After the group division, pretests were carried out to measure the students' initial communication skills. In the next stage, the experimental group underwent learning with a social media-based jigsaw model (Jainal & Shahrill, 2021). In this stage, students use smartphones to look for references and discuss, which are then presented in groups. Meanwhile, the control group learned in a conventional way without actively utilizing digital technology.

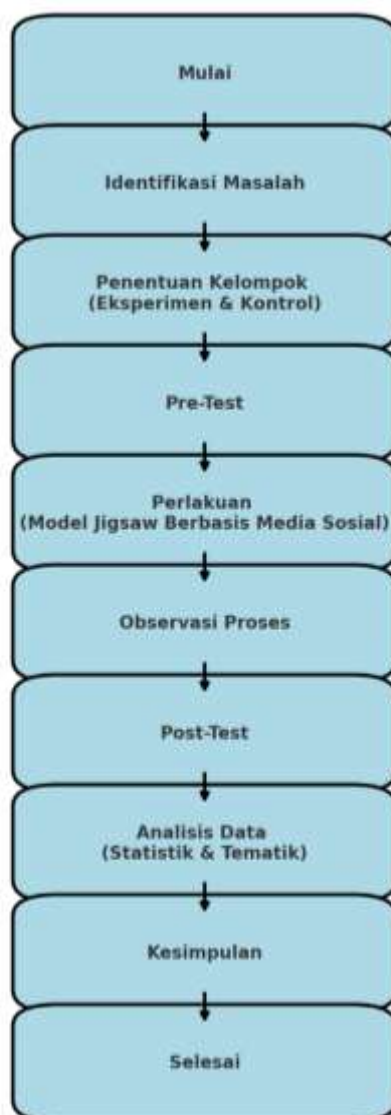


Figure 1. Research flow

During the learning process, observations are made to record student interactions, participation, and responses. After the learning was completed, students from both groups followed a post-study to measure their improvement in their communication skills. The results of pre- and post-treatment were analyzed using statistical methods to determine the effectiveness of treatment (Sabrila & Apoko, 2022; Yuliandra et al., 2020). In the final stage, the data is analyzed quantitatively through statistical tests and qualitatively with interviews. This analysis process aims to describe the effectiveness of learning models and student perceptions of the use of social media in learning. The results of the study are summarized in the conclusion, which presents the main findings of the research and suggestions for further implementation.

Results

This research was carried out in stages, identifying student characteristics, preparing learning tools, conducting learning with a social media-based jigsaw model, conducting final assessments (post-assessments), and analyzing data interactively (Ziliwu & Anas,

2024). The activities carried out are in the first month to conduct initial tests, identify student characteristics, then prepare learning tools, carry out actions as well as observations, and do post-tests. At the beginning of the lecture, the student's ability to communicate is identified. The aspects observed were stress, grammar, vocabulary, fluency and comprehension. From the results of this identification, it can be seen that students' communication skills are still low, with the majority in the low score category (60–65). Based on these findings, a learning strategy was designed using a social media-based jigsaw model to improve their communication skills. This step is carried out to provide a wider space for interaction, both individually and in groups. This model allows students to be active, interactive both individually and in groups. Student communication is carried out orally and in writing. The following are the stages of the learning model with a jigsaw model based on social media.

Early Identification

In the initial stage, a prates test was carried out to measure students' communication skills. Assessments include aspects of stress when speaking, grammar, vocabulary, fluency, and comprehension. The results of the prates show that the average communication ability of students is in the low category with an average score of 65. Most students fall into the 60–65 scoring range, which reflects the need for improved communication skills.

