



Increasing Biology Learning Activity Through the Project Based Learning Model with the Culturally Responsive Teaching (CRT) Approach

Dian Rifkanita^{1*}, Lilies Tangge¹, Nurhaidah Nurhaidah²

¹Teacher Professional Education, Faculty of Teacher Training Education, Tadulako University

²SMA Negeri 6 Palu

Received: September 10, 2025. Revised: September 21, 2025. Accepted: October 15, 2025.

First Available Online: October 27, 2025. Publication Date: October 31, 2025.

DOI: 10.61142/esj.v3i3.257

*Corresponding author: dianrifkanitappg@gmail.com

Keywords :

Project Based Learning,
Culturally Responsive
Teaching, Learning
Activeness

ABSTRACT

This study is a Classroom Action Research (CAR) that aims to improve the activeness of Grade X Melati students at SMA Negeri 6 Palu through the implementation of the Project-Based Learning (PjBL) model with a Culturally Responsive Teaching (CRT) approach. The research was conducted in two learning cycles, each consisting of the stages of planning, implementation, observation, and reflection. The subjects of the study were 31 students. The research instruments included student learning activeness observation sheets and a student learning activeness questionnaire. Data analysis was carried out by reflecting on observation results and calculating the scores obtained for each activeness indicator. The findings revealed an increase in student learning activeness from the pre-cycle to Cycle I and Cycle II. In the pre-cycle, the average percentage of activeness was only 51%, which then increased to 66% in Cycle I, categorized as moderately active. In Cycle II, the percentage further increased to 88%, categorized as highly active. These results indicate that the PjBL model integrated with the CRT approach significantly enhanced students' learning activeness. These findings imply that the integration of the PjBL model with a CRT approach has the potential to be applied beyond specific subjects and across

different educational levels, fostering participatory, contextual, and culturally responsive learning.

INTRODUCTION

The 21st-century learning paradigm emphasizes that students should be able to think critically, connect knowledge to real-life contexts, communicate effectively, and collaborate (Priantari et al., 2020). One of the main challenges in today's educational landscape is how to design learning that is not only teacher-centered but also fosters students' activeness in acquiring and processing information (Lara & Syamsurizal, 2024). One instructional model proven to be effective in enhancing student activeness is Project-Based Learning (PjBL). Research conducted by (Widyaningrum & Hartarini, 2024) demonstrated that PjBL significantly improves students' critical thinking scores through active engagement in meaningful projects. Similarly, findings by (Jannah et al., 2023) revealed that the implementation of the Project-Based Learning model led to improvements in students' critical thinking skills and learning outcomes.

Project-Based Learning (PjBL) emerges as an effective alternative to position students as active learners by engaging them in designing and completing real-world projects that integrate knowledge and skills (Setiawan et al., 2022). The project-based model enhances student engagement in authentic real-world contexts compared to non-real-world settings (Chang et al., 2024). According to (Fitri et al., 2024) PjBL is among the most effective models for fostering high levels of creativity, enabling students to solve everyday problems by following the PjBL syntax. Findings from (Zhong et al., 2025) also indicate that project-based learning significantly enhances students' emotional, behavioral, and cognitive engagement. Furthermore, a literature review by (Rofieq et al., 2019) emphasized that PjBL is effective in improving student activity and conceptual understanding in biology learning.

The application of Project-Based Learning (PjBL) can be enriched with the Culturally Responsive Teaching (CRT) approach to make it more relevant and inclusive. A study by (Putri et al., 2025) revealed that CRT enhances student engagement in learning environments with high cultural diversity. In the international context, (Aina Fahadah & Jame Thomps, 2025) found that culturally responsive pedagogy significantly improves students' academic engagement as well as equity in multicultural settings. Similarly (Whatoni et al., 2024) emphasized that the CRT approach is effective in creating culturally relevant learning environments, fostering learning interest, and improving student outcomes.

Based on preliminary observations through interviews with the supervising biology teacher of Grade X Melati at SMA Negeri 6 Palu in the 2025/2026 academic year, various issues were identified that potentially hinder the learning process. The main problem observed in Grade X Melati was the low level of student activeness during lessons. In addition, some students still demonstrated low critical thinking skills. This condition highlights the urgency of implementing more appropriate instructional strategies. Educational strategies need to evolve to integrate digital tools and learning models that foster curiosity, reflection, and collaboration (Muawanah et al., 2025).

