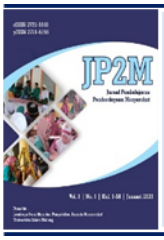

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Community empowerment through peer-project collaborative program to strengthen critical analysis and collective problem-solving skills

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ABSTRACT

This community engagement program was designed to empower Catholic Religious Education teachers in Palangkaraya who experienced challenges in facilitating collaborative learning and nurturing students' critical thinking. Through a Peer-Project Collaborative Learning (PPCL) approach, the program aimed to strengthen teachers' pedagogical practices and encourage meaningful classroom collaboration. Using a participatory action–based model, the training was carried out through preparation, workshop sessions, peer simulations, classroom mentoring, and reflective evaluation. Teachers actively practiced designing peer-project activities, modeling collaborative problem-solving, and applying questioning strategies that promote critical reasoning. The program resulted in noticeable improvements in teachers' confidence and ability to guide student collaboration, as reflected in their teaching demonstrations and feedback discussions. Beyond individual capacity-building, the training fostered a supportive learning community among teachers, helping to establish a culture of shared practice and collaborative planning in their schools. This initiative is expected to be sustained through peer mentoring and has the potential for replication in other educational settings seeking to strengthen 21st-century teaching competencies.

Keywords: *peer project collaborative; critical thinking; collaboration*

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INTRODUCTION

The rapid advancement of science and technology in the globalization era has transformed the competencies required of students in the 21st century (Malik, 2018). Beyond mastering subject content, students are now expected to think critically, collaborate effectively, and respond adaptively to complex and dynamic challenges (Mei et al., 2023). These competencies are particularly important for students in secondary education, who must navigate diverse learning environments and social interactions. Despite this growing demand, many

teachers in Indonesia still face difficulties in designing learning experiences that systematically nurture students' critical thinking and collaborative abilities. These challenges are especially evident in regions where access to professional development is limited, including Palangkaraya, Central Kalimantan (Dariyono & Rusman, 2023).

Preliminary observations and needs assessment involving Catholic Religious Education teachers in Palangkaraya revealed several key issues. Teachers reported limited knowledge of structured collaborative learning strategies, minimal experience in facilitating project-based learning, and uncertainty about how to guide students in analyzing problems critically (Hussein, 2021). Classroom observations further indicated that learning activities were often dominated by teacher-centered instruction, with few opportunities for students to work collaboratively, articulate ideas, or engage in peer-supported problem-solving. These conditions create a gap between students' learning needs and teachers' instructional practices, potentially resulting in low student engagement, passive learning habits, and inadequate preparation for future academic and social challenges (Wu, 2024).

The urgency of this community service initiative arises from the need to strengthen teacher competence as a crucial factor influencing student learning outcomes. Without targeted interventions, the gap between expected competencies and classroom realities may widen, affecting not only teaching quality but also students' readiness to participate in an increasingly knowledge-driven and collaborative society. Moreover, the partner schools expressed a strong demand for training programs that are practical, contextual, and sustainable—particularly those that encourage teachers to work together, exchange experiences, and develop shared solutions. This underscores the importance of a structured and empowering professional development program that addresses teachers' real challenges and promotes long-term capacity building.

In response to these challenges, this community service program was designed as part of the university's commitment to the Tri Dharma, particularly in strengthening the educational capacity of local communities through training, mentoring, and collaborative problem-solving. The program partnered with the Catholic Religious Education Teachers' Forum (MGMP Pendidikan Agama Katolik) in Palangkaraya, involving ten teachers from diverse school backgrounds. The intervention selected—Peer Project Collaborative Learning (PPCL)—was chosen because it aligns directly with teachers' needs while offering a practical, student-centered model for fostering critical thinking and collaborative skills.

The PPCL model draws upon Constructivist Learning Theory, as proposed by Piaget and Vygotsky, which emphasizes that knowledge is actively constructed through meaningful experiences and social interaction (Dewi & Elisa, 2025). PPCL is also supported by Collaborative Learning Theory, which highlights the cognitive and social benefits of structured peer engagement (Romdhon et al., 2024). These theoretical foundations are not presented merely as conceptual background but as frameworks that directly address the practical challenges identified in partner schools. Through PPCL, teachers can learn to design projects rooted in real-life

issues, facilitate peer dialogue, guide students in critical inquiry, and promote equitable participation within groups.