Tabel 1. Prates Score Distribution

Interval	Frequency	Percentage
60-65	23	50%
66-70	16	35%
70-75	7	15%
76-80	0	0%
85-90	0	0%
Average: 65		

From Table 1, it can be seen that as many as 50% of students have a communication score in the range of 60–65, which is the lowest category in this measurement. This shows that half of the student population has very basic communication skills. As many as 35% of students are in the range of 66-70, while 15% of students have communication skills in the range of 70-75. None of the students achieved a score above 75, indicating that students' overall communication skills still need significant improvement. These findings are the basis for designing a learning strategy using a social media-based jigsaw model, which aims to significantly improve students' communication skills through group interaction and collaborative activities (Ambarwati et al., 2024).

Implementation of Social Media-Based Jigsaw Models

During the application of the social media-based jigsaw model, students are trained to work together through group discussions facilitated by smartphone technology (Ghorbanian et al., 2024). Smartphones are used to access additional references, which are then presented in groups. This step allows students to hone their speaking skills while strengthening collaboration in discussions (Jie et al., 2024). Next, an analysis of the results of the pre- and post-prates was carried out to evaluate significant changes in

their communication skills. The results of the discussion were recorded on cardboard media to be presented. The activity is illustrated in figures 1 and 2.



Figure 1. Students use smartphones to search for references.

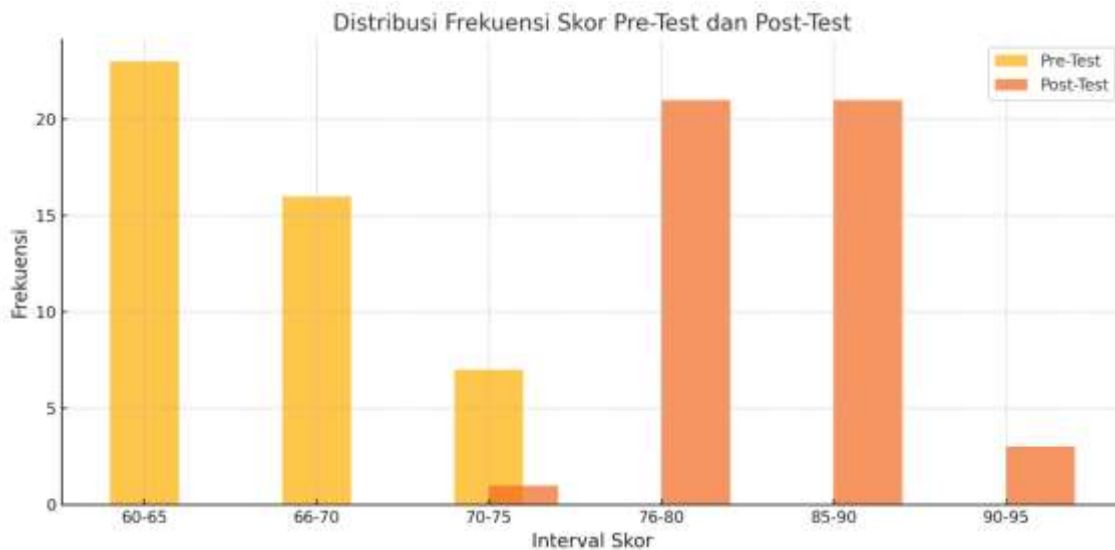


Figure 2. The group presents the results of the discussion to the other group members.

For this, the analysis was carried out based on the results of pretests to identify the students' initial abilities, followed by post-tests after the implementation of the method (Sarwi et al., 2021). The distribution of scores on these two tests provides a visual representation of the significant improvement in students' communication skills. After the implementation of the social media-based jigsaw model, an evaluation was carried out through a post-treatment test to assess the improvement of students' communication skills. The analysis was carried out by comparing pre- and post-treatment scores using descriptive and inferential statistical approaches.

Descriptively, there was an increase in the average score from 65 in the pretests to 86 in the posttests. In addition, the distribution of scores has undergone a drastic shift. If previously the majority of students (50%) were in the low score category (60–65), then after the majority treatment moved to the high score range, namely 80–85 and 85–90. This distribution indicates that the learning model applied has a positive influence on communication aspects such as speaking fluency, courage to express opinions, vocabulary mastery, and the structure of conveying ideas. The distribution graph (shown in the next section) provides visual evidence of significant changes in score categories.

