



Implementation of lesson study to improve meaningful learning outcomes in physical education

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Abstract

Physical Education (PE) plays a vital role in developing students' physical, emotional, social, and cognitive abilities. However, many PE learning processes still rely on teacher-centered approaches that limit student engagement and fail to create meaningful learning experiences. As a result, learning outcomes often lack relevance and sustainability. This study investigates how the use of Lesson Study (LS) affects both instructor professionalism and student learning. With LS, teachers work together to plan, observe, and methodically reflect on the learning process. This study used a qualitative approach with a case study method. 10 primary school teachers from Palembang, Indonesia, who teach physical education, participated in this study. The research instrument used was the Formative Class Evaluation (FCE), which consists of nine questions and four components: results, motivation, learning, and cooperation. The data analysis using the FCE indicated a significant improvement in teaching quality after the implementation of LS. The average FCE scores before LS ranged from 2.66 to 2.85. After LS, the average scores increased to between 2.71 and 2.86. These results suggest that although the relationship is relatively weak, LS implementation significantly enhanced classroom learning quality as perceived by the students. The findings suggest that LS has a positive impact on improving classroom learning experiences. Although the correlation between LS and student learning improvements was moderate, the statistical significance of the results highlights its potential as an effective professional development tool for teachers. Future research could explore the long-term effects of LS on student performance and the sustainability of these improvements.

Keywords: Lesson study, learning, teacher professional development, student engagement, improved understanding.

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INTRODUCTION

The quality of physical education (PE) teachers in Indonesia is a multifaceted issue that is influenced by various competencies and

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educational standards. Research shows that while P.E. teachers show strengths in social (81.9%) and personality (80.4%) competencies, pedagogical skills are much weaker at 52.3%, highlighting a critical area for improvement (Sударso et al., 2019). This indicates that although teachers may relate well with students and display professional attitudes, they often lack effective instructional strategies and classroom management techniques essential for meaningful learning. In addition, most P.E. teachers in private Madrasah Ibtidaiyah lack formal educator certification, with 87% being Strata One graduates in relevant fields, yet none have the necessary credentials, undermining their professional competence (Shidiq et al., 2022). The absence of certification reflects a gap between academic qualifications and practical teaching readiness, which can affect the consistency and quality of PE instruction.

The integration of character education into P.E. is also a challenge, as teachers struggle to meet the requirements of Curriculum 2013, indicating the need for enhanced pedagogical training (Suherman et al., 2019). This suggests that without adequate pedagogical support, teachers are ill-equipped to embed character values into physical activities, which is a key objective of the national curriculum. Overall, the effectiveness of teaching behaviors remains low, requiring targeted professional development to improve educational outcomes in P.E. across Indonesia (Irnidayanti & Fadhilah, 2023; Komalasari, 2023). Strengthening pedagogical competence through continuous training and collaborative learning approaches, such as Lesson Study (LS), may offer a sustainable solution to address these persistent challenges.

The quality of PE teachers, measured against Indonesia's national standards, revealed that although social and personality competencies are relatively high, pedagogical skills require immediate attention, indicating gaps that may affect student learning outcomes (Sударso et al., 2019). These weaknesses in pedagogical competence may result in ineffective lesson planning, limited classroom management strategies, and insufficient adaptation to diverse student needs. In addition, the teacher

certification program, intended to improve education quality, has shown limited impact on student performance, suggesting that mere certification does not equate to improved teaching effectiveness (Ramli, 2014). This points to the importance of ongoing, practice-based professional development rather than relying solely on formal qualifications. Overall, the integration of comprehensive training and a focus on pedagogical competencies is essential to drive better educational outcomes in physical education (Hartono et al., 2024; Pramono, 2012). By prioritizing pedagogical mastery alongside content knowledge, educational institutions can better prepare teachers to meet the demands of modern physical education and improve student engagement and achievement.

