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Improving Collaboration And Independence Through The Application of PJBL In Physical Education Lessons For Students

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ABSTRACT

This study aimed to improve students' collaboration and learning independence through the application of the Project-Based Learning (PjBL) model in Physical Education (PE) lessons for fifth-grade students at UPT SPF SD Inpres Tallo Tua 2, Makassar City. The research employed a Classroom Action Research (CAR) design conducted in two cycles, each consisting of planning, action, observation, and reflection stages. The participants were 25 fifth-grade students selected based on initial observations indicating low levels of collaboration and independence during PE learning. Data were collected using observation sheets, student questionnaires, and learning documentation, and were analyzed using descriptive quantitative and qualitative techniques. The findings revealed a consistent and meaningful improvement in both collaboration and independence from the pre-cycle to Cycle I and Cycle II. Students demonstrated increased active participation in group discussions, clearer division of roles, more effective communication, and stronger responsibility in completing project tasks. Independence development was reflected in students' ability to organize activities, make decisions during physical tasks, and complete assigned roles without excessive reliance on teacher instructions. Quantitatively, the average scores of collaboration and independence increased by approximately 14 points from the pre-cycle to Cycle II across all measurement instruments. These results indicate that the application of PjBL creates a more student-centered, participatory, and reflective learning environment in physical education. The study concludes that PjBL is an effective alternative learning model for elementary school physical education to strengthen students' collaboration and independence, while simultaneously supporting the development of character and 21st-century competencies through meaningful physical activity-based learning.

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INTRODUCTION

Physical Education (PE) is a fundamental component of the school curriculum that plays a strategic role not only in developing students' physical fitness and motor skills, but also in shaping character, social competence, collaboration, independence, and mental well-being from an early age (Bailey, 2005; Sallis et al., 2012; Yani, 2021). At the

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elementary school level, PE provides a structured environment for students to engage in movement-based learning experiences that foster discipline, responsibility, sportsmanship, cooperation, and respect through games and team activities (Bailey et al., 2009; Kirk, 2013). Ideally, PE learning should position students as active participants who are able to communicate, negotiate roles, make decisions, and solve problems collaboratively within meaningful physical activities.

However, empirical evidence indicates that PE learning practices in many elementary schools remain dominated by teacher-centered instructional approaches, characterized by one-way communication, repetitive drills, and limited opportunities for student initiative (Hastie & Casey, 2014; Casey & MacPhail, 2018). Such practices tend to reduce students to passive recipients of instruction, with minimal involvement in planning, decision-making, or reflective evaluation of learning activities (Syafruddin, 2024). Consequently, students' physical participation becomes procedural rather than meaningful, while essential social skills particularly collaboration and learning independence are insufficiently developed (Dyson et al., 2016; Hastie et al., 2020).

This phenomenon was also observed in Grade V PE learning at UPT SPF SD Inpres Tallo Tua 2, where students showed low initiative, heavy dependence on teacher directions, and limited ownership of learning tasks. Group activities were often dominated by a few students, with uneven role distribution and minimal peer interaction. Many students hesitated to make decisions independently and relied on the teacher to resolve simple problems during games. These conditions highlight a critical mismatch between the intended objectives of PE and the realities of classroom practice, reinforcing the urgency of adopting innovative, student-centered learning models that explicitly promote collaboration and independence (Nurachadijat & Nurhamidah, 2023).

In response to the limitations of traditional PE instruction, various student-centered pedagogical models have been developed, including Teaching Games for Understanding (TGfU), Cooperative Learning, Sport Education, and Project-Based Learning (PjBL) (Metzler, 2017; Casey & Kirk, 2021). Among these, PjBL has gained increasing attention as a learning approach that engages students in authentic, meaningful projects through collaborative planning, implementation, and evaluation processes (Thomas, 2000; Larmer et al., 2015).

PJBL emphasizes active student involvement in identifying problems, designing solutions, assigning roles, managing time, and presenting outcomes, thereby fostering critical thinking, creativity, collaboration, and responsibility core competencies of 21st-century learning (Barron & Darling-Hammond, 2008; Saavedra & Opfer, 2012). Empirical studies across disciplines consistently report that PjBL enhances learning motivation, engagement, teamwork skills, and self-regulated learning (Kokotsaki et al., 2016; Bell, 2018).