To reinforce these findings, inferential tests such as paired t-tests can be applied to determine the statistical significance of such improvements. The results of this test (if conducted) would reinforce the claim that the difference in score did not occur by chance, but rather as a result of a structured learning intervention. In addition to quantitative data, the results of observations during the discussion and presentation process showed that students seemed to be more actively participating, more confident in conveying ideas, and more accustomed to working together academically. This shows that a jigsaw approach combined with social media is not only numerically effective, but also forms a more positive pattern of communication behavior.



Graph 1. Frequency distribution of pre- and post-rated scores

Graph 1 shows the frequency distribution of pre- and post-prates scores, showing significant changes in the communication skills of PBSI students, Universitas PGRI Semarang. Prior to the implementation of the social media-based jigsaw model (Affandi et al., 2022), the majority of students were in the low score category, which is the interval of 60-65, with the highest frequency of 23 students (50%). None of the students achieved a score above 75, reflecting their still very limited early communication skills. After the application of the method, there was a significant shift in distribution, where the majority of students managed to reach the intervals of 80-85 and 85-90 with a frequency of 21 students (46%) each. In fact, as many as 8% of students managed to achieve the highest score at the interval of 90-95, indicating a significant improvement in communication skills.

The average score also jumped, from 65 in prates to 86 in the post-prates, indicating the success of the method in improving students' speaking skills, vocabulary, fluency, and confidence. This shift reflects the effectiveness of social media-based jigsaw models in creating interactive learning environments and encouraging active participation (Tajeddin & Asadnia, 2023). The use of social media not only makes it easier for students to find references but also provides comfort in communicating. With a collaborative learning atmosphere, students can share ideas without fear or pressure, resulting in a significant improvement in their communication skills.

Post-Results

After the implementation of the social media-based jigsaw model, a post-test was carried out to measure the improvement of students' communication skills (Wikanta & Suharti, 2023). Post-test results showed a significant improvement, with the average score rising to 86. Data are taken through pre- and post-measurement measurements. Prates are carried out to determine the initial ability of students, while post-tests are carried out after the application of methods to measure the improvement that occurs (Sekarsari, 2023). The table below presents the frequency distribution of pre- and post-grade scores, which is the basis for analyzing the effectiveness of the applied learning methods.

Table 2: Frequency Distribution of prates and post-scores

Score Interval	Frequency Prates	Percentage Prates	Postage Frequency	percentage Post-test
60-65	23	50%	0	0%
66-70	16	35%	0	0%
70-75	7	15%	1	4%
76-80	0	0%	21	46%
85-90	0	0%	21	46%
90-95	0	0%	3	8%

Table 2 shows a significant difference between the distribution of pre- and post-score scores. Before the application of the model, the majority of students were in the low score category with an average score of 65. After implementation, the distribution of scores underwent a significant shift, where the majority of students managed to reach the high score category with an average of 86. This data provides strong evidence that social media-based jigsaw models are effective in improving students' communication skills. In the prates, the majority of students were in the score interval of 60-65 (50%), with an average score of 65. None of the students achieved a score above 75, indicating low initial communication skills. As many as 35% of students are in the 66-70 interval, and only 15% of students manage to reach the 70-75 interval. However, after the implementation of the social media-based jigsaw model, the distribution of scores changed drastically. In the post-secondary exams, the majority of students were in the high score interval, namely 80-85 and 85-90 (46% respectively). In addition, 8% of students managed to reach the highest interval, which was 90-95, which was not previously achieved in the prates. The average score increased to 86, which reflected an improvement in overall communication skills. Overall, these results show that the social media-based jigsaw learning model has a significant positive impact on students' communication skills. In addition to creating an interactive learning environment, this approach has succeeded in increasing students' confidence in speaking and collaborating, which are essential skills for aspiring educators (Alfi & Amalia, 2024; Gilbertson et al., 2022).