To translate these theories into actionable practice, the training program incorporated a participatory and empowering approach. Teachers engaged in hands-on workshops, peer teaching simulations, collaborative lesson design, classroom implementation trials, and reflective discussions. This approach aims not only to enhance technical teaching skills but also to foster a culture of mutual support, shared reflection, and continuous improvement among teachers—core elements of community empowerment in the educational sector (Erawati & Adnyana, 2024).

The objectives of this program place strong emphasis on capacity building rather than research outcomes. Specifically, the program aims to: (1) strengthen teachers' ability to implement collaborative and project-based learning strategies; (2) improve their skills in guiding students' critical reasoning and collective problem-solving; (3) foster a professional learning community that supports ongoing pedagogical innovation; and (4) contribute to long-term improvements in the quality of learning within partner schools. These goals demonstrate a clear orientation toward social impact, empowerment, and sustainable educational development.

The benefits of this community service program extend beyond individual teachers. For partner schools, improved teacher competence contributes to richer learning environments, greater student engagement, and the strengthening of a collaborative culture among educators. For the broader community, the program supports the development of students who are more thoughtful, socially responsible, and prepared to contribute meaningfully to society. For the university, the initiative reflects a tangible manifestation of the Tri Dharma through direct involvement in solving educational problems and supporting community empowerment.

Overall, this introduction situates the community service program within a clear empirical context, explains the urgency and social significance of the intervention, connects theoretical foundations with real needs, and presents the program's goals and expected benefits in a coherent and systematic manner.

METHOD

This community service program was conducted in collaboration with ten Catholic Religious Education teachers from several schools in Palangkaraya, Central Kalimantan. The program ran from April to August 2024 and was supported by the local educational office and school leadership. The urgency of the activity stemmed from teachers' limited capacity to implement collaborative learning and critical-thinking–oriented instruction, which affected the quality of classroom interaction and hindered the development of 21st-century competencies among students. Therefore, a structured capacity-building intervention grounded in participatory and reflective practices was required.

This study employed a Participatory Action Research (PAR) model to ensure that teachers were actively involved in every stage of the capacity-building

process. Rather than functioning as a research-oriented method focused solely on data collection, PAR was adopted as an empowerment framework that positions teachers as equal partners in diagnosing problems, co-designing solutions, implementing innovations, and engaging in collaborative reflection. As highlighted by Sopin & Sanrattana (2023) PAR enables joint problem-solving, sustained mentoring, and systematic skills development, allowing teachers to become co-creators of knowledge rather than mere research subjects.

In practice, the PAR process unfolded through a series of interconnected phases, beginning with a needs assessment and partnership building, followed by the collaborative design of PPCL modules, capacity-building workshops, and classroom implementation accompanied by structured mentoring. The cycle culminated in collective reflection to evaluate the effectiveness of the actions taken and to formulate subsequent improvements. This dynamic and responsive process allowed instructional innovations to evolve in alignment with the teachers' actual needs and the contexts in which they work.

The phases were carried out iteratively, with continuous feedback loops to adjust strategies based on teachers' experiences. In this community service program, the collected data were not intended for hypothesis testing as commonly found in formal research (Sipayung et al., 2025). Instead, the data served as a foundation for strengthening the empowerment process. Specifically, the data were used to map teachers' needs related to the implementation of collaborative learning and critical thinking facilitation, to monitor the progress of the program throughout the training and mentoring stages, and to descriptively assess improvements in the participants' teaching practices. Thus, all data functioned as reflective and decision-making inputs within each cycle of activities rather than statistical testing tools, ensuring alignment with the principles of Participatory Action Research (PAR) and the core values of community engagement (Pozo-Rico et al., 2024).

Tools included interviews, focus group discussions (FGDs), observation notes, mentoring logs, and reflective journals. Any numerical indicators (e.g., improvement percentage) functioned as program evaluation measures, not statistical tests. The following table summarizes each phase, including its description and concrete outputs.