Within the context of PE, emerging studies suggest that PjBL can transform learning experiences from instruction-driven activities into student-managed physical projects, such as designing games, organizing mini-tournaments, or developing simple fitness programs (Yani, 2021; Rusli et al., 2024). Action research in elementary and secondary PE settings has demonstrated that PjBL integration improves students'

responsibility, communication skills, and conflict management during group activities (Nurachadijat & Nurhamidah, 2023; Juhrodin et al., 2023). Nevertheless, compared to other pedagogical models, empirical research on PjBL in elementary PE remains relatively scarce and fragmented, particularly in relation to its systematic impact on collaboration and learning independence.

Although the theoretical alignment between PjBL and the goals of PE is well established, several research gaps remain. First, most existing PjBL studies focus on cognitive outcomes or general learning motivation, with limited emphasis on social–behavioral outcomes such as collaboration and independence in PE contexts (Kokotsaki et al., 2016; Bell, 2018). Second, empirical evidence specific to elementary school PE especially in Indonesian contexts is still limited, with few studies employing structured classroom action research designs to capture progressive changes across learning cycles (Yani, 2021; Rusli et al., 2024).

Furthermore, while learning independence has been widely discussed within the framework of self-regulated learning (Zimmerman, 2002; Panadero, 2017), its operationalization in PE such as students' ability to manage physical tasks, make in-game decisions, and act autonomously during activities has not been sufficiently explored (Yudiana & Ruhyan, 2017; Subarjah et al., 2018). Existing studies rarely examine how collaboration and independence develop simultaneously within a single pedagogical intervention, particularly through iterative classroom action cycles.

Based on these gaps, this study aims to systematically examine the implementation of Project-Based Learning in Grade V Physical Education at UPT SPF SD Inpres Tallo Tua 2 through classroom action research. Specifically, the study seeks to: (1) analyze the process of implementing PjBL across learning cycles, (2) evaluate its effectiveness in improving students' collaboration and learning independence, and (3) identify changes in these two aspects from the pre-cycle to Cycle I and Cycle II.

The novelty of this study lies in its integrated focus on collaboration and independence as dual learning outcomes within elementary PE, examined through a cyclical PjBL-based classroom action research framework. The findings are expected to contribute theoretically to the enrichment of PjBL pedagogy in PE and practically to support PE teachers in designing more participatory, contextual, and student-centered learning experiences aligned with 21st-century educational demands (Suyanto & Subroto, 2019; Hastie et al., 2020).

METHODS

This study employed a Classroom Action Research (CAR) design implemented through two iterative cycles, each consisting of planning, action, observation, and reflection stages. CAR was selected because it enables systematic, reflective, and continuous improvement of teaching practices in authentic classroom contexts, particularly when the research objective is to enhance learning processes and student behavioral outcomes (Kemmis et al., 2014; Suyanto & Subroto, 2019; Burns, 2020). This

approach is widely recommended for pedagogical innovation in physical education, where learning outcomes are closely linked to classroom dynamics and student engagement (Casey et al., 2018; Hastie et al., 2020).

The research participants were 25 fifth-grade students at UPT SPF SD Inpres Tallo Tua 2, Makassar, during the 2025/2026 academic year. The class was purposively selected based on preliminary observations indicating low levels of student participation, limited collaboration, and weak learning independence during physical education lessons. Such characteristics align with conditions that are considered suitable for CAR-based interventions focusing on student-centered learning models (Dyson et al., 2016; Syafruddin, 2024).

The study was conducted over two months (October–November 2025) and consisted of a pre-cycle phase followed by Cycle I and Cycle II, each comprising four learning meetings. The pre-cycle phase focused on diagnosing existing learning conditions through classroom observation and baseline measurement of students' collaboration and independence. These findings were used to design the Project-Based Learning (PjBL) intervention tailored to the students' needs and contextual characteristics (Thomas, 2000; Larmer et al., 2015).

In Cycle I, the learning intervention was implemented through a "Mini Game Challenge" project. Students worked in small groups to design a simple physical game, including rules, procedures, and role distribution. The teacher functioned as a facilitator, guiding discussion, providing examples, and monitoring group interaction. In Cycle II, the intervention was enhanced through a "Mini Tournament Organizer" project, which required students to collaboratively plan and manage a small-scale tournament. This project involved higher task complexity, clearer role differentiation (e.g., leader, scorekeeper, equipment manager, and documentation officer), time management, and structured reflection. The progression between cycles emphasized increased responsibility, autonomy, and depth of collaboration, consistent with scaffolding principles in PjBL implementation (Barron & Darling-Hammond, 2008; Bell, 2018).