The correlation between the learning model and the results of this improvement confirms that the social media-based jigsaw strategy is not only pedagogically relevant, but also concretely able to answer the problem of low communication skills of students. This is evidenced by a significant increase in scores on post-election results and a shift in distribution to the high-score category. Students show progress in fluency, confidence, and the ability to convey ideas after being actively involved in group discussions and presentations. The use of social media plays an important role in creating a flexible and comfortable collaborative space, allowing students to access information independently and discuss in real-time, even outside the classroom. Thus, this model is directly in line with the research topic that aims to improve students' communication skills through innovative learning approaches that are integrated with technology.

Discussion

Research shows that the application of a social media-based jigsaw learning model significantly improves the communication skills of PBSI students, Universitas PGRI Semarang. The average score of the prates which was initially 65 increased to 86 in the post, with the distribution of the score shifting from the low category to the high category. This shows that interactive learning methods can have a positive impact on the

development of students' communication skills. Students who previously tended to be passive now show increased confidence in communicating, conveying ideas, and interacting with their peers. Improvements show that student-centered learning methods are more effective in motivating active engagement than conventional teaching methods (Tajeddin & Asadnia, 2023; Wang, 2023).

The results of this study support the view of Vygotsky's (1978) social constructivist theory, that effective learning occurs through social and collaborative interaction in the zone of proximal development. In this context, the role of peers as a source of learning has been proven to accelerate the mastery of communication skills. These findings are also in line with the principles of collaborative learning, which emphasize that cognitive and social skills can be improved through structured and participatory interactions between group members. From TPACK's point of view, social media integration shows the synergy between content knowledge, pedagogy, and technology to create a learning environment that is more interactive and relevant to the needs of the times.

The jigsaw learning model provides a crucial role to each student in the group, where they are responsible for understanding and explaining certain segments of material to other members of the group (Sulfemi & Kamalia, 2020). This method creates a dynamic learning atmosphere, where each student feels they have a significant contribution (Ayu et al., 2021). The process of collaboration in groups trains students to listen to other people's ideas, discuss constructively, and resolve differences of opinion in a positive way. In addition, the integration of social media as a learning tool provides wider access for students to obtain additional information that supports their learning process (Ambarwati et al., 2024). Therefore, learning is not only centered on the material delivered by lecturers, but also encourages students' independent exploration.

The success of this paradigm is also supported by the comfort experienced by students when utilizing social media for learning. As a generation that is very familiar with technology, students find ease and flexibility in accessing materials and discussing through their devices (Salamzadeh et al., 2022). Social media provides a platform for students to exchange information and ideas directly without the limitations of space and time. This strengthens their motivation to actively participate in the learning process. A learning environment that is not rigid and relevant to students' daily lives also contributes to reducing anxiety when speaking in front of a group (Wong et al., 2022). Ultimately, this contributes to the improvement of students' speaking abilities and confidence.

Although this study indicates the success of the social media-based jigsaw learning model, there are several aspects that need to be considered in its implementation (Jainal & Shahrill, 2021; Pribudi, 2020). One of the main challenges is ensuring that the use of social media remains focused on learning objectives, not on other irrelevant activities (Wang, 2023). Therefore, lecturers must provide clear guidance and efficient supervision during the learning process. In addition, the success of this method also depends on the ability of lecturers to create a classroom atmosphere that supports and encourages constructive collaboration. If it is not managed effectively, there is a possibility that students only rely on information from social media without really understanding the material being studied.

Overall, this study confirms that the social media-based jigsaw learning model not only improves students' communication skills, but also creates a more inclusive and relevant learning environment (Affandi et al., 2022; Ambarwati et al., 2024). This method allows students to learn collaboratively and independently, while training them in the productive use of technology. This research makes a significant contribution to

the development of innovative learning methods that are in line with the demands of the digital era (Ghorbanian et al., 2024). Through this approach, students as prospective educators can be better prepared to face challenges in the world of work, especially in the aspect of communication and efficient use of technology (Sulfemi & Kamalia, 2020). It emphasizes the significance of innovation in education in line with technological advances and the needs of contemporary generations.