Table 1. Summary of PAR phases, descriptions, and outputs

Phase	Description	Outputs
Needs Assessment and Partner Engagement	Mapping teachers' challenges, school conditions, and institutional support through interviews and FGDs; identifying gaps in collaborative learning and critical-thinking instruction.	Needs analysis report; agreed program goals and focus of capacity building.
Co-Design of Modules	Developing PPCL training materials collaboratively with teachers through participatory discussions to ensure contextual fit.	Draft PPCL learning modules, instructional tools, and scenario-based teaching guides.
Capacity-Building Workshops	Interactive workshops involving simulation, microteaching, reflective dialogue, and modeling of PPCL practices.	Teachers' improved demonstration of PPCL strategies during training sessions.

Classroom Practice and Mentoring	Teachers apply PPCL strategies in real classrooms while receiving mentoring, feedback, and coaching from facilitators.	Documentation of classroom implementation, observation notes, and mentoring records.
Collaborative Reflection and Improvement	Reflection sessions to review changes in teaching practice, identify barriers, and formulate sustainability strategies.	Reflection reports, improved teaching plans, and sustainability action plan for expanding PPCL practice.

The following figure visualizes the complete PAR cycle implemented in this community service program:

Figure 1. The complete PAR cycle

RESULT AND DISCUSSION

The PPCL capacity-building program was implemented to strengthen teachers' pedagogical ability to facilitate critical thinking and collaboration through a project-based collaborative model. The activities included orientation, pre-assessment, collaborative workshops, peer reflection, classroom implementation, and post-assessment. Throughout the process, teachers engaged in structured discussions, peer feedback sessions, and hands-on lesson design aligned with the principles of constructivism (Piaget) and social interaction theory (Vygotsky), where learning occurs through experience, dialogue, and shared problem-solving.

The PPCL model provided teachers with concrete strategies to engage students in joint project completion, collaborative decision-making, and analytical thinking. Teachers practiced facilitating structured group work, guided inquiry, and peer-to-peer evaluation—mechanisms theoretically known to increase higher-order thinking and productive social interaction.

Table 2. Pre-test critical thinking concepts

Critical Thinking Aspect	Mean Score	Criteria
Problem Analysis	56.7%	Fairly Good
Information Evaluation	58.3%	Fairly Good
Decision Making	57.5%	Fairly Good
Information Synthesis	55.2%	Fairly Good
Overall Average	**56.9%**	**Fairly Good**

The initial assessment indicates that teachers had moderate conceptual understanding of higher-order thinking, with no aspect surpassing 60%. This confirms the findings of the preliminary needs assessment, which showed a strong reliance on teacher-centered instruction. These data justify the urgency of the PPCL program as teachers needed structured support to shift toward student-centered, collaborative, and inquiry-based pedagogy.

Table 3. Pre-test collaboration skills

Collaboration Aspect	Mean Score	Criteria
Effective Communication	57.0%	Fairly Good
Active Participation	55.5%	Fairly Good
Task Allocation	56.0%	Fairly Good
Conflict Resolution	54.8%	Fairly Good
Overall Average	**55.8%**	**Fairly Good**

Across all collaboration indicators, teachers demonstrated only foundational understanding, reinforcing the need for training in structured team management, conflict mediation, role delegation, and dialogic communication—all essential in the PPCL model.

Figure 2. Training model

The improvements observed in the post-test were not simply numerical outcomes but emerged from a series of empowerment mechanisms embedded within the PPCL framework. Teachers strengthened their capacity through collaborative problem analysis, where they learned to guide students in deconstructing real-world issues into manageable analytical components. This process reflects Piaget's cognitive constructivism, in which learners reorganize their understanding through structured cognitive challenges.

Meaningful gains also stemmed from peer dialogue and information evaluation. During guided peer-review sessions, teachers critically assessed the credibility and relevance of instructional materials. These interactions exemplify Vygotsky's Zone of Proximal Development, demonstrating how social collaboration facilitates higher-order cognitive growth.

Another important mechanism involved group-based decision-making. Through simulation activities that required consensus-building, argument formulation, and justification, teachers practiced dialogic reasoning that parallels the skills they are expected to cultivate in their students. These exchanges fostered deeper critical thinking and reflective judgment.