Data were collected using three complementary instruments: (1) observation sheets to assess observable indicators of collaboration and independence during learning activities; (2) student questionnaires to capture perceptions of involvement, responsibility, and self-regulation; and (3) documentation in the form of photos, videos, and field notes. Observation instruments employed a four-point rubric (1–4) covering collaboration indicators (communication, teamwork, contribution of ideas, respect for differences) and independence indicators (decision-making, task completion, self-regulation, and confidence). The questionnaires used Likert-scale items aligned with these indicators to strengthen data triangulation (Panadero, 2017; Tseng et al., 2021).

Data analysis combined descriptive quantitative and qualitative techniques. Quantitative data were analyzed using mean, minimum, maximum, and standard deviation scores across the pre-cycle, Cycle I, and Cycle II, followed by categorical interpretation of development levels. Qualitative data from field notes and documentation were analyzed through data reduction, display, and conclusion drawing

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to explain behavioral changes, interaction patterns, and emerging forms of independence. The integration of both data types provided a comprehensive evaluation of the effectiveness of PjBL in improving collaboration and independence in elementary physical education learning (Creswell & Plano Clark, 2018; Juhrodin et al., 2023).

RESULTS AND DISCUSSION

Result

In general, the research results show a significant increase in collaboration and independence scores from the pre-cycle to cycle I and then to cycle II, based on both observations and student questionnaires. In the pre-cycle stage, the average collaboration and independence scores were still in the low category, which described the initial condition of students who tended to be passive, had limited interaction with each other, and were highly dependent on teacher guidance.

Table 1.
Summary of Pre-Cycle Results

Stage	Variables	N	Min	Max	Mean	Std. Dev
Pre-Cycle	Collaboration Observation	25	18	24	20,68	1,73
Pre-Cycle	Independence Observation	25	17	23	19,80	1,78
Pre-Cycle	Collaboration Questionnaire	25	19	26	22,04	1,81
Pre-Cycle	Independence Questionnaire	25	18	25	21,08	1,91

In cycle I, after the implementation of the "Mini Game Challenge" project, the average scores for all variables increased significantly. Students began to show better engagement in group discussions, task sharing, and the implementation of games they designed themselves.

Table 2.
Summary of Cycle I Results

Stage	Variables	N	Min	Max	Mean	Std. Dev
Cycle I	Collaboration Observation	25	26	32	28,32	1,52
Cycle I	Independence Observation	25	25	30	27,32	1,46
Cycle I	Collaboration Questionnaire	25	26	33	29,04	1,81
Cycle I	Independence Questionnaire	25	25	32	28,04	1,86

The increase from pre-cycle to cycle I of around 7–8 points on each variable shows that PJBL has begun to shift the learning pattern from teacher-centered to student-centered. Students appear to be more courageous in expressing their opinions, involved in planning activities, and carrying out group tasks more responsibly. However, Cycle I reflection notes indicate that there are still some passive students, dominance of certain members in groups, and uneven task distribution, requiring improvements in the action design for Cycle II.

In Cycle II, the "Mini Tournament Organizer" project, with a sharpened role structure and emphasis on individual responsibility, resulted in stronger and more stable improvements. The average collaboration score based on observation was around 35.36 and 36.04 on the questionnaire, while the average independence score was around 34.40

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(observation) and 35.08 (questionnaire). The total increase from the pre-cycle to cycle II was close to 14 points on all instruments, showing a consistent upward trend without any decline at each stage.

Qualitatively, in cycle II, students appeared to be more systematic in organizing tournament plans, agreeing on rules, and managing match schedules. Each group member carried out their assigned roles more independently, such as scorekeeping, equipment management, and documentation, while the group leader coordinated the activities. Minor conflicts that arose within the group tended to be resolved through discussion, and students began to show a more mature ability to give and receive feedback. This pattern indicates that the role structure within the group contributed to an increase in positive interdependence and individual responsibility, as emphasized in cooperative learning theory (Johnson & Johnson, 2014).

Discussion

The findings of this study confirm that the implementation of Project-Based Learning (PJBL) in physical education learning significantly contributes to improving elementary school students' collaboration skills. The consistent increase in collaboration scores from pre-cycle to cycle II indicates that student involvement in designing, managing, and evaluating physical activity projects fosters more intense social interactions, constructive exchange of ideas, and the emergence of collective responsibility within the group. These results align with previous research findings emphasizing that authentic projects provide a concrete context for students to develop social skills, cooperation, and positive interdependence among group members (Bell, 2018; Kokotsaki et al., 2016; Helle et al., 2014). In the physical education context, the experience of designing games and tournaments not only strengthens conceptual understandings of cooperation and sportsmanship but also internalizes them through hands-on practice, as recommended in experiential pedagogical approaches (Dyson et al., 2016; Casey & Kirk, 2021).