Conclusion

The findings of this study indicate that the jigsaw learning model based on social media is significantly effective in enhancing the communication skills of PBSI students at Universitas PGRI Semarang. This increase is reflected in the change in students' average scores, from 65 in pretests to 86 in posts, as well as the distribution of scores that show a shift from the low category to the high category. This learning model allows students to actively participate, both in group discussions and in expressing opinions. In addition, the use of social media facilitates access to information and encourages students to learn independently. The study confirms that an interactive learning approach that integrates technology can have a positive impact on essential skills such as communication.

However, the application of this model has a number of limitations that need to be considered. The utilization of social media as an integral component of learning necessitates stringent oversight to ensure its relevance to academic objectives. In addition, the effectiveness of this method also depends on the ability of lecturers to facilitate and motivate students during the learning process. For wider implementation, it is recommended that the development of this learning model be accompanied by special training for lecturers in managing technology-based classrooms. Further research can investigate the impact of the use of this learning technology on various study programs or in more complex learning contexts. Therefore, the findings of this study can be the basis for further innovation in the development of technology-based learning strategies.

Acknowledgment

Thank you to the rector of the Universitas Persatuan Guru Republik Indonesia for fully supporting this research.

References

- Affandi, Y., Darmuki, A., & Hariyadi, A. (2022). The Evaluation of JIDI (Jigsaw Discovery) Learning Model in the Course of Qur'an Tafsir. *International Journal of Instruction*, 15(1), 799–820.
- Akour, M., & Alenezi, M. (2022). Higher Education Future In The Era of Digital Transformation. *Education Sciences*, 12(11), 784.
- Alfi, Z., & Amalia, N. (2024). Empowering Future Teachers: The Role of Student Organizations in Enhancing Public Speaking and Teaching Skills. *Jurnal Penelitian Pendidikan*, 27(1), 113–120.
- Alshumaimeri, Y. A., & Alhumud, A. M. (2021). EFL Students' Perceptions of the Effectiveness of Virtual Classrooms in Enhancing Communication Skills. *English Language Teaching*, 14(11), 80–96.
- Ambarwati, I. D., Kartikawati, R., & Sadeli, E. H. (2024). *The Effectiveness of The Jigsaw Cooperative Learning Model Assisted by Wordwall Application on Citizenship Competence (A Quasi-Experimental Study of 8th Grade Students at SMP*

Muhammadiyah Bumiayu).

