



Efforts to Improve Creative Thinking Skills and Communication Skills Through the Application of Project Based Learning Models

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Abstract: This study aims to improve students' creative thinking and written communication skills through the application of project-based learning methods (PjBL) on alternative energy materials. The study was conducted at MAN 2 Pekanbaru City, class X.5, involving 36 students. This classroom action research was carried out in two cycles, each consisting of planning, implementation, evaluation, and reflection. The instruments used included teaching modules, student worksheets (LKPD), observation sheets, and test questions. The results showed a significant increase in students' creative thinking skills. In cycle I, the fluency indicator reached 76%, flexibility 73%, originality 36%, and elaboration 63%. In cycle II, each indicator increased to 78%, 87%, 76%, and 87%. Written communication skills also increased, with the dimension of changing the form of data presentation increasing from 72% in cycle I to 78% in cycle II, and the accuracy of using tables and graphs from 79% to 87%. The PjBL method provides opportunities for students to be actively involved in learning through project activities that encourage creative thinking and effective communication. The results of this study indicate that the PjBL method is effective in improving students' cognitive and communication skills, although it requires further adjustments related to classroom management.

Keywords: Alternative energy; Creative thinking skills; Physics learning; Project-based learning; Written communication

Introduction

Education is one of the most important components in human life in facing the challenges of living in society and global challenges (Firdausih & Aslan, 2024; Santos et al., 2023). According to Suwarno (2006), education is an investment in the future of the nation. In the era of globalization marked by rapid technological developments, creative thinking and communication skills are becoming increasingly crucial. The results of the PISA 2022 survey show that Indonesia still has challenges in terms of students' creative thinking and communication skills, especially in the context of science (Purwanti et al., 2024; Romli et al., 2024).

Physics learning, as a branch of natural science that is abstract, is often considered difficult by students (Haryadi & Pujiastuti, 2022; Munfaridah et al., 2021). This has an impact on students' low interest in learning and less than optimal achievement of learning outcomes. In addition, the results of the national assessment show that students' ability to interpret information and draw conclusions still needs to be improved (OECD, 2016).

MAN 2 Pekanbaru City as one of the schools that will represent Indonesia in the PISA 2025 event, has great potential to improve the quality of learning. However, based on the report on the results of the national assessment, students' creative thinking and communication skills at this school still need to be improved (Astuti et al., 2022; Sari et al., 2023).

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Creative thinking skills need to be trained in students so that they are able to see in many directions and are able to generate new ideas (Asmara et al., 2015; Nurkhin et al., 2020). Creative thinking skills are a way of thinking that can produce ideas, something new or different from what has existed before in solving problems (Malik et al., 2019).

Afriani et al. (2019) said that communication skills in students are very important because in social interactions they can influence conditions and situations to be better if they are able to explain both verbally and in writing in the learning process. Especially in written communication, students are able to practice critical thinking skills, make learning more consistent, and can develop communication to be more effective (Quitadamo & Kurtz, 2007).

The learning model is a design that contains a description of the learning process carried out by teachers in learning in order to transfer knowledge to students. There are many models, approaches, and methods that can be used in the learning process, especially to improve critical thinking and communication skills, one of which is the Project Based Learning (PjBL) learning model (Andini & Rusmini, 2022; Oktavia & Ridlo, 2020; Putri et al., 2021).

Therefore, this study aims to improve students' creative thinking and written communication skills through the application of the Project Based Learning (PjBL) learning model in physics learning at MAN 2 Pekanbaru City.

Method

This study aims to measure the improvement of students' creative thinking and written communication skills after the implementation of the Project Based Learning (PjBL) learning model on physics material in class X MAN 2 Pekanbaru City. As a research method, Classroom Action Research with the Kemmis and McTaggart model was chosen. This model allows researchers to make continuous improvements to the learning process (Firmansyah & others, 2024; Rabgay & Kidman, 2023).

