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Effect of peer presentation in project-based learning on communication skills of preservice biology teacher students

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ABSTRACT

This study investigates the effect of peer presentation within Project-Based Learning (PjBL) on the communication skills of preservice biology teacher students, given its potential to actively engage students and foster effective scientific communication. A quasi-experimental approach was employed using a posttest-only non-equivalent control group design, involving 72 students divided into experimental and control groups (n = 36 each). The experimental group implemented peer presentation in small, rotating discussion groups across four sessions, while the control group presented project results in a single large-group format without rotation. Communication skills were measured using a validated and reliable Likert-scale instrument (CVI = 1.00; α = 0.783). An independent samples t-test revealed a statistically significant difference in communication skills between the experimental group (M = 42.94, SD = 6.27) and the control group (M = 39.31, SD = 4.45), t(70) = 2.842, p = .006, with a mean difference of 3.64 points. Cohen's d indicated a medium (d = 0.67), suggesting that the observed difference is not only statistically significant but also practically meaningful. These findings imply that structuring peer presentation as a small-group, high-interaction activity within PjBL substantially enhances students' communication skills, particularly in oral expression, responsiveness to audience questions, and presentation strategy. Peer presentation can therefore be regarded as a valuable pedagogical approach for developing communication competence among preservice biology teachers.

INTRODUCTION

Communication is an essential skill in the era of globalization and modernization, including in the context of biology learning. For biology education students as prospective teachers, communication skills are an indispensable competency because they are directly related to the ability to explain complex biological concepts (Irfan et al., 2023; Titin et al., 2023; Kasperski & Crispel, 2022). These skills enable students to convey scientific ideas clearly, engage in critical discussions regarding biological phenomena, and collaborate in solving science-based problems (Doyle, 2023; Rahman et al., 2024). Furthermore, strong communication skills will significantly support their future roles as biology teachers, capable of effectively transferring knowledge to students.

Given this urgency, communication skills in biology learning need to be systematically trained from the beginning of the lecture period. Biology learning emphasizes not only conceptual mastery but also students' ability to communicate scientific processes, observational results, and data-based arguments (Priadi et al., 2022; Soysal, 2026). Therefore, selecting the right learning strategy is a crucial factor in supporting the development of these skills (Kusuma et al., 2022). Learning models that encourage active interaction, scientific discussion, and the open exchange of ideas are essential (Owens et al., 2020; Sobach et al., 2023). One potential approach is combining peer presentations with Project-Based Learning (PjBL) in biology learning.

The combination of peer presentations and PjBL has synergistic potential in improving students' communication skills in biology learning. In PjBL, students engage in group work to design and complete projects related to biological phenomena, such as environmental investigations or biodiversity analysis, which indirectly trains their interpersonal communication skills (Crespi et al., 2022; Ghosheh et al., 2021). Meanwhile, peer presentations provide students with the opportunity to communicate project results scientifically through a systematic, logical, and evidence-based presentation of ideas (Sulianta, 2024). The integration of these two strategies allows students not only to actively participate in discussions but also to practice conveying biological concepts and research findings in a structured manner to an audience.

Therefore, this study attempts to explore the effects of peer presentations in Project-Based Learning (PjBL) on students' communication skills. It is hoped that this will provide empirical data as a basis for developing learning strategies in the classroom. Furthermore, it can also help students practice their communication skills as future biology teachers.

Literature Review

Communication Skills

Communication skills in biology learning refer to students' ability to convey biological concepts, processes, and phenomena clearly and scientifically, both orally and in writing. In biology education, communication is not limited to conveying information, but also includes the ability to explain scientific processes, interpret data, and present evidence-based arguments (Ping et al., 2020; Zhang & Jenkinson, 2024; Sembiring & Yusuf, 2025). This is crucial because biology, as a science, requires students to be able to systematically communicate the results of observations, experiments, and analyses.

For prospective biology teachers, communication skills serve a dual role: as both an academic and a professional competency (Digarbayeva et al., 2024; González & Vásquez, 2024). They are required to be able to explain complex concepts, such as biological systems and the interactions of living things, in a way that is easily understood by students. Therefore, biology learning in higher education needs to be designed to provide students with opportunities to practice scientific communication through discussions, presentations, and contextual collaborative activities (Eppler et al., 2021; Owens & Hite, 2022).