LS emerges as a promising strategy for enhancing sustainable professional development among PE teachers, as evidenced by various studies. This collaborative approach fosters a culture of continuous improvement through planning, implementation, observation, and reflection, which is crucial for developing effective teaching practices (Colburn et al., 2024; Marques Santinha et al., 2024). These structured cycles allow teachers to refine instructional strategies based on real classroom experiences, thereby bridging the gap between theory and practice. Research indicates that lesson study not only enhances teachers' innovative skills and teaching quality but also promotes a collaborative work environment, thereby increasing student engagement (Dzattadini et al., 2024). The collective nature of lesson study encourages peer support and knowledge sharing, which can lead to the adoption of diverse pedagogical approaches tailored to student needs.

However, while some studies report positive changes in teacher behavior, the impact on student motivation remains limited, suggesting that LS alone may not suffice for significant student outcomes (Borghouts et al., 2023). This highlights the importance of integrating student-centered strategies within the LS framework to ensure its effects translate meaningfully into the classroom. Furthermore, the integration of LS in initial teacher training has been shown to elevate critical reflection and

teaching competencies, indicating its potential for long-term professional growth (Jones, 2024). Such findings demonstrate that when introduced early in a teacher's career, lesson study can shape reflective, adaptive, and student-aware educators. Thus, while LS is beneficial, its effectiveness may be maximised when combined with other professional development strategies. A multifaceted approach can provide teachers with broader perspectives and tools to meet the evolving challenges of PE.

Research indicates that LS not only improves teachers' pedagogical skills but also promotes critical reflection, which is essential for ongoing professional growth (Jones, 2024; Mengistu et al., 2024). By engaging in systematic analysis of their teaching, educators become more responsive to students' needs and more adept at refining instructional strategies. For instance, studies show that teachers engaged in LS exhibit better lesson planning and delivery compared to those who do not participate in such collaborative frameworks (Mengistu et al., 2024). These improvements stem from the structured and iterative nature of LS, which encourages teachers to continuously test, observe, and revise their methods based on peer feedback.

Furthermore, LS has been recognized for its ability to adapt to various educational contexts, thereby optimizing student engagement and learning outcomes (Bautista et al., 2023; Rahim et al., 2015). This flexibility makes LS particularly suitable for diverse school settings, including those with limited resources or varying curricular goals. Overall, LS stands out as a robust model for professional development, particularly in enhancing the competencies of PE teachers through structured collaboration and reflective practice. Its emphasis on shared learning and iterative improvement offers a sustainable path toward instructional excellence in physical education.

The purpose of this study is to analyze and evaluate the extent to which the implementation of Lesson Study affects the quality of student learning in the classroom. This research focuses on several aspects, namely: identifying the impact of Lesson Study on students' conceptual

understanding, particularly in terms of how effective it is in enhancing in-depth understanding of the material; assessing the increased student engagement and participation in the learning process resulting from the use of Lesson Study methods, as well as how these changes occur across different learning contexts; and exploring the role of Lesson Study in teacher professional development, by assessing the extent to which collaboration among teachers through planning, observation, and reflection can improve the effectiveness of classroom teaching strategies.

METHOD

This study employed a qualitative-quantitative mixed-method approach using a quasi-experimental design with pre-test and post-test in combination with lesson study cycles. The research aimed to explore the effectiveness of implementing lesson study in improving the meaningfulness of physical education learning outcomes. The lesson study model was structured in three key stages: Plan, Do, and See, and was carried out collaboratively among a team of physical education teachers over three consecutive lesson cycles. The study also incorporated a descriptive qualitative component, analyzing teacher reflections, peer observations, and student feedback to gain deeper insights into the pedagogical changes and classroom dynamics brought about by the lesson study.

Formative class evaluation (FCE) is a questionnaire that uses student responses to gauge how well physical education instruction is working. [Suroto et al. \(2017\)](#) this questionnaire is regarded as valid and reliable in Indonesia and Japan. Results, motivation, learning, and cooperation are the four components that make up the nine items on the FCE questionnaire. The FCE is an instrument used to measure students' perceptions of the effectiveness of the learning process, especially after the implementation of a particular learning model such as Lesson Study. The assessment is done using a Likert scale, which usually consists of 4 or 5 levels of assessment (e.g., strongly disagree to strongly agree).