The strategy proposed in this study is the integration of PjBL and CRT to create a synergy that enhances student activeness. PjBL encourages active engagement through concrete projects, while CRT provides cultural relevance that strengthens students' intrinsic motivation to participate. At SMA Negeri 6 Palu, where students come from diverse cultural backgrounds, the application of PjBL combined with CRT is expected to foster a more active and inclusive learning environment. By integrating projects based on local cultural contexts into biology learning, students are expected to become more motivated, feel valued, and actively engage in the learning process. The research problem in this study is how the implementation of the Project-Based Learning model integrated with the Culturally Responsive Teaching (CRT) approach in biology learning at SMA Negeri 6 Palu can improve student activeness. Based on this problem statement, the study aims to examine the effectiveness of the Project-Based Learning model integrated with the Culturally Responsive Teaching (CRT) approach in enhancing students' activeness in biology learning at SMA Negeri 6 Palu.

METHOD

This research adopted the Classroom Action Research (CAR) approach. As stated by (Azizah, 2021), CAR is a systematic inquiry carried out by teachers with the aim of improving learning quality while also advancing their professional competence. PjBL highlights students' active involvement by engaging them in contextual projects that stimulate creativity, critical thinking, and higher participation in classroom activities (Fitri et al., 2024). To strengthen this model, the researcher incorporated the Culturally Responsive Teaching (CRT) approach. (Lesnussa et al., 2024) have shown that CRT-based instructional designs are effective in increasing students' activeness in learning. Thus, combining PjBL with CRT within the CAR framework is considered highly appropriate, as each component plays a complementary role: CAR functions as a method for systematic improvement, while PjBL with CRT provides a learning strategy that fosters active and meaningful student engagement.

This research was initiated based on real problems identified in the classroom, followed by the search for alternative solutions, which were then implemented through planned and systematic actions. The implementation of CAR followed several stages: planning, implementation, observation/evaluation, and reflection. Each sequence of these stages is referred to as one cycle. In this study, two cycles were carried out, with the provision that the cycle would end when the research objectives had been achieved as planned. The detailed research procedure is illustrated in figure 1.

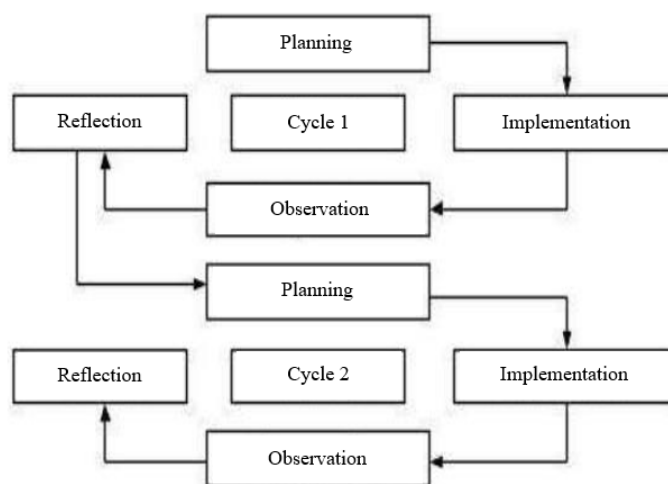


Fig 1. Classroom Action Research (Lesnussa et al., 2024)

This study was conducted at SMA Negeri 6 Palu during April–May 2025. The Classroom Action Research (CAR) aimed to enhance students' activeness, with the expectation of improving the overall classroom learning process.

Research Subjects

The subjects of this study were Grade X students of SMA Negeri 6 Palu in the second semester of the 2025/2026 academic year. A total of 31 students participated, consisting of 20 female and 11 male students.

Research Instruments

The research instruments consisted of student learning activeness observation sheets and a student learning activeness questionnaire. These instruments were utilized by the researcher/observer teacher to assess students' activeness during the learning process. The observation sheet used to evaluate student activeness in classroom activities is presented in the following Table 1.