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Peer presentation

Peer presentations in biology learning are a strategy that provides students with the opportunity to share their understanding or project results related to biological concepts with their peers (Kiselyov & Schunn, 2024). This approach is highly relevant because many topics in biology are conceptual and require in-depth explanation. Through peer presentations, students can strengthen their conceptual understanding through scientific and data-based argumentation (Krange et al., 2020; Chang et al., 2024; Arwita et al., 2025).

Furthermore, this activity encourages students to develop critical thinking skills through question-and-answer sessions and discussions. In the context of this research, students will present in small groups. They will present their project designs and reports during an environmental science lecture.

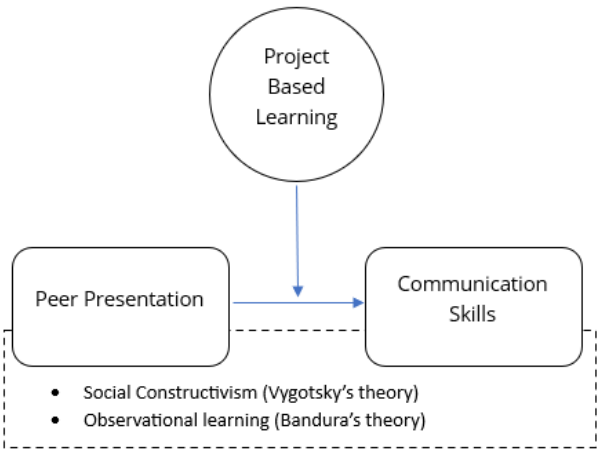
Project-Based Learning (PjBL) in Biology

Project-Based Learning (PjBL) can potentially create a positive learning environment for prospective biology teachers. This model helps students collaborate in designing and completing projects, thereby enhancing interaction and communication among group members (Mulyati et al., 2024; Al Muhajir, 2025). Furthermore, the project completion process also provides hands-on experience to help develop science process skills such as observation, data analysis, and problem-solving (Hujjatusnaini et al., 2022; Hizqiyah et al., 2023).

In the context of this research, PjBL was implemented in an environmental science lecture session. Students were asked to identify environmental problems in their surroundings, propose a solution plan, implement it, and report on it. This approach is expected to help train students' communication skills and engage in project completion efforts related to real-life phenomena (Deria et al., 2023). Furthermore, in this study, project-based learning is positioned as a learning environment to train students' communication skills through peer presentations. This is based on Vygotsky's social constructivism, which explains that learning is not only influenced by individual factors but can also be developed through social interaction (Vygotsky, 1978). Furthermore, peer presentations enable students to learn to communicate through observational learning (Bandura, 1986), so they can obtain good examples and input to practice their communication.

Figure 1

Theoretical framework.



Based on this description, this study aims to analyze the effect of peer presentations on students' communication skills in biology learning through the implementation of Project-Based Learning (PjBL). Two hypotheses are proposed:

H_0 : There is no significant effect of peer presentations on students' communication skills in PjBL

H_1 : There is a significant effect of peer presentations on students' communication skills in PjBL

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METHODS

Research Design

This study used a quasi-experimental approach with a posttest-only non-equivalent control group design. This design consisted of two groups: the experimental and the control. The experimental group received treatment in the form of peer presentations in Project-Based Learning (PjBL), while the control group used PjBL learning without peer presentations. After the treatment, both groups were given a posttest to measure changes in communication skills (see Table 1).

Table 1
Research design.

Class	Treatment	Posttest
Experiment	PjBL + Peer presentation	O
Control	PjBL	O

Population and Samples

The study population was active students in the Biology Education Study Program at a university in Jambi. The sample was obtained through purposive sampling, meaning that the students were equal in number and taking the Environmental Knowledge course. This resulted in an experimental class of 36 students and a control class of 36 students.

Instruments

The instrument in this study used a Likert scale ranging from 1 to 5. This instrument also includes indicators of communication skills, including oral communication, receptive communication, communication goals, communication strategies, communicating clearly to achieve goals, and presentation skills (Greenstein, 2012). Before being used, the instrument was tested for validity with CVI (3 experts) and reliability, this was done using SPSS software. Based on the results of measurements and trials (30 respondents), the instrument used was classified as valid (CVI = 1.00) and reliable (α = 0.783). The validity and reliability of the instruments are shown in Table 2.