Broadly speaking, this study goes through four main stages. First, the planning stage includes the preparation of learning devices, research instruments, and learning plans. Second, the action stage is carried out by implementing learning using the PjBL model. Third, the observation stage is carried out to observe the learning process and collect data. Finally, the reflection stage is carried out to analyze the data obtained and plan improvements for the next cycle.

The subjects of the study were students of class X.5 MAN 2 Pekanbaru City. The instruments used included

teaching modules, student worksheets, creative thinking and written communication skills tests, and assessment rubrics. Data were collected through tests, observations, and documentation. Data analysis was carried out through instrument validity tests, descriptive analysis, and statistical tests.

The results of the study are expected to provide information on the effectiveness of the PjBL model in improving students' creative thinking and written communication skills. Thus, this research can contribute to the development of physics learning that is more effective and relevant to the needs of students in the modern era.

Result and Discussion

This research was conducted at MAN 2 Pekanbaru City in class X.5 consisting of 36 students (17 males and 19 females). The learning process in this class uses digital technology, and the research focuses on the application of project-based learning methods (PjBL) to improve students' creative thinking and written communication skills. This research was conducted in two cycles with each cycle involving planning, implementation, evaluation, and reflection.

Instrument Validation

Various instruments, including teaching modules, student worksheets (LKPD), observation sheets, and test questions, were validated by three validators. The validation results showed that the teaching modules and LKPD obtained an average Aiken's V validity index of 0.83 with very high criteria. Observation sheets and test questions were also declared valid for use.

Cycle I

In cycle I, students carried out two projects, namely making simple biogas and miniature wind power plants (PLTB). The evaluation showed that creative thinking indicators such as fluency (76%) were quite good, but the originality indicator (36%) was very low. This indicates that students still have difficulty in generating original ideas and developing ideas in depth. While for written communication skills, dimensions such as changing the form of data presentation reached 72%, while the accuracy of using tables and graphs reached 79%.

Cycle II

In cycle II, the project carried out was the creation of a miniature hydroelectric power plant (PLTA) and solar power plant (PLTS). There was a significant increase in all indicators of creative thinking, including originality which increased to 76%. This was influenced by improvements made in cycle II, namely by providing more opportunities for students to think independently

and providing more specific feedback, there was a significant increase in the other three indicators. Students showed better abilities in generating diverse ideas, developing ideas in more detail, and connecting one concept to another.

Written communication skills also showed improvement, with the dimension of accuracy in the use of tables and graphs reaching 87%. This shows that students are becoming more skilled in presenting data in various forms, using appropriate language, and constructing logical arguments. This improvement can be seen from students' ability to write more structured and systematic project reports.

Comparison of Cycles I and II

The increase in creative thinking and written communication skills is summarized in the Table 1. In Table 1, there is an increase in the percentage of creative thinking ability assessment scores in cycles I and II. The fluent thinking indicator increased by 2%, flexible thinking increased by 14%, original thinking increased quite significantly by 40%, while the elaborating indicator increased by 24%.

In Table 2, there is an increase in the percentage of written communication skills assessment scores in cycle

I and cycle II. In the dimension of Changing the form of data presentation increased by 6%, Accuracy of use of notation, vocabulary, sketches, graphs, tables and images increased by 8%, Suitability of writing solution steps with the problems presented increased quite significantly by 21%, while in the dimension of Making conclusions increased by 15%.

Table 1. Comparison of Creative Thinking Indicators

Indicators	Cycle I (%)	Cycle II (%)	Improvement (%)
Fluency	76	78	2
Flexibility	73	87	14
Originality	36	76	40
Elaboration	63	87	24

The results of the study showed that the PjBL method was effective in improving students' creative thinking and written communication skills. This learning model provides opportunities for students to build knowledge and develop their skills (Alka Kianda et al., 2024). This is in line with their research which states that there is an increase in students' creative thinking and written communication skills after using the PjBL learning model.