Finally, the synthesis of ideas into project-based outputs played a central role in enhancing integrative thinking. The PPCL approach encouraged teachers to merge diverse perspectives into coherent instructional products, a process that directly contributed to the gains evident in the post-test results. Collectively, these

mechanisms illustrate how PPCL nurtures both cognitive and pedagogical growth through structured collaboration and reflective practice.

Figure 3. Impelentation of PPCL model

During the field implementation phase, the teachers successfully applied the PPCL model in Catholic Religious Education classes involving 35 students, resulting in observable pedagogical and social transformations. Classroom observations indicated a clear shift from teacher-centered lecturing toward more facilitative and student-driven learning. Teachers began adopting the role of learning facilitators who guided inquiry, encouraged discussion, and supported collaborative problem-solving. This shift directly influenced student behavior; learners showed increased verbal participation, more frequent peer interaction, and greater willingness to express ideas during group tasks. Teachers also reported heightened classroom engagement and a noticeable reduction in passive learning habits that had previously dominated the instructional environment. Beyond classroom changes, the program fostered stronger professional collaboration among teachers. They actively exchanged instructional strategies, discussed challenges in PPCL implementation, and reflected together on classroom outcomes—strengthening the sense of community within the school. These developments illustrate that the program generated not only improvements in teachers' technical understanding of collaborative learning but also broader social empowerment effects, including enhanced collegiality, reflective practice, and a more participatory learning culture.

Table 4. Post-test critical thinking skills

Critical Thinking Aspect	Mean Score	Criteria
Problem Analysis	87.2%	Very Good
Information Evaluation	88.5%	Very Good
Decision Making	89.0%	Very Good
Information Synthesis	86.0%	Very Good
Overall Average	**87.7%**	**Very Good**

The substantial increase (30.8% on average) is consistent with collaborative learning literature, which asserts that dialogic interactions accelerate cognitive

development. The highest gain in decision-making aligns with PPCL's emphasis on argumentation and team-based reasoning.

Table 5. Post-test collaboration skills

Collaboration Aspect	Mean Score	Criteria
Effective Communication	88.0%	Very Good
Active Participation	87.5%	Very Good
Task Allocation	86.8%	Very Good
Conflict Resolution	85.2%	Very Good
Overall Average	**86.9%**	**Very Good**

The 31.1% increase indicates that teachers became more adept at structuring teamwork, guiding discussions, and managing classroom dynamics. These improvements validate theories emphasizing that structured collaboration strengthens communication and social-emotional competencies.

The results also indicate a strong conceptual relationship between the two competencies enhanced through the program—critical thinking and collaboration. Collaborative learning naturally stimulates critical thinking as students are exposed to diverse viewpoints that challenge assumptions, deepen analysis, and broaden perspectives. Conversely, critical thinking strengthens collaboration by improving the quality of arguments presented in group discussions, sharpening reflective dialogue, and enhancing the negotiation skills required to reach collective decisions. The PPCL model integrates these reciprocal dynamics by requiring teams to analyze problems, evaluate information, make decisions, and synthesize ideas collaboratively, reflecting widely recognized 21st-century competency frameworks. As a result, improvements in one dimension reinforced the other, demonstrating the holistic and synergistic effectiveness of the model.

Despite the program's positive impact, several limitations must be acknowledged to maintain academic rigor. The participant group was relatively small, consisting of only ten teachers, which limits the generalizability of the findings. The implementation period was also short, with only one day of training followed by immediate classroom practice, restricting the ability to observe sustained behavioral changes or long-term mastery of the PPCL model. Additionally, classroom observations were primarily qualitative and limited in frequency, preventing deeper triangulation with other forms of evidence. Variation in teachers' initial readiness and experience levels also created inconsistencies in implementation quality. Recognizing these constraints is essential to provide a reflective foundation for future improvements.