Table 2
Validity and reliability of instruments.

Indicator	Code	Statement Items	CVI	(α)
Oral communication	CS1	I am able to verbally convey ideas or solutions resulting from the Environmental Science project in a coherent and understandable manner.	1,00	0,771
	CS2	I can explain project concepts or findings verbally without rigidly reading text.	1,00	0.764
Receptive communication	CS3	I am able to listen to and accurately understand questions or input from the audience during project discussions.	1,00	0.792
	CS4	I can respond appropriately to questions or criticisms raised by the audience regarding the project results.	1,00	0.793
Purpose of communication	CS5	I am able to adapt the method of presenting information to suit the objectives of the project presentation.	1,00	0.749

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Indicator	Code	Statement Items	CVI	(α)
	CS6	I determine the main message I want to convey before explaining the project results to the audience.	1,00	0.747
Communication strategies	CS7	I use examples, illustrations, or analogies to help the audience understand the Environmental Science project results.	1,00	0.776
	CS8	I adapt my word choice and language style to suit the background of the audience when explaining the project proyek.	1,00	0.767
Communicating clearly to achieve a goal	CS9	I can connect Environmental Science concepts logically and clearly so that the audience understands the project's purpose.	1,00	0.783
	CS10	I am able to answer audience questions with clear explanations to avoid misunderstandings.	1,00	0.762
Presentation skills	CS11	I am able to present the project results systematically (introduction, body, conclusion) and make it easy for the audience to follow.	1,00	0.751
	CS12	I use supporting media (slides, posters, or visual aids) effectively in presenting project results.	1,00	0.745

Procedures

The research procedure was conducted during an Environmental Science course based on Project-Based Learning. This course required students to identify environmental problems and report on recommended solutions as the results of the project. Both the experimental and control groups underwent Project-Based Learning, but the presentation formats differed. In the experimental group, presentations were conducted in small groups, with representatives from each project group joining newly formed small discussion groups to present their work. In contrast, the control group presented their project results in a large group format (presenting to the entire class as usual), without the small group rotation used in the experimental group. Each presentation lasted a maximum of 15 minutes. The presentation sessions were conducted over four sessions: two sessions allocated for presenting the project design and two meetings for presenting the final project report. During these sessions, peer feedback and question-and-answer exchanges occurred spontaneously without a structured format, allowing for authentic peer interaction after each presentation. Presentations were evaluated based on four aspects: mastery of the material, ability to explain the content, ability to answer questions, and quality of the presentation material. A posttest was then administered to both groups after the fourth session to assess improvements in communication skills following the treatment.

Data Collection and Analysis

Data collection was conducted through the distribution of communication skills questionnaires. The data obtained were then analyzed using IBM SPSS Statistics. The analysis began with prerequisite tests, namely the normality test (Shapiro-Wilk) and the homogeneity test (Levene) to ensure the data met the parametric statistical assumptions. Table 3 shows that the experimental class data is categorized as abnormal (<0.05), while the control class data is categorized as normal (>0.05) and both classes are categorized as homogeneous (>0.05).

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Table 3
Results of the normality test (Shapiro-Wilk) and homogeneity (Levene) tests.

Class	Shapiro-Wilk Sig.	Conclusion
Experiment	.007	Not normal
Control	.580	Normal

Note. df = 36 for both classes. Levene's test for equality of variances: F = 1.011, p = .318, indicating homogeneous variances.

The normality and homogeneity tests indicated that the parametric statistical assumptions were met (Table 2 and 3), so the analysis continued with an independent sample t-test with a significance level of α = 0.05. To determine the magnitude of the treatment effect, Cohen's d test was used. A value of 0.20 indicates a small effect, 0.50 a medium effect, and 0.80 a large effect.

RESULTS AND DISCUSSION

Respondent Demographics

This study involved students in the biology education program at a state university in Jambi. It was found that 86% of respondents were female, and 55.6% were under 18 years of age. The respondent demographics are shown in Table 4.

Table 4
Respondent demographics

Characteristics	Category	n	%
Gender	Female	62	86,1
	Male	10	13,9
Age	17	9	12,5
	18	40	55,6
	19	19	26,4
	20	4	5,6
Total		**72**	**100**

Description of Average Communication Skills

Based on the research conducted, it was found that there was a difference in average communication skills between the experimental and control classes. The two classes had an average difference of 3.64%. The experimental class had a standard deviation of 6.2, while the control class had a standard deviation of 4.4. The average communication skills in both class are showed in Table 5.