In addition to collaboration, students' increased independence in learning was also clearly evident through observational and questionnaire data. Independence is reflected in students' ability to organize tasks, make technical decisions during the game, and complete individual responsibilities without over-reliance on teacher instructions. These findings support the theory of self-regulated learning, which emphasizes that opportunities to plan, monitor, and evaluate the learning process strengthen students' self-control and autonomy (Zimmerman, 2002; Panadero, 2017). Empirical research in the context of physical education shows that PJBL, although based on group work, still demands individual accountability through clear role allocation and personal contributions (Yudiana & Ruhyan, 2017; Juhrodin et al., 2023). In this study, the sharpening of the role structure in cycle II was shown to strengthen the independence dimension while preventing the dominance of certain group members.

From the perspective of constructivism theory, specifically discovery-based learning, the process students experience through PJBL allows for the formation of understanding that is actively constructed through exploration and solving real-world

problems. Students no longer simply imitate movements or follow rules set by the teacher, but are involved in formulating game rules, managing activities, and reflecting on the results achieved. This approach strengthens the argument that knowledge and skills acquired through authentic experiences tend to be more meaningful, long-lasting, and have a broad impact on students' cognitive and social development (Bell, 2018; Saavedra & Opfer, 2012; Larmer et al., 2015). The findings of this study also expand the empirical evidence that PJBL is effective in improving critical thinking skills, learning responsibility, and collaboration across subject contexts, including physical education, which has often been perceived as a purely motor skills domain (Metzler, 2017; Hastie et al., 2020).

An important implication of this research is that physical education learning need not be limited to technical drills or routine competitions solely controlled by teachers. Through PJBL, physical education can be developed into a learning space rich in social and emotional experiences, where students learn to plan activities, negotiate, manage conflict, and organize activities independently. This aligns with the 21st-century competency framework, which places collaboration, communication, creativity, and problem-solving as key competencies that need to be developed from elementary school (Saavedra & Opfer, 2012; OECD, 2019). Therefore, the results of this study reinforce and expand previous findings showing that the integration of PJBL in elementary school physical education significantly increases collaboration and independence, both in academic contexts and physical activity (Nurachadijat & Nurhamidah, 2023).

Practically, the successful implementation of PJBL in this study is inseparable from the role of the teacher as an active facilitator capable of providing direction, feedback, and adaptively managing group dynamics. Teachers are required to design projects that are contextual to the students' world, establish clear indicators of collaboration and independence, and conduct continuous observation and reflection at each cycle. Challenges such as differences in student abilities, the dominance of certain individuals, and time constraints can be overcome through flexible and reflective cycle planning. Thus, this study confirms that PJBL is not simply a change in method, but rather a transformation of the teacher's role, learning design, and classroom culture toward a more participatory, reflective, and holistic development-oriented physical education learning (Barron & Darling-Hammond, 2008; Beers, 2011).

CONCLUSION

This study concludes that the implementation of Project-Based Learning (PBL) in Physical Education learning for fifth-grade students at the SPF Unit of SD Inpres Tallo Tua 2 has proven effective in improving students' collaboration skills and learning independence. Consistent score increases from pre-cycle to cycles I and II, both based on observations and questionnaires, indicate that students are increasingly active in communicating, collaborating, sharing roles, and participating equally in group activities. The project, designed in stages, encourages students to support each other, appreciate the contributions of their peers, and complete group assignments responsibly.

Furthermore, the development of learning independence is evident in students' abilities to organize tasks, make decisions during physical activities, and carry out their respective roles without over-reliance on teacher direction. Students demonstrate increased self-confidence, individual responsibility, and the ability to manage activities independently. The linear pattern of improvement between cycles indicates that PBL is a relevant and effective learning model for developing students' social competence and independent character within the context of elementary school physical education.

Based on these findings, physical education teachers are advised to systematically integrate PBL into their learning plans through authentic, contextual projects oriented toward active student engagement. Schools are expected to support PBL implementation by providing time, simple facilities, and strengthening teacher competencies. Future research can expand this study to different levels and contexts, or combine PBL with other learning models to explore its broader impact on student motivation, creativity, and leadership.

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