- Ayu, I. G., Mammadova, I., & Masykuri, E. S. (2021). Cooperative Learning by Jigsaw to Improve Learning Outcomes for Eight-Grade-Students. *Scripta: English Department Journal*, 8(2), 45–54.
- Dvorak, B. I., Stewart, B. A., Hosni, A. A., Hawkey, S. A., & Nelsen, V. (2011). Intensive environmental sustainability education: Long-term impacts on workplace behavior. In *Journal of Professional Issues in Engineering Education and Practice*.
- Elbyaly, M. Y. H., & Elfeky, A. I. M. (2023). The Impact of Problem-Solving Programs In Developing Critical Thinking Skills. *European Chemical Bulletin*, 12, 6636–6642.
- FENG, W. (2021). *Level of Awareness, Challenges and Teaching Strategies In Implementing Higher Order Thinking Skills Among Teachers of Sjk (C) In Kluang, Johor*. Universiti Teknologi Malaysia.
- Fitrianto, I. (2024). *Innovation and Technology in Arabic Language Learning in Indonesia : Trends and Implications*. 2(3), 134–150.
- Ghorbanian, E., Mohammadhassani, N., Nasab, Y. M., & Rajabi, M. (2024). Investigating the Effect of Flipped Classroom and Jigsaw Method on Students' Learning and Academic Engagement. *2024 11th International and the 17th National Conference on E-Learning and E-Teaching (ICeLeT)*, 1–6.
- Gilbertson, K., Ewert, A., Siklander, P., & Bates, T. (2022). *Outdoor education: Methods and strategies*. Human Kinetics.
- Hanun, F., Pamungkas, O. Y., Habibullah, A., & Kozin, W. (2025). The Impact of Research-Based Learning and Institutional Support on Student Research Productivity at Madrasah Aliyah Negeri in Jakarta, Indonesia. *Qubahan Academic Journal*, 5(2), 204–223.
- Jainal, N. H., & Shahrill, M. (2021). Incorporating Jigsaw Strategy to Support Students' Learning through Action Research. *International Journal on Social and Education Sciences*, 3(2), 252–266.
- Jie, D., Nadjwa, N., Miskam, M., & Sazalli, N. (2024). The Use of China-based Social Media to Enhance English Speaking Skills in Chinese Higher Education: A Systematic Literature Review. *International Journal of Academic Research in Progressive Education and Development*, 13(1).
- Karasheva, Z., Amirova, A., Ageyeva, L., Jazdykbayeva, M., & Uaidullakzyzy, E. (2021). Preparation of Future Specialists for the Formation of Educational Communication Skills for Elementary School Children. *World Journal on Educational Technology: Current Issues*, 13(3), 467–484.
- Karki, D. R. (2021). Teaching Methods: Irrelevancy of Teacher Centric Techniques in Classroom. *KMC Research Journal*, 5(5), 19–28.
- Lestari, D. S., Pamungkas, O. Y., & Education, L. (2023). Writing Explanatory Texts for SMK Students in Cilacap: Problem and Efforts. *American Journal of Universal Studies*, 1(01), 34–42.
- Masjid, A. Al, & Pamungkas, O. Y. (2024). Ecocriticism-Based Curriculum Development Strategies in Indonesia Universities: Evaluation and Recommendations. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, 16(2), 1193–1208. <https://doi.org/10.37680/qalamuna.v16i2.5734>
- Mutohhari, F., Sutiman, S., Nurtanto, M., Kholifah, N., & Samsudin, A. (2021). Difficulties in Implementing 21st Century Skills Competence in Vocational Education Learning. *International Journal of Evaluation and Research in Education*, 10(4), 1229–1236.
- Ordu, U. B.-A. (2021). The Role of Teaching and Learning Aids/Methods in a Changing World. *Bulgarian Comparative Education Society*.