Table 1. Score Range and Categorization (Assessment Norms)

Score Range Average	Category	Interpretation
3.26 – 4.00	Excellent	Learning is very effective, and students are highly engaged and satisfied.
2.51 – 3.25	Good	Learning is moderately effective, students are moderately engaged, and satisfied.
1.76 – 2.50	Fair	Learning is less effective, and students are less engaged.
1.00 – 1.75	Poor	Learning is not effective, students are not satisfied, and not engaged.

This study was carried out at the sub-district level among a group of physical education teachers in elementary schools. The 10 physical education teachers (two female and eight male) were selected by their communities to participate in the Lesson Study (LS) program. They were recruited through the following steps: (1) the researcher surveyed several schools in Palembang, Indonesia; (2) invitations were sent via WhatsApp; (3) the number of teachers who agreed was recorded; and (4) participants signed a consent form confirming their willingness to take part in all LS activities.

Table 2. List of PE teachers in Plaju, Palembang

No.	Name	Sex	Age	Degree	Work Experience (years)
1.	Teacher 1	P	25	Bachelor	3
2.	Teacher 2	L	33	Bachelor	8
3.	Teacher 3	L	33	Bachelor	12
4.	Teacher 4	P	28	Bachelor	6
5.	Teacher 5	L	24	Bachelor	2
6.	Teacher 6	L	34	Bachelor	9
7.	Teacher 7	L	32	Bachelor	4
8.	Teacher 8	L	37	Bachelor	15
9.	Teacher 9	L	26	Bachelor	3
10.	Teacher 10	L	32	Bachelor	6

This three-month study was conducted in three stages and adhered to the ethical principles of the Helsinki Declaration. In the first month, a preliminary evaluation was conducted to assess baseline conditions, and the second month involved training physical education (PE) teachers in the implementation of Lesson Study (LS), focusing on teaching quality indicators and alignment with the Indonesian National Curriculum. The training included open classes, mentoring sessions, and collaborative discussions with school principals and supervisors to provide constructive feedback. During the final stage, teachers implemented four LS cycles, which were followed by a comprehensive evaluation in the third month. Data analysis began with descriptive statistics (mean and standard deviation), followed by the Kolmogorov–Smirnov normality test ($p > 0.05$),

and analysis of variance (ANOVA) to determine the significance of observed changes.

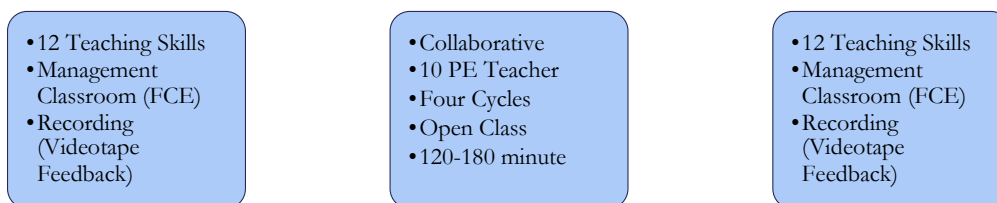


Figure 1. Lesson Study Model in Research

RESULT

Table 2 presents the descriptive statistics results. Table 3 shows no difference in Formative Class Evaluation (FCE) values before and after the Lesson Study (LS).