Table 1. Student Learning Activeness Observation Sheet (Lesnussa et al., 2024)

No	Indicators of Learning Activeness	Assessment Aspects
1	Attention	Students respond to greetings and participate in prayers Students listen to and pay attention to the teacher's explanation Students pay attention to the material explanation given by the tutor
2.	Collaboration and Social Interaction	Students collaborate with the tutor during group discussions Students actively participate in solving problems within the group Students respect the opinions of group members Students confidently express their opinions to the tutor
3.	Expressing Ideas	Students respond to questions or instructions from the teacher or tutor
4.	Problem-Solving	Students ask questions to the teacher or tutor Students complete the problems provided in the student worksheet (LKK) accurately and correctly Students ask the teacher for assistance when facing difficulties in solving worksheet problems. Students ask the tutor for clarification on materials or questions they do not yet understand.
5.	Discipline	Students maintain order during group discussions Students present discussion results in an orderly manner. Students maintain composure during group presentations.

Research Procedure

The research was conducted in two cycles, each consisting of two sessions, and each cycle included four main stages: planning, action, observation, and reflection. In Cycle I, the researcher began by planning to implement the Project-Based Learning (PjBL) model through a Culturally Responsive Teaching (CRT) approach that integrates cultural elements. During this stage, the researcher prepared lesson modules, student worksheets, and instructional materials for Grade X Biology, focusing on the topic of environmental change. The action stage involved incorporating cultural elements into both the introductory and core activities while conducting lessons in accordance with the PjBL syntax. Students were encouraged to actively collaborate in completing their projects. In this cycle, the researcher taught the subtopics of organic and inorganic waste and their utilization over two meetings. Students presented their findings on the types of waste found around the school environment and began planning a project related to inorganic waste.

During the observation stage, the researcher closely monitored the learning process, recorded student responses and participation during group activities, and collected formative assessment data related to student learning outcomes. The reflection stage involved evaluating the results of the interventions, identifying both the successes and the challenges encountered. Based on this reflection, the researcher decided to proceed to Cycle II, as student activeness had not yet reached the desired level.

In Cycle II, the planning stage focused on improving student activeness by adding instructional videos and a word wall as supplementary media for the continuation of the topic on inorganic waste utilization. This decision was based on the findings from Cycle I, which showed that student engagement remained suboptimal. The researcher expected that the integration of videos and word wall media would foster greater participation and enthusiasm. The action stage involved presenting interactive learning videos to stimulate engagement and introducing the word wall as a creative and

meaningful learning tool. The PjBL model and the culturally responsive approach were consistently maintained throughout this cycle.

During the observation stage, the researcher noted an increase in student activeness based on classroom observations. Finally, in the reflection stage, it was concluded that student activeness could be effectively enhanced through the implementation of the PjBL model integrated with the CRT approach. Students became more involved in developing projects related to inorganic waste, demonstrating greater participation and enthusiasm in the learning process.

Data Analysis

In classroom action research, data analysis is carried out from the beginning at each stage of the activity. The collected data include observations, questionnaires, and documentation, which are then converted into scores or numerical values. Therefore, the technique used is descriptive analysis with percentages. In addition, the analysis is also based on reflection in each cycle so that the results can serve as a reference for improving the learning process in subsequent cycles. The analysis of observation data on students' activeness was conducted by reflecting on the observation results, calculating the scores obtained for each indicator, and then comparing them with the maximum score. The percentage of students learning engagement can be determined using the following formula:

$$P = \frac{f}{N} \times 100\%$$

Explanation:

P = Percentage value

f = Frequency being calculated

N = Number of cases (total frequency/number of individuals)

(Anas Sudijono, 2006 in (Lesnussa et al., 2024))

The success criteria are presented in Table 2 below. Students are considered active if more than 75% of them achieve the *Active* category (Lesnussa et al., 2024).

Table 2. Criteria for Student Learning Activeness

Level of Activeness	Category
85,01%–100%	Very Active
75,01%–85,00%	Active
65,01%–75,00%	Moderately Active
55,00%	Very Inactive

Success Criteria

Criteria serve as benchmarks for assessing the success of an activity or program. An activity is considered successful when it meets the predetermined standards and is deemed unsuccessful when it does not. In classroom action research, success is reflected through observable improvements in both teachers and students. The measure of success is determined by comparing the results obtained before and after the intervention. This research began with a pre-cycle stage, followed by Cycle I and subsequent cycles, and was concluded once the targeted objectives had been achieved. This process formed the foundation for evaluating and interpreting the outcomes of the implemented interventions.