Table 5
Average communication skills (experimental and control)

	Class	N	Mean	Std. Deviation	Std. Error Mean
Communication	Experiment	36	42.9444	6.26530	1.04422
	Control	36	39.3056	4.44535	.74089

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Hypothesis Testing

This study proposed two hypotheses: H_0 and H_1. Table 6 reveals that H_1 is accepted and H_0 is rejected ($p = 0.006 < 0.05$). Therefore, it was concluded that there is a significant effect of peer presentations on students' communication skills in PjBL.

Table 6

Result of independent samples test

		t-test for Equality of Means		
		Sig. (2-tailed)	**Mean Difference**	**Std. Error Difference**
Communication	Equal variances assumed	.006	3.63889	1.28035

An effect size test was then conducted and found that the treatment had a medium effect (0.67). This confirms the results of the independent samples test that peer presentations had a moderate effect on students' communication skills (see Table 7).

Table 7

Result of effect size

Variable	Mean Difference	Std. Error Difference	*t*	Cohen's d	Category (Cohen, 1988)
Communication Skills	6,23	1,28	2.842	0,67	Medium

Discussion

Based on the research results, most participants were female (86.1%) and were 18 years old (55.6%), followed by 19-year-old students (26.4%). This indicates that the intervention was implemented mainly with first-year preservice biology teachers who were still developing their academic and professional competencies. At this stage, communication skills are still evolving, making students more likely to benefit from structured opportunities to practice communication (González & Vásquez, 2024; Digarbayeva et al., 2024). The high proportion of female participants also reflects the typical demographic profile of biology education programs in Indonesia. Because this study did not examine gender differences, the findings should primarily be generalized to populations with similar characteristics.

The experimental group obtained a higher mean communication skills score (M = 42.94, SD = 6.27) than the control group (M = 39.31, SD = 4.45), with a mean difference of 3.64 points. In addition to the higher average score, the experimental group showed greater variation in students' performance. This suggests that the peer presentation strategy did not affect all students equally, with some students appearing to benefit more than others. One possible explanation is offered by Bandura's (1986) social learning theory, which proposes that observational learning depends on learners' attention to and engagement with modeled behaviors. During peer presentations, students had opportunities to observe how their classmates organized ideas, responded to questions, and communicated arguments. Differences in how students attended to and learned from these experiences may have contributed to the variation in communication outcomes. Therefore, the effectiveness of peer presentation may depend not only on the instructional strategy itself but also on the extent to which students actively engage in the learning process.

The independent samples t-test confirmed that this descriptive difference was statistically significant, $t(70) = 2.842$, $p = .006$, with a mean difference of 3.64 points and a 95% confidence

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interval of [1.09, 6.19] that excludes zero. This result supports rejection of the null hypothesis and provides direct empirical evidence that incorporating peer presentation into Project-Based Learning produces a measurable improvement in communication skills relative to PjBL implemented without this component. The effect size analysis using Cohen's d yielded a value of 0.67, which falls in the medium range according to Cohen's criteria. This indicates that the difference between groups is not only statistically detectable but also practically meaningful the average student in the experimental group scored roughly two-thirds of a standard deviation above the average student in the control group, a difference large enough to be noticeable in real classroom performance rather than a marginal statistical artifact.

This effect size is consistent with, and in some cases stronger than, findings from related interventions targeting communication or presentation competencies through peer-based and collaborative formats. Prosenjak and Lučev (2020) found that peer assessment activities meaningfully improved oral presentation skills, while Kiselyov and Schunn (2024) reported that peer-reviewed presentation exchange enhanced undergraduate students' communicative engagement with course material. Owens and Hite (2022) similarly demonstrated that structured collaborative presentation formats in STEM contexts strengthened student communication competencies. The convergence of the present d = 0.67 with effect sizes reported in these studies lends external support to the claim that the specific structural choice restructuring peer presentation into a rotating, small-group format is a meaningful driver of communication skill development, rather than presentation practice alone being sufficient.