Table 3. Descriptive Statistics FCE

		Formative Class Evaluation (FCE)					
		Result	Volition	Method	Cooperation	Mean	Criterion
Teacher 1	Before LS	2.89	2.94	2.35	2.97	2.79	Very Good
	After LS	2.98	2.94	2.53	3.00	2.86	Very Good
Teacher 2	Before LS	2.78	2.94	2.32	2.97	2.75	Good
	After LS	2.89	2.94	2.46	2.97	2.82	Very Good
Teacher 3	Before LS	2.91	2.95	2.59	2.97	2.85	Very Good
	After LS	2.84	2.95	2.19	2.97	2.74	Good
Teacher 4	Before LS	2.74	2.95	1.99	2.97	2.66	Good
	After LS	2.91	2.95	2.35	2.97	2.79	Very Good
Teacher 5	Before LS	2.82	2.95	1.99	2.98	2.68	Good
	After LS	2.94	2.95	2.40	3.00	2.82	Very Good
Teacher 6	Before LS	2.74	2.95	1.96	2.98	2.66	Good
	After LS	2.92	2.95	2.17	3.00	2.76	Good
Teacher 7	Before LS	2.72	2.94	2.05	2.97	2.67	Good
	After LS	2.78	2.94	2.32	2.97	2.75	Good
Teacher 8	Before LS	2.74	2.94	2.23	2.97	2.72	Good
	After LS	2.80	2.94	2.53	2.97	2.81	Very Good
Teacher 9	Before LS	2.74	2.95	2.09	2.98	2.69	Good
	After LS	2.80	2.95	2.33	3.00	2.77	Good
Teacher 10	Before LS	2.74	2.95	1.99	2.98	2.66	Good
	After LS	2.78	2.95	2.10	3.00	2.71	Good

Based on the results of the Formative Class Evaluation (FCE), it was found that there were improvements in the components of results, volition, method, and cooperation after the implementation of Lesson Study (LS). Before LS, the average FCE scores for teachers ranged from 2.66 to 2.85, categorized as "Good" or "Very Good." After LS, the scores slightly increased, ranging from 2.71 to 2.86. Six out of ten teachers experienced an improvement in their overall classification from "Good" to "Very Good," while the others maintained stable scores with slight increases. In detail, the "Result" and "Method" components showed noticeable improvements,

indicating that Lesson Study contributed to better teaching practices and clearer learning methods.

Meanwhile, "Volition" remained relatively stable, suggesting that student motivation was already high before LS and remained so afterward. "Cooperation" among students also improved slightly, reflecting a better learning atmosphere. Overall, the data suggest that Lesson Study had a positive, albeit gradual, impact on the quality of learning as perceived by the students.

Table 4. Difference in value of FCE and Teaching Skills Before and After LS

Variable	Correlation	t-stat	p-value	d
FCE	0.225	3.074	0.013	9

The results of the correlation analysis show that the FCE variable has a correlation coefficient of 0.225, indicating a positive but weak relationship between Lesson Study implementation and the improvement of students' learning experiences. The t-statistic value of 3.074 with a p-value of 0.013 ($p < 0.05$) suggests that the correlation is statistically significant. This means that Lesson Study activities had a meaningful effect on the improvement of FCE scores. The degrees of freedom (d) are 9, confirming that the analysis involved data from ten paired observations. Overall, although the strength of the relationship is relatively low, the statistical significance indicates that Lesson Study contributed positively to the enhancement of the classroom learning process as perceived by students.

DISCUSSION

Lesson study (LS) significantly enhances specific teaching practices for physical education (PE) teachers in Indonesia compared to other professional development methods by fostering collaboration, reflection, and improved lesson planning. Through structured group interactions, teachers engage in collaborative lesson design, which promotes active student learning and the effective use of local resources (Hendayana et al., 2011). This indicates that teachers are better able to contextualize

lessons using materials and examples relevant to students' environments, thereby increasing engagement and comprehension. This collaborative approach not only improves teachers' competencies in lesson planning and implementation but also encourages meaningful learning activities and scaffolding techniques (Rozimela, 2020; Salimi et al., 2017). By incorporating scaffolding, teachers are able to support student learning progressively, adjusting instruction to match student abilities and ensuring more inclusive classroom experiences.