In this study, the success criteria were established based on several indicators. First, the learning process on the topic of environmental change had to be implemented in accordance with the planned activities, particularly in utilizing students' cognitive levels effectively. Second, the percentage of students categorized as active learners needed to reach at least 75%. This aligns with Mulyasa (2008, in Lesnussa et al., 2024), who stated that, in terms of process, learning can be considered successful and of high quality if all or at least the majority (75%) of students are actively engaged in learning activities. Third, student activeness was measured through five key indicators, namely attention, collaboration and social interaction, ability to express opinions or ideas, problem-solving skills, and discipline.

RESULTS AND DISCUSSIONS

RESULTS

This section presents the findings of a study that applied the Project-Based Learning (PjBL) model combined with the CRT approach on the topic of environmental change for Grade X Melati at SMA Negeri 6 Palu. The development of students' learning engagement from the pre-cycle phase through Cycle I and Cycle II is shown in the figure 2 and figure 3.

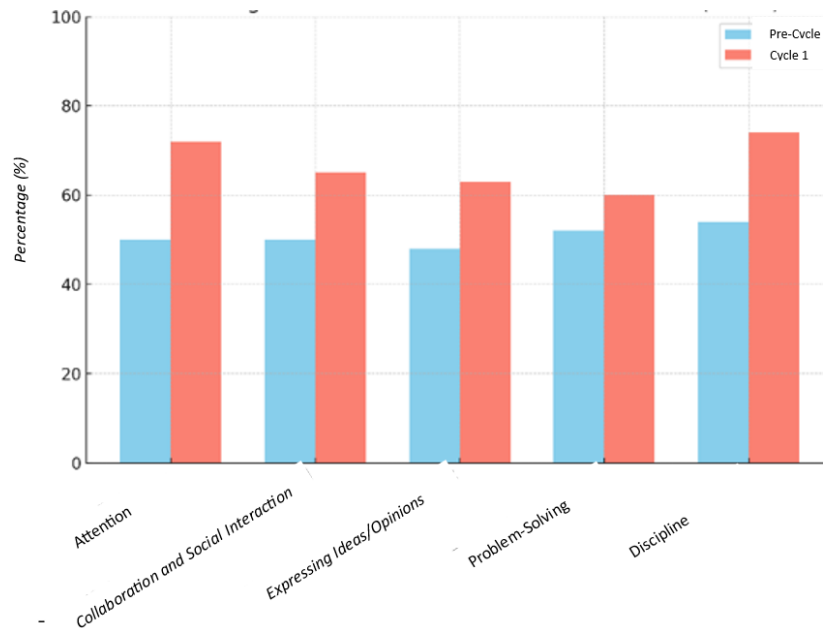


Figure 2. Graph of Students' Activeness in the Pre-cycle and Cycle I

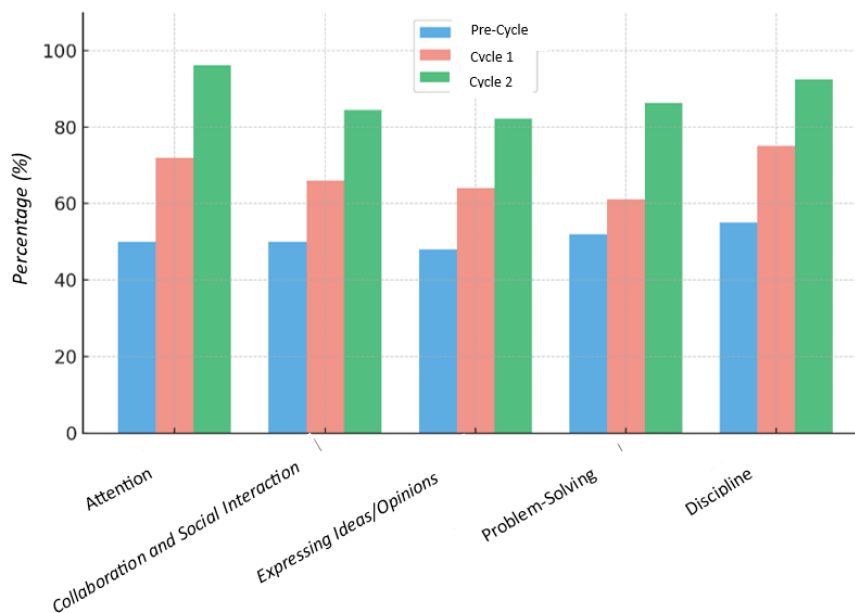


Figure 3. Graph of Students' Activeness in The Pre-cycle, Cycle I, and Cycle II

DISCUSSIONS

The findings of this classroom action research were carried out in two cycles: Cycle I and Cycle II. This phase was completed in Cycle II as students' engagement in biology learning had shown significant improvement and the previously identified classroom issues had been addressed. In this study, the researcher integrated the Project-Based Learning model with the (CRT) methodology. This aligns with the findings of (Yanti et al., 2025) who emphasized that combining PjBL with CRT can enhance students' activeness to the "active" level in biology learning. The learning activities involved students in designing projects related to different types of inorganic waste. This approach was not only aimed at promoting active participation but also at increasing students' environmental awareness. As noted by (Zulfana et al., 2025) By embedding elements of the school environment into instructional activities, students' engagement can be heightened, simultaneously promoting a deeper and more comprehensive grasp of scientific principles. Moreover, effective learning should bridge scientific knowledge with real-life contexts (Rizal & Alberida, 2024).

Cycle I

The observational findings from Cycle I (see Figure 2) present the development of students' learning activeness from the pre-cycle stage to the first cycle. During the pre-cycle, students' activeness was still categorized as low, with an overall average of 51%. The scores for each indicator were as follows: attention (50%), collaboration and social interaction (50%), expressing opinions (48%), problem-solving (52%), and discipline (53%). In Cycle I, the results indicated progress: attention increased to 72.04%, collaboration and social interaction reached 64.52%, expressing opinions achieved 62.78%, problem-solving was 59.68%, and discipline improved to 73.66%. The overall average rose to 66%, placing students in the "fairly active" category. Although these results show improvement compared to the pre-cycle, the outcomes were not yet optimal since the average score remained below 75%, the threshold for the "active" category. Consequently, a follow-up action plan was prepared for Cycle II. The plan included designing a more detailed lesson plan, developing student worksheets, incorporating a word wall medium, using an instructional video on inorganic waste management within a project-based learning framework, and preparing research instruments along with observation sheets to gather data throughout the learning process.