The procedural design of this study helps explain the mechanism behind this effect. In the experimental group, representatives from each project team rotated into newly formed small discussion groups across four sessions, meaning every student presented and fielded questions multiple times in a low-stakes, small-audience setting. The control group, by contrast, presented only once to the entire class in a single large-group format. This structural difference plausibly accounts for the observed gains: smaller audiences reduce communication apprehension and multiply the number of speaking turns and direct question-and-answer exchanges each student experiences (Rezaei, 2023). This maps closely onto several of the instrument's specific indicators oral communication (CS1–CS2), receptive communication (CS3–CS4), and communication strategies (CS7–CS8) since students in the experimental condition repeatedly practiced adapting their explanations to different small audiences and responded to spontaneous questions far more frequently than their control-group counterparts. Viewed through Vygotsky's (1978) social constructivist lens, communication competence is built through repeated, situated social interaction rather than through a single performance opportunity; the rotating small-group format simply afforded more of these interactive opportunities than the control condition's single large-group presentation.

Taken together, these findings carry direct pedagogical implications for biology teacher education. Given that the intervention was effective among a predominantly first-year, female-majority cohort, embedding structured, small-group peer presentation early in the curriculum rather than reserving presentation-based assessment for later, more advanced courses appears to be a timely and practical strategy for cultivating communication skills that these students will need in their future roles as science educators (Tang, 2020; Jain, 2021). This complements evidence that PjBL also strengthens other professional competencies among preservice biology teachers, such as the ability to design digital learning media and think creatively (Widianingsih et al., 2025), suggesting that well-structured PjBL can support the parallel development of multiple competencies needed for future biology teaching. At the same time, the greater score variability in the experimental group suggests that instructors should not assume uniform benefit across all students; supplementary support, such as more deliberate rotation of group composition or targeted coaching for less engaged students, may help ensure that the gains associated with peer presentation are distributed more evenly.

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Some limitations should be acknowledged. The posttest-only design without a pretest limits the ability to fully rule out pre-existing differences between the two classes, although the use of purposive sampling from equivalent course sections partially addresses this concern. In addition, communication skills were measured through a self-report Likert-scale instrument, which may be subject to social desirability bias; future studies could complement this with rater-based assessment of actual presentation performance to corroborate the self-reported gains observed here.

CONCLUSION

This study investigated the effect of peer presentation on students' communication skills in a Project-Based Learning (PjBL) environment. The findings indicate that peer presentation significantly improves students' communication skills, with a medium effect size, suggesting that the intervention provides meaningful educational benefits beyond statistical significance. These findings support constructivist learning theory, which emphasizes learning through social interaction and active knowledge construction, while also reinforcing the principles of Project-Based Learning that promote collaboration, discussion, and authentic communication. Therefore, this study contributes to the growing body of evidence that structured peer presentation is an effective instructional strategy for developing communication competencies among biology education students.

From a practical perspective, the findings suggest that peer presentation should be integrated into project-based biology courses as a pedagogical strategy to enhance students' communication competence and active participation in collaborative learning. Nevertheless, this study was limited by its quasi-experimental design and implementation within a single institution, which may restrict the generalizability of the findings. Future research is recommended to employ more rigorous research designs, such as randomized controlled trials (RCTs), and longitudinal studies to examine the sustainability of the intervention's effects. Additionally, future studies should investigate the role of variables such as communication self-efficacy, biology content knowledge, collaborative skills, and learning motivation to provide a more comprehensive understanding of how peer presentation influences students' learning outcomes.

REFERENCES

Al Muhajir, M. (2025). Project-based assessment in biology learning: Enhancing student collaboration and creativity. *IJEA: International Journal of Education and Assessment, 1*(1), 40–48. https://journalpejuang.web.id/index.php/ijea/article/view/52

Arwita, W., Hasruddin, Ningsih, W., Mukra, R., & Rangkuty, S. M. (2025). Keterampilan komunikasi mahasiswa calon guru biologi melalui pembelajaran microteaching. *BIODIK, 11*(1), 110–117. https://doi.org/10.22437/biodik.v11i1.41644

Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Chang, H. Y., Chang, Y. J., & Tsai, M. J. (2024). Strategies and difficulties during students' construction of data visualizations. *International Journal of STEM Education, 11*(11), 1-22. https://doi.org/10.1186/s40594-024-00463-w

Crespí, P., García-Ramos, J. M., & Queiruga-Dios, M. (2022). Project-based learning (PBL) and its impact on the development of interpersonal competences in higher education. *Journal of New Approaches in Educational Research, 11*(2), 259–276. https://doi.org/10.7821/naer.2022.7.993