Positioning the program within the broader literature shows that the findings align with well-established research. Collaborative learning has long been recognized for its ability to enhance problem analysis and reasoning skills, as highlighted by Johnson and Johnson. Similarly, project-based learning approaches have been shown to boost learner motivation, teamwork, and applied understanding, supporting the outcomes observed during PPCL implementation. Research by Gillies (2016) also emphasizes the role of peer dialogue in strengthening conceptual understanding, mirroring the improvements recorded

in this program. By situating the results within existing scholarly discourse, the study gains stronger academic grounding and demonstrates that the PPCL model contributes meaningfully to the evolving field of collaborative and critical thinking development.

Figure 4. Impelentation of PPCL model in junior high school

This training aims to train teachers with the PPCLmodel to enhance critical thinking and collaboration skills. Based on the results of descriptive analysis, it was found that the implementation of this training significantly improved both sets of skills. The mean score for critical thinking increased from 56.9 to 87.7, representing a 54.1% increase, while collaboration skills increased from 55.8 to 86.9, reflecting a 55.6% increase. These findings indicate that PPCL is an effective educational strategy for simultaneously developing higher-order cognitive skills and social competencies.

Table 6. Teachers' training improvement

Critical Thinking Skills Aspect	Improvement	Collaboration Aspect	Improvement
Problem Analysis	53.8%	**Effective Communication**	54.4%
Information Evaluation	51.7%	**Active Participation**	57.7%
Decision Making	54.8%	**Task Allocation**	55.0%
Information Synthesis	55.7%	**Conflict Resolution**	55.5%
Overall Average	54.1%	**Overall Average**	55.6%

Critical thinking is an important skill for the 21st century. It includes problem identification, information evaluation, data synthesis, and evidence-based decision-making. The training improvement aligns with active learning principles, where teachers actively facilitate students to identify problems, gather relevant information, and collaborate on solutions. information synthesis showed the highest gain at 55.7%, indicating that teachers significantly improved their ability to guide students in integrating multiple information sources to reach logical conclusions. Additionally, teachers' competency in facilitating decision-making improved by 54.8%, demonstrating their enhanced capacity to help students apply analytical thinking in complex project situations. These results show that this training approach enhances teachers' ability to promote critical thinking and systematic problem-solving in their students.

Collaboration skills are essential for collective goal achievement. The training's largest improvement in active engagement (57.7%) demonstrated that teachers became more proficient in encouraging student involvement and proactivity during project activities. Teachers' ability to model effective communication increased by 54.4%, showing they developed skills in teaching students to listen actively, articulate clearly, and provide constructive peer feedback. Improvements in task distribution and conflict resolution demonstrate teachers' enhanced capacity to facilitate better interpersonal dynamics, shared responsibility, and effective group management among students.

CONCLUSION

The implementation of the Peer Project Collaborative Learning (PPCL) training has produced substantial educational and social benefits for the partner teachers and their school communities. Beyond the documented improvements in teachers' critical thinking facilitation and collaboration–modeling skills, the program succeeded in addressing the core problem identified during the preliminary needs assessment—namely, teachers' limited mastery of collaborative learning strategies and their reliance on conventional, teacher-centered instruction. Through structured workshops, guided practice, and reflective discussions, teachers developed a deeper conceptual understanding of collaborative pedagogy and demonstrated increased confidence in designing and facilitating PPCL-based learning activities in their classrooms.

This program also fostered meaningful social impacts within the partner school environment. The training encouraged the emergence of a more reflective teaching culture in which educators openly discussed classroom challenges, shared strategies, and collaboratively evaluated student learning outcomes. Teachers reported stronger collegial interactions, greater openness to innovation, and a willingness to integrate collaborative project-based learning into their regular instructional routines. These changes indicate that the PPCL training not only enhanced individual competencies but also strengthened the social dynamics and collaborative ethos within the partner institutions.

The training approach—grounded in direct practice, peer modeling, and iterative reflection—proved effective in engaging participants actively throughout the process. Teachers showed high enthusiasm during group discussions, simulation activities, and classroom implementation, suggesting that the participatory model successfully empowered them to take ownership of their professional growth. The practical orientation of the program also allowed teachers to immediately apply PPCL strategies in real classroom settings, resulting in observable improvements in student engagement, teamwork, and critical inquiry.