Cycle II

The observational results in Cycle II (see Figure 3) demonstrate a marked improvement in all indicators when compared with Cycle I. Specifically, attention reached 96.24%, collaboration and social interaction 84.41%, expressing ideas or opinions 82.26%, problem-solving 86.29%, and discipline 92.47%. The overall average rose to 88%, which falls into the "very active" category of student activeness. These findings confirm that applying the Project-Based Learning model in combination with the CRT approach successfully increased students' participation in biology learning, with the average score rising from 66% in Cycle I to 88% in Cycle II. This progress was largely supported by the integration of animated instructional videos on waste management projects that incorporated students' cultural backgrounds, making it easier for them to design and comprehend their projects. Furthermore, the addition of an interactive word wall enhanced students' focus and engagement, resulting in a more active, interactive, and meaningful learning experience.

These results align with earlier research (Yanti et al., 2025) reported that the project-based integration with the CRT approach successfully improved students' activeness in biology learning to the "active" level. Likewise, (Annisya Nuraini Rahmawati et al., 2024) found that student activeness in basic mathematics increased substantially, moving from "less active" (38.34%) to "active" (82.08%) after the use of PjBL. Similar evidence was presented by (Nurhayati et al., 2023) who showed that PjBL was effective in fostering student participation in elementary social studies. In addition, (Lesnussa et al., 2024) highlighted that culturally responsive teaching strategies contribute positively to enhancing student activeness. (Johnson, 2022) further explained that the core idea of CRT is to use students' cultural backgrounds as the foundation for the teaching process. According to (Alhanachi et al., 2021) CRT becomes more impactful when accompanied by collaborative and ongoing professional development for teachers. Moreover, (Pevac-Zimmer et al., 2024) emphasized that CRT not only increases teachers' confidence in working with culturally diverse students but also equips them to engage with cultural issues in the classroom.

Comparative analyses of CRT implementation across several studies reveal consistent findings, the approach positively influences learning by enhancing student engagement. Notably, a randomized controlled trial by (Debnam et al., 2024) demonstrated significant gains in teachers' self-efficacy in culturally responsive practices, classroom instructional support, and student engagement indicators. A subsequent study by (Anyichie et al., 2023) confirmed that students from diverse cultural backgrounds exhibited greater engagement when teachers integrated culturally responsive pedagogical practices with other instructional strategies. Meanwhile, the study conducted by (Sanchez-Garcia & Reyes-de-Czar, 2025) on the implementation of PjBL concluded that the success of PBL is largely influenced by the project stages, the availability of resources, and the context of implementation. However, the study paid less attention to the role of teachers, student characteristics, and institutional support. Similarly, when compared to that study, the present research also places limited emphasis on the aspect of institutional support.