Furthermore, the reflective practice embedded in lesson study allows teachers to observe and learn from each other, leading to a deeper understanding of pedagogical strategies and increased professional confidence (Effendi, 2015). This shared reflection creates a safe space for peer learning, where teachers can candidly assess strengths and areas for improvement without judgment. Overall, the integration of these elements within lesson study creates a supportive community that enhances the professional growth of PE teachers in Indonesia, addressing both pedagogical skills and collaborative practices (Kusanagi, 2013). Such a community-based model of learning fosters a sustained culture of mutual development, essential for long-term improvement in teaching effectiveness.

Lesson study is an effective methodology for enhancing the professionalism of physical education (PE) teachers by fostering collaborative learning and critical reflection. Research indicates that lesson studies facilitate significant changes in teaching practices, particularly for those in initial teacher training (ITT) and ongoing professional development (PD) contexts. For instance, studies show that teachers engaged in lesson study cycles develop a deeper understanding of instructional strategies and improve their teaching competencies through collaborative planning and reflection on practice (Jones, 2024; Marques Santana et al., 2024). Additionally, continuous professional development initiatives, such as those involving visual methods and community learning, have been shown to boost teachers' confidence and competence

in delivering PE (Fan & Zuest, 2024). However, challenges such as limited access to technology and reduced social interaction in online PD programs can hinder effectiveness, highlighting the need for tailored content and support (Setiawan et al., 2024). Overall, integrating lesson study into PD frameworks can significantly enhance the professional growth of PE teachers (Aksonova, 2023).

The research findings show that Lesson Study (LS) implementation before and after instructional activities significantly improves the quality of teacher instruction. This improvement can be attributed to several interrelated factors. First, collaborative planning and peer observation, which are central components of LS, enable teachers to reflect critically on their instructional practices (Færøyvik Karlsen, 2022). When teachers jointly design lessons and observe each other, they become more aware of effective pedagogical strategies and student learning responses in real-time. Second, structured reflection sessions, conducted after each lesson cycle, encourage evidence-based discussions that focus on student understanding rather than teacher performance alone (Takahashi & McDougal, 2016). This shift enhances the teacher's ability to adjust instruction based on actual classroom needs. Third, the LS process fosters a culture of continuous learning and mutual accountability, which leads to increased teacher confidence, pedagogical depth, and innovation in lesson delivery. In the context of this study, the combination of professional dialogue, mentorship, and repeated cycles of planning, teaching, and reflection appears to be the driving force behind instructional improvement. These findings align with previous studies that emphasize the transformative potential of LS in improving teaching quality through collective inquiry and sustained professional development (Jones, 2024; Østergaard, 2016).

Based on the findings, it is recommended that professional development programs for physical education teachers integrate the Lesson Study (LS) model to improve teaching practices. Schools should provide structured time and mentoring and ensure alignment with the

national curriculum while fostering collaboration among educators to enhance reflection and instructional quality. However, the study has limitations, such as a small or homogenous sample, a short duration, and varying teacher experience, which could affect the generalizability and implementation of the results. Additionally, the reliance on self-reported data may introduce bias. Future studies should address these limitations by using a larger, diverse sample and ensuring consistent implementation of LS sessions.

CONCLUSION

This study highlights the critical importance of improving the quality of physical education (P.E.) teachers in Indonesia, as it directly influences student learning outcomes and well-being. Through the exploration of continuing professional development (CPD) strategies, it is evident that approaches like Lesson Study provide a collaborative, practical, and reflective framework that effectively enhances teacher skills. By focusing on real-time classroom observation, peer collaboration, and iterative lesson refinement, Lesson Study stands out as a powerful tool for fostering continuous professional growth among educators. As the education system evolves, implementing such strategies will be essential to ensuring that P.E. teachers are better equipped to provide high-quality education that benefits both students and the broader educational community. The findings of this study suggest that Lesson Study has a positive impact on improving classroom learning experiences. Although the correlation between LS and student learning improvements was moderate, the statistical significance of the results highlights its potential as an effective professional development tool for teachers. Future research could explore the long-term effects of LS on student performance and the sustainability of these improvements.

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