The broader implications of this program extend beyond the immediate participants. For teachers, PPCL offers a concrete and replicable pedagogical framework that enhances professional competence in facilitating 21st-century learning skills. For schools, the program contributes to the development of a culture of collaboration, innovation, and shared pedagogical responsibility. At the

systemic level, the outcomes of this program highlight the potential of PPCL as a scalable model for teacher capacity-building initiatives that can be adopted by educational institutions or local education authorities in efforts to strengthen collaborative, student-centered learning across regions.

To support long-term impact, several follow-up actions are recommended. Schools and local education offices are encouraged to organize advanced PPCL workshops to deepen pedagogical mastery, establish teacher learning communities for ongoing sharing of best practices, and provide institutional support to ensure sustainability—such as allocating time for peer discussion, mentoring, and collaborative lesson planning. These strategies will help maintain the momentum of empowerment initiated through the program.

The program acknowledges several limitations, including the small number of participants, the short duration of the training, and the limited period for follow-up classroom observation. Future activities would benefit from longer mentoring cycles, broader teacher participation, and more extensive documentation of classroom implementation to strengthen the continuity and social reach of the program.

Overall, the PPCL community service program demonstrates a meaningful contribution to both educational practice and community empowerment. By bridging collaborative learning theory with practical classroom application, the program helps establish a foundation for sustainable teacher development and strengthens schools as dynamic learning communities committed to continuous improvement.

REFERENCES

Dariyono, & Rusman. (2023). Curriculum Transformation in The 21st Century Education: Perspectives, Challenges, and Prospects. *Proceedings International Conference on Education Innovation and Social Science*, *July*, 57–68. https://proceedings.ums.ac.id/iceiss/article/view/3168

Dewi, D. A., & Elisa, E. I. (2025). Implications of constructivism theory in elementary school science learning: Systematic literature review. *EDUHUMANIORA: Jurnal Pendidikan Dasar*, *17*(2), 199–210. https://doi.org/10.17509/eh.v17i2.86250

Erawati, N. K., & Adnyana, P. B. (2024). Implementation of Jean Piaget's theory of cognitive development in education. *International Journal of Education and Development.*, *5*(3), 394–401.

Hussein, B. (2021). Addressing collaboration challenges in project-based learning: The student's perspective. *Education Sciences*, *11*(8). https://doi.org/10.3390/educsci11080434

Malik, R. S. (2018). Educational challenges in 21St century and sustainable development. *Journal of Sustainable Development Education and Research*, *2*(1), 9. https://doi.org/10.17509/jsder.v2i1.12266

Mei, L., Feng, X., & Cavallaro, F. (2023). Evaluate and identify the competencies of the future workforce for digital technologies implementation in higher education. *Journal of Innovation and Knowledge*, *8*(4).

https://doi.org/10.1016/j.jik.2023.100445
Pozo-Rico, T., Scott, R., Bąk, M., Castejón, J. L., & Gilar-Corbí, R. (2024). Riding the wave towards flourishing in STEM education: Enhancing teaching efficacy through a K-12 training program. *Teaching and Teacher Education*, *143*(August 2023). https://doi.org/10.1016/j.tate.2024.104564
Romdhon, J., Masrifah, M., Meena, N., & Suharyati, H. (2024). Applying constructivist learning theory to enhance student learning outcomes in elementary schools. *International Journal of Sustainable Development & Future Society*, *2*(2), 62–69. https://doi.org/10.62157/ijsdfs.v2i2.73
Sipayung, R., Sitanggang, N., & Purba, S. (2025). Innovative training management models for advancing teacher competence: A research-based framework for pedagogical development. *Edelweiss Applied Science and Technology*, *9*(6), 1748–1767. https://doi.org/10.55214/25768484.v9i6.8239
Sopin, S., & Sanrattana, W. (2023). Teachers with participatory action to enhance 21st century learner skills. *World Journal of Education*, *13*(3), 79. https://doi.org/10.5430/wje.v13n3p79
Wu, X. Y. (2024). Unveiling the dynamics of self-regulated learning in project-based learning environments. *Heliyon*, *10*(5), e27335. https://doi.org/10.1016/j.heliyon.2024.e27335