CONCLUSION AND SUGGESTION

Based on the findings of this study, it can be concluded that the implementation of the Project-Based Learning model with a CRT approach in Grade X Melati at SMA Negeri 6 Palu effectively increased student activeness from 51% in the pre-cycle, to 66% in Cycle I, and finally to 88% in Cycle II. Therefore, it is recommended that the PjBL model with CRT be applied in teaching and learning processes, particularly in addressing the issue of low student activeness. Due to the limited duration of this study, future research is encouraged to incorporate more interactive learning media and to evaluate the effectiveness of the instructional tools employed. This model can also be applied in other schools with diverse student backgrounds, and the use of digital Word Wall media may be further developed to enrich learning experiences and strengthen cultural relevance in various instructional contexts.

REFERENCES

- Aina, F., & Thomps, J. (2025). Exploring the role of culturally responsive pedagogy in promoting equity across diverse educational environments. *International Journal of Post Axial: Futuristic Teaching and Learning*, 3(2), 97–108. <https://doi.org/10.59944/postaxial.v3i2.445>
- Alhanachi, S., de Meijer, L. A. L., & Severiens, S. E. (2021). Improving culturally responsive teaching through professional learning communities: A qualitative study in Dutch pre-vocational schools. *International Journal of Educational Research*, 105, 101698. <https://doi.org/10.1016/j.ijer.2020.101698>
- Rahmawati, A. N., Rosanawati, I. M. R., & Sadino. (2024). Implementasi model Project Based Learning (PjBL) untuk meningkatkan keaktifan dan hasil belajar siswa pada pembelajaran matematika. *Edudikara: Jurnal Pendidikan dan Pembelajaran*, 9(3), 91–98. <https://doi.org/10.32585/edudikara.v9i3.361>
- Anyichie, A. C., Butler, D. L., & Nashon, S. M. (2023). Exploring teacher practices for enhancing student engagement in culturally diverse classrooms. *Journal of Pedagogical Research*, 7(5), 183–207. <https://doi.org/10.33902/JPR.202322739>
- Azizah, A. (2021). Pentingnya penelitian tindakan kelas bagi guru dalam pembelajaran. *Auladuna: Jurnal Prodi Pendidikan Guru Madrasah Ibtidaiyah*, 3(1), 15–22. <https://doi.org/10.36835/au.v3i1.475>
- Chang, Y., Choi, J., & Şen-Akbulut, M. (2024). Undergraduate students' engagement in project-based learning with an authentic context. *Education Sciences*, 14(2). <https://doi.org/10.3390/educsci14020168>
- Debnam, K. J., Kaihoi, C. A., Pas, E. T., & Bradshaw, C. P. (2024). A school-wide approach to cultural responsiveness and student engagement: A randomized trial of Double Check in middle schools. *Journal of School Psychology*, 107, 101362. <https://doi.org/10.1016/j.jsp.2024.101362>
- Fitri, R., Lufri, L., Alberida, H., Amran, A., & Fachry, R. (2024). The project-based learning model and