Deria, A., Fadilah, M., Nisa, I. K., Fortuna, A., Fajriansyah, B., Salsabila, P., & Junita, U. (2023). Effect of project-based learning (PjBL) learning model on creative thinking ability of high school

biology students: A literature review. *Pakar Pendidikan, 21*(1), 58–64. https://doi.org/10.24036/pakar.v21i1.288

Digarbayeva, A., Kaliyeva, A., Batayeva, D., Bakirova, K., & Koksal, E. A. (2024). Enhancing the professional skills of future biologists through laboratory training. *Journal of Advanced Academics, 35*(4), 752–771. https://doi.org/10.1177/1932202X241253448

Doyle, T. (2023). *Helping students learn in a learner-centered environment: A guide to facilitating learning in higher education*. Routledge. https://doi.org/10.4324/9781003445067

Eppler, E., Meyer, J., Serowy, S., Link, K., Pauk, B., & Filgueira, L. (2021). Enhancing scientific communication skills: A real-world simulation in a tertiary-level life science class using e-learning technology in biomedical literature perception, reflective review writing on a clinical issue, and self and peer assessments. *Research in Science Education, 51*(2), 277–299. https://doi.org/10.1007/s11165-018-9795-7

Ghosheh W, D., Najjar, E. A., Sartawi, A. F., Abuzant, M., & Daher, W. (2021). The role of project-based language learning in developing students' life skills. *Sustainability, 13*(12), 1-14. https://doi.org/10.3390/su13126518

González, S. A., & Vásquez, J. A. (2024). Higher education and professional performance: Gaps and opportunities for developing professional skills in marine biologist graduates. *Journal of Biological Education, 58*(5), 1481–1503. https://doi.org/10.1080/00219266.2023.2255198

Greenstein, L. M. (2012). *Assessing 21st century skills: A guide to evaluating mastery and authentic learning*. Corwin Press.

Hizqiyah, I. Y. N., Nugraha, I., Cartono, Ibrahim, Y., Nurlaelah, I., Yanti, M., & Nuraeni, S. (2023). The project-based learning model and its contribution to life skills in biology learning: A systematic literature network analysis. *JPBI (Jurnal Pendidikan Biologi Indonesia), 9*(1), 26–35. https://doi.org/10.22219/jpbi.v9i1.22089

Hujjatusnaini, N., Corebima, A. D., Prawiro, S. R., & Gofur, A. (2022). The effect of blended project-based learning integrated with 21st-century skills on pre-service biology teachers' higher-order thinking skills. *Jurnal Pendidikan IPA Indonesia, 11*(1), 104–118. https://doi.org/10.15294/jpii.v11i1.27148

Irfan, M., Sainab, & Fitrah. (2023). Tingkat literasi media digital pada mahasiswa pendidikan biologi di era revolusi industri 4.0. *Indonesian Journal of Educational Science (IJES), 5*(2), 95–103. https://doi.org/10.31605/ijes.v5i2.2396

Jain, A. K. (2021). Developing effective communication skills in students. *National Journal of Environment and Scientific Research*, *2*(10), 27–39. https://doi.org/10.53571/NJESR.2021.2.10.27-39

Kasperski, R., & Crispel, O. (2022). Preservice teachers' perspectives on the contribution of simulation-based learning to the development of communication skills. *Journal of Education for Teaching, 48*(5), 521–534. https://doi.org/10.1080/02607476.2021.2002121

Kiselyov, K., & Schunn, C. D. (2024). Peer-reviewed presentation exchange in an undergraduate classroom. *Journal of Microbiology and Biology Education, 25*(1), 1-14. https://doi.org/10.1128/jmbe.00067-23

Krange, I., Silseth, K., & Pierroux, P. (2020). Peers, teachers and guides: A study of three conditions for scaffolding conceptual learning in science centers. *Cultural Studies of Science Education, 15*(1), 241–263. https://doi.org/10.1007/s11422-018-9905-x

Kusuma, A. E., Wasis, Susantini, E., & Rusmansyah. (2022). The effect of RODE learning model on enhancing students communication skills. *Studies in Learning and Teaching, 3*(3), 132–140. https://doi.org/10.46627/silet.v3i3.170

Mulyati, E., Arsyad, M. R., Suryaningsih, S., Maryati, S., Gustina, L., Junianto, P., & Hidayati, S. (2024). *Pengantar SPSS: Teori, implementasi dan interpretasi*. CV Gita Lentera.