Table 2. Comparison of Written Communication Dimensions

Dimensions	Cycle I (%)	Cycle II (%)	Improvement (%)
Changing the form of data presentation	72	78	6
Accurate use of tables and graphs	79	87	8
Suitability of completion steps	65	86	21
Make conclusions	71	86	15

The PjBL learning model also supports students' creative thinking skills because it provides new ideas and applies them in solving problems (Hikmah et al., 2023; Zulyusri et al., 2023) based on the results of creative thinking which can also improve students' communication skills in learning when producing products from the projects they work on (Ariyani et al., 2019; Undari et al., 2023). Based on these results, the researcher stopped the research in cycle II. However, the limitations of the study include the large number of students, making it difficult to condition the class.

Influencing Factors

Some factors that are thought to influence the improvement of students' abilities after the implementation of PjBL are: active Student Involvement: The PjBL model encourages students to be actively involved in the learning process (Aji et al., 2023; Chintya et al., 2023), so that they have more opportunities to develop critical and creative thinking skills (Ekaputra, 2023; Yanti et al., 2023), collaboration in Groups: Collaboration in groups allows students to learn from

each other and share ideas (Sarjani et al., 2023), thereby enriching their knowledge and skills; and constructive Feedback: Feedback provided by teachers regularly helps students to correct mistakes and improve the quality of their work.

Conclusion

The addition of corn cob extract to bulk cooking oil can This study proves that the application of the Project-Based Learning (PjBL) method is effective in improving students' creative thinking and written communication skills in alternative energy material. Based on the two research cycles carried out, there was a significant increase in both aspects. In cycle I, indicators of creative thinking skills such as fluency (76%) showed good criteria, while originality (36%) was still relatively low. However, after improvements were made through reflection and action in cycle II, all indicators experienced significant improvement, especially originality which increased to 76%. Overall, the average increase in creative thinking skills reached the good to

very good category. Written communication skills also showed progress from cycle I to cycle II. The dimension of the accuracy of the use of tables and graphs increased from 79% in cycle I to 87% in cycle II, and other dimensions such as changing the form of data presentation and making conclusions also increased to the good to very good category. The PjBL learning model provides opportunities for students to be active in learning, both individually and in groups, through project activities that encourage them to think creatively and communicate effectively. However, there are limitations in classroom management, especially in ensuring the participation of each student in the group. With these results, the PjBL method can be used as an alternative learning strategy to improve students' cognitive abilities and communication skills, especially in physics learning.

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Author Contributions

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Conflicts of Interest

The authors declare no conflict of interest.