- Pamungkas, O. Y., Hastangka, H., Suprpto, S., Mastiyah, I., Purwoko, D., Zuhrah, F., & An-Nahidl, N. A. (2023). Discovering the Value of Education in a Fantastical World: An Exploration of Magical Realism in a Contemporary Novel. *International Journal of Society, Culture and Language*, 11(3), 72–86. <https://doi.org/10.22034/ijscsl.2023.2008386.3115>
- Pribudi, A. P. A. (2020). Community-based Approach to Sustain Batik Tourism Village Area in the Special Region of Yogyakarta (The Case of Giriloyo Village). *Journal of Social Science*, 1(4), 113–122.
- Rahayu, H., Agbale, B., Ackon, E., & Assopiah, B. (2023). Teacher Professionalism in Asia: Practical Perspectives from Indonesia. *International Journal of Research and Innovation in Social Science*, 7(10), 720–730.
- Rigamonti, L., Dolci, A., Galetta, F., Stefanelli, C., Hughes, M., Bartsch, M., Seidelmeier, I., Bonaventura, K., & Back, D. A. (2020). Social media and e-learning use among European exercise science students. *Health Promotion International*, 35(3), 470–477. <https://doi.org/10.1093/heapro/daz046>
- Sabrila, R. A. P., & Apoko, T. W. (2022). The Effectiveness of Podcast on Listening Skill for Vocational School Students. *IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature*, 10(2), 1177–1186.
- Salamzadeh, A., Mortazavi, S. S., & Hadizadeh, M. (2022). Social Media and Digital Technologies Among Pottery Makers and In The Sewing Sector. In *Artisan and handicraft entrepreneurs: Past, present, and future* (pp. 217–238). Springer.
- Saleem, A. N., Noori, N. M., & Ozdamli, F. (2022). Gamification Applications In E-Learning: A Literature Review. *Technology, Knowledge and Learning*, 27(1), 139–159.
- Sari, P. P., & Ardianti, D. (2021). Implementation of Problem Based Learning (PBL) on Interactive Learning Media. *Journal of Technology and Humanities*, 2(2), 24–30.
- Sarwi, S., Baihaqi, M. A., & Ellianawati, E. (2021). Implementation of Project Based Learning Based on STEM Approach to Improve Students' Problems Solving Abilities. *Journal of Physics: Conference Series*, 1918(5), 52049.
- Sekarsari, E. P. (2023). The Effect of Team Games Tournament Model-Assisted Articulate Storyline Media on Improving Outcomes and Interest in Learning Javanese Script Material in Elementary School. *Elementary School Forum (Mimbar Sekolah Dasar)*, 10(1), 281–296.
- Sulfemi, W. B., & Kamalia, Y. (2020). Jigsaw Cooperative Learning Model Using Audiovisual Media To Improve Learning Outcomes. *JPsD (Jurnal Pendidikan Sekolah Dasar)*, 6(1), 30–42.
- Supena, I., Darmuki, A., & Hariyadi, A. (2021). The Influence of 4C (Constructive, Critical, Creativity, Collaborative) Learning Model on Students' Learning Outcomes. *International Journal of Instruction*, 14(3), 873–892.
- Tajeddin, Z., & Asadnia, F. (2023). Teachers' Collaborative Reflections on Classroom Materials: From Traditional Consumers to Digital Materials Developers and Teacherpreneurs. *RELC Journal*, 00336882231222036.
- Taufik, O. A., & Pamungkas, O. Y. (2025). Mapping Determinants of Success through Information Systems in Higher Education: A Structural Equation Modeling Approach. *Educational Process: International Journal*, 33(5), 505–519.
- Vygotsky, L. S. (1978). *4-Vygotsky*.
- Wang, L. (2023). The Impact of Student-Centered Learning on Academic Motivation and Achievement: A Comparative Research between Traditional Instruction and Student-Centered Approach. *Journal of Education, Humanities and Social Sciences*, 22, 346–353.

- Wikanta, W., & Suharti, P. (2023). Development of Practicum-Based Mobile Augmented Reality through the Group Investigation Model to Improve Students' Creative Thinking. *Journal of Biological Education Indonesia (Jurnal Pendidikan Biologi Indonesia)*, 9(2), 145–166.
- Wong, P. P. Y., Wong, G. W. C., Techanamurthy, U., Mohamad, W. S. B., Febriana, A., & Chong, J. C. M. (2022). Using Social Mobile Learning to Stimulate Idea Generation for Collective Intelligence among Higher Education Students. *Knowledge Management & E-Learning*, 14(2), 150–169.
- Yuliandra, R., Nugroho, R. A., & Gumantan, A. (2020). The Effect of Circuit Training Method on Leg Muscle Explosive Power. *Active: Journal Of Physical Education, Sport, Health And Recreation*, 9(3), 157–161.
- Zhumash, Z., Zhumabaeva, A., Nurgaliyeva, S., Saduakas, G., Lebedeva, L. A., & Zhoraeva, S. B. (2021). Professional Teaching Competence in Preservice Primary School Teachers: Structure, Criteria and Levels. *World Journal on Educational Technology: Current Issues*, 13(2), 261–271.
- Ziliwu, S., & Anas, N. (2024). The Development of Puzzle Board Card Media to Enhance Students' Critical Thinking Skills in Science Learning. *Jurnal Elementaria Edukasia*, 7(2), 2772–2785.