Owens, A. D., & Hite, R. L. (2022). Enhancing student communication competencies in STEM using virtual global collaboration project-based learning. *Research in Science & Technological Education, 40*(1), 76–102. https://doi.org/10.1080/02635143.2020.1778663

DOI: https://doi.org/10.17509/aijbe.v9i2.951
e-ISSN 2621-7260

Owens, D. C., Sadler, T. D., Barlow, A. T., & Smith-Walters, C. (2020). Student motivation from and resistance to active learning rooted in essential science practices. *Research in Science Education, 50*(1), 253–277. https://doi.org/10.1007/s11165-017-9688-1

Ping, I. L. L., Halim, L., & Osman, K. (2020). Explicit teaching of scientific argumentation as an approach in developing argumentation skills, science process skills and biology understanding. *Journal of Baltic Science Education, 19*(2), 276–288. https://doi.org/10.33225/jbse/20.19.276

Priadi, M. A., Jalmo, T., Sikumbang, D., & Meilinda, K. (2022). The effectiveness of Jigsaw cooperative learning model in developing students' oral communication skills and cognitive learning outcomes. *Assimilation: Indonesian Journal of Biology Education, 5*(1), 29–38. https://doi.org/10.17509/aijbe.v5i1.44112

Prosenjak, B., & Lučev, I. (2020). The impact of peer assessment on the attainment level of oral presentation skills. *Language Value, 12*(1), 30–55. https://doi.org/10.6035/LanguageV.2020.12.3

Rahman, M. H. A., Jaafar, J., & Huda, M. (2024). Information and communication skills for higher learners competence model. In *Computational methods in systems and software* (pp. 357–375). Springer. https://doi.org/10.1007/978-3-031-53549-9_36

Rezaei, A. R. (2023). Comparing strategies for active participation of students in group discussions. *Active Learning in Higher Education, 24*(3), 337–351. https://doi.org/10.1177/14697874221075719

Sembiring, D. A. E. P., & Yusuf, M. (2025). How do students understand biological concepts? A study on science literacy in basic education. *Jurnal Sinar Edukasi, 6*(3), 207–222. https://doi.org/10.61346/jse.v6i03.289

Sobach, N. V., Marpaung, R. R. T., Maulina, D., & Yolida, B. (2023). The effect of project-based learning model assisted by interactive digital modules on scientific literacy in biotechnology topic in 9th grade of junior high school. *Assimilation: Indonesian Journal of Biology Education, 6*(2), 133–140. https://doi.org/10.17509/aijbe.v6i2.61482

Soysal, Y. (2026). Uncovering the potential of epistemic practice demands embedded in biology curriculum learning outcomes. *Journal of Biological Education*, 1–44. https://doi.org/10.1080/00219266.2026.2652864

Sulianta, F. (2024). *Teknik presentasi & interpersonal skills*. Self-published.

Tang, K. N. (2020). The importance of soft skills acquisition by teachers in higher education institutions. *Kasetsart Journal of Social Sciences, 41*(1), 22–27. https://doi.org/10.1016/j.kjss.2018.01.002

Titin, Wahyuni, E. S., Komaria, S., Ayu, N. A. K., & Wilma. (2023). Deskripsi kemampuan komunikatif dan kolaboratif mahasiswa pendidikan biologi melalui penerapan model pembelajaran Project Based Learning. *Bioscientist: Jurnal Ilmiah Biologi, 11*(2), 1482–1492. https://doi.org/10.33394/bioscientist.v11i2.9318

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Widianingsih, A. A., Supriatno, B., & Suwandi, T. (2025). The profile of pre-service biology teacher students' ability to design digital learning media and its correlation with creative thinking skills. *Assimilation: Indonesian Journal of Biology Education*, *8*(2), 121-136. https://doi.org/10.17509/aijbe.v8i2.85722

Zhang, K. E., & Jenkinson, J. (2024). The visual science communication toolkit: Responding to the need for visual science communication training in undergraduate life sciences education. *Education Sciences, 14*(3), 1-29. https://doi.org/10.3390/educsci14030296

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