References

- Afriani, D., Wilujeng, I., Kuswanto, H., & others. (2019). Implementation of Problem Based Learning Model Assisted Edmodo to Measure Students Scientific Communication Skills. *Journal of Physics: Conference Series*, 1233(1), 12041. <https://doi.org/10.1088/1742-6596/1233/1/012041>
- Aji, G. S., Darmadi, D., & Rohmawati, Y. I. (2023). Improving Learning Outcomes and Student Responses through Project Based Learning Model on Light and Optical Instruments. *JPPIPA (Jurnal Penelitian Pendidikan IPA)*, 8(1), 35–42. <https://doi.org/10.26740/jppipa.v8n1.p35-42>
- Alka Kianda, A., Azwar, B., & Iswanto, R. (2024). *Pengembangan Kemampuan Pemecahan Masalah Peserta Didik Melalui Pembelajaran Berbasis Problem Based Learning pada Mata Pelajaran Pendidikan Agama Islam dalam Kurikulum Merdeka (Studi Kasus di SMA Negeri 04 Kepahiang)* [Thesis: Institut Agama Islam Negeri Curup]. Retrieved from <https://e-theses.iaincurup.ac.id/7626/>
- Andini, S., & Rusmini, R. (2022). Project-based learning model to promote students critical and creative thinking skills. *Jurnal Pijar Mipa*, 17(4), 525–532. <https://doi.org/10.29303/jpm.v17i4.3717>
- Ariyani, E., Jalmo, T., & Yolida, B. (2019). Pengaruh Model PjBL terhadap Kemampuan Komunikasi Sains dan Berpikir Kreatif Peserta Didik. *Jurnal Bioterdidik: Wahana Ekspresi Ilmiah*, 7(3), 1–12. Retrieved from <http://jurnal.fkip.unila.ac.id/index.php/JBT/article/view/17318>
- Asmara, R., Susantini, E., & Rahayu, Y. S. (2015). Pengembangan perangkat pembelajaran biologi berorientasi pendekatan TASC (Thinking Actively in Social Contexts) untuk melatih keterampilan berpikir kreatif siswa. *Jpps (Jurnal Penelitian Pendidikan Sains)*, 5(1), 855–891. <https://doi.org/10.26740/jpps.v5n1.p855-891>
- Astuti, N., Efendi, U., Haya, F. F., & others. (2022). The impact of project based learning model on creative thinking ability of fourth grade students. *International Journal of Elementary Education*, 6(3), 440–445. <https://doi.org/10.23887/ijee.v6i3.48881>
- Chintya, J., Haryani, S., Linuwih, S., & Marwoto, P. (2023). Analysis of the application of the project based learning (PjBL) learning model on increasing student creativity in science learning in Elementary Schools. *Jurnal Penelitian Pendidikan IPA*, 9(6), 4558–4565. <https://doi.org/10.29303/jppipa.v9i6.2726>
- Ekaputra, F. (2023). Correlation of Critical Thinking Ability to Learning Activity After Flipped Classroom-Pjbl Learning Model Application. *JPPIPA (Jurnal Penelitian Pendidikan IPA)*, 8(1), 43–47. <https://doi.org/10.26740/jppipa.v8n1.p43-47>
- Firdausih, F., & Aslan, A. (2024). Literature review: The effect of project-based learning on student motivation and achievement in science. *Indonesian Journal of Education (INJOE)*, 4(3), 1011–1022. Retrieved from <https://www.injoe.org/index.php/INJOE/article/view/176>
- Firmansyah, A. (2024). Using Problem-Based Learning to Boost Social Studies Performance: Classroom Action Research in Grade 5 at SD Inpres 3 Talise: English. *Jurnal Elementaria Edukasia*, 7(3), 3183–3196. <https://doi.org/10.31949/jee.v7i3.10065>
- Haryadi, R., & Pujiastuti, H. (2022). enhancing pre-service physics teachers' higher-order thinking skills through STEM-PjBL model. *International Journal of STEM Education for Sustainability*, 2(2), 156–171. <https://doi.org/10.53889/ijses.v2i2.38>
- Hikmah, N., Febriya, D., Asrizal, A., & Mufit, F. (2023). The Impact of the Project-Based Learning Model on Students' Critical and Creative Thinking Skills in