- its contribution to student creativity: A review. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 10(1), 223–233. <https://doi.org/10.22219/jpbi.v10i1.31499>
- Jannah, S. R., Munandar, K., Wadiono, G., & Aisah, D. N. (2023). Peningkatan kemampuan berpikir kritis dan hasil belajar biologi dengan model PjBL dan pendekatan CRT. *Jurnal Biologi*, 1(4), 1–11. <https://doi.org/10.47134/biology.v1i4.1994>
- Johnson, A. P. (2022). Culturally responsive teaching in higher education. *The International Journal of Equity and Social Justice in Higher Education*, 1(1). <https://doi.org/10.56816/2771-1803.1008>
- Lara, M., & Syamsurizal, S. (2024). Pengaruh model PBL (Problem Based Learning) terhadap hasil belajar siswa pada mata pelajaran biologi. *Jurnal El-Hamra: Kependidikan dan Kemasyarakatan*, 9(2), 27–37. <https://doi.org/10.62630/elhamra.v9i2.179>
- Lesnussa, A. A. A., Saenab, S., & Rosdiana. (2024). Penerapan model discovery learning dengan pendekatan culturally responsive teaching (CRT) menggunakan media kartu untuk meningkatkan keaktifan belajar IPA di SMP Negeri 3 Makassar. *Jurnal Pemikiran dan Pendidikan*, 4(4), 566–575.
- Muawanah, R., Fitri, A., Ridho, A., Badriyah, N., & Zahro, F. (2025). A literature review on the effectiveness of problem-based learning in enhancing biology students' problem-solving skills and learning outcomes. *Equator Science Journal*, 3(2), 72–78. <https://doi.org/10.61142/esj.v3i2.207>
- Nurhayati, H., Handayani, L., & Wdiarti, N. (2023). Keefektifan model Project Based Learning untuk meningkatkan keaktifan belajar siswa pada pelajaran IPS sekolah dasar. *Jurnal Basicedu*, 7(3), 1716–1723. <https://doi.org/10.31004/basicedu.v7i3.5384>
- Pevac-Zimmer, S., Juang, L. P., & Schachner, M. K. (2024). Promoting awareness and self-efficacy for culturally responsive teaching of pre-service teachers through the Identity Project – A mixed methods study. *Identity*, 24(4), 288–306. <https://doi.org/10.1080/15283488.2024.2344086>
- Priantari, I., Prafitasari, A. N., Kusumawardhani, D. R., & Susanti, S. (2020). Improving students' critical thinking through STEAM-PjBL learning. *Bioeducation Journal*, 4(2), 95–103. <https://doi.org/10.24036/bioedu.v4i2.283>
- Rizal, R., & Alberida, H. (2024). Pengaruh model Problem Based Learning (PBL) terhadap kemampuan berpikir kreatif peserta didik pada pembelajaran biologi. *Al-Alam: Islamic Natural Science Education Journal*, 3(1), 35–43. <https://doi.org/10.33477/al-alam.v3i1.6855>
- Rofieq, A., Latifa, R., Susetyarini, E., & Purwatiningsih. (2019). Project-based learning: Improving students' activity and comprehension through lesson study in senior high school. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 5(1), 41–50. <https://doi.org/10.22219/jpbi.v5i1.7456>
- Sánchez-García, R., & Reyes-de-Cózar, S. (2025). Enhancing project-based learning: A framework for optimizing structural design and implementation — A systematic review with a sustainable focus. *Sustainability (Switzerland)*, 17(11), 1–24. <https://doi.org/10.3390/su17114978>
- Setiawan, A., Suhendar, & Ramdhan, B. (2022). Penggunaan model pembelajaran Project Based Learning untuk meningkatkan kemampuan komunikasi interpersonal siswa kelas VIII mata pelajaran IPA di MTs Raudhatul Ikhwan. *Report of Biological Education*, 3(1), 33–44.
- Whatoni, A. S., Anwar, Y. A. S., & Namira, D. (2024). Penerapan pendekatan culturally responsive teaching untuk meningkatkan hasil belajar dan minat belajar kimia peserta didik. *Didaktika: Jurnal Penelitian Tindakan Kelas*, 2(1), 22–28. <https://doi.org/10.63757/jptk.v2i1.13>
- Widyaningrum, A., & Hartarini, Y. M. (2024). Improving students' critical thinking through Project-Based Learning (PBL). *EduLite: Journal of English Education, Literature and Culture*, 9(1), 97–108. <https://doi.org/10.30659/e.9.1.97-108>
- Yanti, R., Rompegading, A. B., Aminah, S., & Irfandi, R. (2025). Peningkatan aktivitas belajar siswa pada mata pelajaran biologi melalui model Project Based Learning (PjBL) berbasis pendekatan Culturally Responsive Teaching (CRT). *Venn: Journal of Education and Learning*, 4(3), 139–145. <https://doi.org/10.53696/venn.v4i3.278>
- Zhong, J., Ismail, L., & Lin, Y. (2025). Investigating EFL students' engagement in project-based speaking activities: From a multi-dimensional perspective. *Frontiers in Psychology*, 16(June), 1–13. <https://doi.org/10.3389/fpsyg.2025.1598513>
- Zulfana, Z., Nurdin, M., & Agni, R. (2025). The school environment as a contextual learning strategy: Its impact on junior high school students' interest in learning biology. *Equator Science Journal*,

3(2), 65–71. <https://doi.org/10.61142/esj.v3i2.176>