- Science and Physics Learning: A Meta-Analysis. *Jurnal Penelitian Pendidikan IPA*, 9(10), 892–902. <https://doi.org/10.29303/jppipa.v9i10.4384>
- Malik, A., Nuraeni, Y., Samsudin, A., & Sutarno, S. (2019). Creative thinking skills of students on harmonic vibration using model student facilitator and explaining (SFAE). *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, 8(1), 77–88. <https://doi.org/10.24042/jipfalbiruni.v8i1.3056>
- Munfaridah, N., Avraamidou, L., & Goedhart, M. (2021). The use of multiple representations in undergraduate physics education: what do we know and where do we go from here? *Eurasia Journal of Mathematics, Science and Technology Education*, 17(1), em1934. <https://doi.org/10.29333/ejmste/9577>
- Nurkhin, A., Pramusinto, H., & others. (2020). Problem-Based Learning Strategy: Its Impact on Students' Critical and Creative Thinking Skills. *European Journal of Educational Research*, 9(3), 1141–1150. Retrieved from <https://eric.ed.gov/?id=EJ1262473>
- OECD, P. (2016). *Prograamme for International Student Assesment (PISA) Results From PISA 2015*. Publishing. Retrieved from https://nces.ed.gov/surveys/pisa/pisa2015/pisa2015highlights_3.asp
- Oktavia, Z., & Ridlo, S. (2020). Critical thinking skills reviewed from communication skills of the primary school students in STEM-based project-based learning model. *Journal of Primary Education*, 9(3), 311–320. <https://doi.org/10.15294/jpe.v9i3.27573>
- Purwanti, P., Hayat, M. S., & Dewi, E. R. S. (2024). Students' Creative Thinking Skills with STEAM-SDGs Approach to Energy Concept: Rasch Model Analysis. *Jurnal Penelitian Pendidikan IPA*, 10(12), 11152–11161. <https://doi.org/10.29303/jppipa.v10i12.9532>
- Putri, R. K., Bukit, N., & Simanjuntak, M. P. (2021). The Effect of Project Based Learning Model's on Critical Thinking Skills, Creative Thinking Skills, Collaboration Skills, & Communication Skills (4C) Physics in Senior High School. *6th Annual International Seminar on Transformative Education and Educational Leadership (AISTEEL 2021)*, 323–330. <https://doi.org/10.2991/assehr.k.211110.103>
- Quitadamo, I. J., & Kurtz, M. J. (2007). Learning to improve: using writing to increase critical thinking performance in general education biology. *CBE – Life Sciences Education*, 6(2), 140–154. <https://doi.org/10.1187/cbe.06-11-0203>
- Rabgay, T., & Kidman, G. (2023). Multiple iterations and messiness in the implementation of action research by Bhutanese secondary science teachers. *Discover Education*, 2(1), 49. <https://doi.org/10.1007/s44217-023-00077-4>
- Romli, S., Suhandi, A., Muslim, M., & Kaniawati, I. (2024). Research trends in the development of learning models oriented to increasing scientific literacy: A systematic literature review. *Indonesian Journal of Science and Mathematics Education*, 7(1), 66–79. <https://doi.org/10.24042/ij sme.v7i1.20517>
- Santos, C., Rybska, E., Klichowski, M., Jankowiak, B., Jaskulska, S., Domingues, N., Carvalho, D., Rocha, T., Paredes, H., Martins, P., & others. (2023). Science education through project-based learning: A case study. *Procedia Computer Science*, 219, 1713–1720. <https://doi.org/10.1016/j.procs.2023.01.465>
- Sari, E. D. P., Trisnawati, R. K., Agustina, M. F., Adiarti, D., & Noorashid, N. (2023). Assessment of Students' Creative Thinking Skill on the Implementation of Project-Based Learning. *International Journal of Language Education*, 7(3), 414–428. Retrieved from <https://eric.ed.gov/?id=EJ1409207>
- Sarjani, L. P. W., Suastra, I. W., & Subagia, I. W. (2023). The Influence of Project-Based Learning Models on Collaboration Skills and Science Learning Outcome for Junior High School. *Jurnal Penelitian Pendidikan IPA*, 9(SpecialIssue), 1284–92. <https://doi.org/10.29303/jppipa.v9ispecialissue.7243>
- Suwarno, W. (2006). *Dasar-dasar ilmu pendidikan*. Yogyakarta: Ar-ruzz media.
- Undari, M., Darmansyah, & Desyandri. (2023). Pengaruh penerapan model PjBL (Project-Based Learning) terhadap keterampilan abad 21. *Jurnal Tunas Bangsa*, 10(1), 25–33. <https://doi.org/10.46244/tunabangsa.v10i1.1970>
- Yanti, N., Rahmad, M., & Azhar. (2023). Application of PjBL (Project Based Learning) Based Physics Learning Model to Improve Collaboration Skills and Creative Thinking Ability of Students. *Jurnal Penelitian Pendidikan IPA*, 9(11), 9973–9978. <https://doi.org/10.29303/jppipa.v9i11.5275>
- Zulyusri, Z., Elfira, I., Lufri, L., & Santosa, T. A. (2023). Literature study: Utilization of the PjBL model in science education to improve creativity and critical thinking skills. *Jurnal Penelitian Pendidikan IPA*, 9(1), 133–143. <https://doi.org/10.29303/jppipa.v9i1.2555>