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Hybrid Lesson Study: An Innovative Model for Enhancing Pre-Service Teachers' TPACK in Indonesia's PPG Program

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ABSTRACT

Objective: This study aims to investigate the implementation of Hybrid Lesson Study as a professional learning model to enhance pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) within Indonesia's Teacher Professional Education (PPG) program. **Method:** A qualitative case study design was employed to explore the complex, real-life implementation of HLS within the PPG's Teaching Practicum (PPL). Ten pre-service teachers and two supervising lecturers from two Indonesian universities participated in this study. Data were collected through classroom observations, analysis of teaching artifacts (lesson plans, digital learning materials, and reflective reports), and semi-structured interviews. Data triangulation was used to ensure validity, while thematic analysis identified recurring patterns related to TPACK development, collaboration, and hybrid learning practices. This design enabled an in-depth understanding of how HLS supported professional learning in an authentic educational context. **Results:** The findings reveal that Hybrid Lesson Study, combining face-to-face meetings with online collaboration, provided a flexible and sustainable framework for lesson planning, peer observation, and reflective dialogue. Participants showed notable improvement in lesson design and technology integration, moving from basic tool use to interactive, context-based, and pedagogically sound digital practices. Reflection sessions via digital platforms further enhanced critical evaluation skills and effective technology use, supported by collaboration, feedback, and institutional infrastructure. **Novelty:** Despite challenges such as internet instability and time constraints, the study highlights the novelty of Hybrid Lesson Study in the PPG context, offering a practical and innovative model that fosters reflective, adaptive, and technologically competent teachers for 21st-century classrooms.

INTRODUCTION

The rapid advancement of digital technologies has significantly transformed the educational landscape, demanding that teachers not only master subject content but also develop the ability to integrate technology and pedagogy effectively. In the era of Education 4.0, pre-service teachers are expected to design innovative, technology-supported learning environments that foster student engagement, higher-order thinking, and adaptability to diverse learning contexts. However, preparing teachers with such competencies remains a major challenge in many teacher education programs, particularly in developing countries. In Indonesia, the Teacher Professional Education (PPG) program plays a vital role in equipping pre-service teachers with professional competencies. Despite its importance, many pre-service teachers still struggle to meaningfully integrate digital tools into lesson planning and classroom practice. Technology is often used superficially—as presentation media—rather than as an integral component of pedagogy and content delivery. Therefore, there is an urgent need for structured professional learning models that foster collaboration, reflection, and technology integration during pre-service teacher training.

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Improving teacher quality has become a national priority in Indonesia. One of the key initiatives addressing this issue is the Teacher Professional Education (TPE) program, which is designed to prepare pre-service teachers to meet high professional and educational competency standards (Alam et al., 2022; Iqbal Maulana et al., 2023; Mardhatillah & Surjanti, 2023; Mulyana et al., 2023; Soenarto et al., 2021). As part of its pedagogical training, the TPE program incorporates various instructional approaches, among which Lesson Study (LS) has emerged as a particularly effective method (Burghes et al., 2009; Nguyen et al., 2024; Saran, 2018; Wedajo et al., 2025).

Lesson Study is a collaborative, cyclical process that involves joint planning, teaching (or observation of an open class), reflection, and revision of teaching practices among educators (Altinsoy, 2023; Rodrigues & Arroio, 2020). This model not only fosters reflective practice but also enhances pedagogical decision-making through shared expertise and continuous improvement cycles.

A growing body of research supports the effectiveness of Lesson Study in improving pre-service teachers' pedagogical knowledge and classroom practices. Several studies have specifically highlighted the potential of LS to contribute significantly to the development of TPACK among future educators (Darsih et al., 2021, 2023; Darsih, Agustiana, & Rahmatunisa, 2024; Sonsupap et al., 2024). A clear relationship has been found between enhanced TPACK understanding and improved student learning outcomes in science education (Nurul Huda et al., 2021). In addition, LS has been reported to promote 21st-century competencies such as reflective thinking, creativity, and teaching confidence (Al-Hattami & Bawaneh, 2024; Erbilgin & Robinson, 2025; Kasi et al., 2022).

Further benefits include improved lesson planning (Mohd Ramli & Borhan, 2024), strengthened noticing skills—the ability to observe and interpret critical classroom interactions (Türk & Baki, 2024), and increased collaboration among prospective teachers. These benefits illustrate the compatibility between LS and the goals of modern teacher education.

Besides, previous research has demonstrated the potential of Lesson Study in enhancing instructional practices, fostering professional collaboration, and improving reflective teaching (Nguyen et al., 2024; Subasman, 2024). In the context of teacher education, several studies (Iqbal Maulana et al., 2023; Kasi et al., 2022) have shown that Lesson Study can facilitate pedagogical improvement among pre-service teachers. Similarly, TPACK has been widely adopted as a theoretical framework to assess teachers' integrated knowledge in using technology effectively (Mishra & Koehler, 2006). Some local studies in Indonesia have begun to explore the intersection between Lesson Study and TPACK development development (Nurul Huda et al., 2021), but findings remain fragmented, and few offer in-depth analyses within the formal structure of the PPG program.

Despite its potential, the implementation of Lesson Study within the TPE program is not without challenges. Existing studies have noted obstacles such as low motivation, limited institutional support, time constraints, difficulty in preparing for Open Class, and even seclusion behavior among pre-service teachers (Ezekiel Kihwele, 2023). Moreover, while both LS and TPACK have been independently studied in the Indonesian context, there is a lack of integrated research that explores how Lesson Study directly supports TPACK development within the formal structure of the TPE program and did not fully address the integration of digital tools in LS settings. This

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indicates a research gap regarding how LS can evolve into a hybrid model to strengthen TPACK in teacher education programs.

While Lesson Study (LS) has been widely recognized as an effective model for collaborative professional development, its traditional implementation is primarily conducted face-to-face. Limited research has explored how LS can be adapted into a hybrid format that combines digital platforms with in-person collaboration, particularly in the context of teacher education in Indonesia. Moreover, there is insufficient empirical evidence on how Hybrid Lesson Study contributes to the development of pre-service teachers' Technological Pedagogical Content Knowledge (TPACK).

This study aims to investigate the implementation of Hybrid Lesson Study in the Indonesian Teacher Professional Education (PPG) program and examine its impact on pre-service teachers' TPACK development. Specifically, it seeks to:

1) Describe how Hybrid Lesson Study is designed and implemented within the PPG context;
2) Identify the enabling and constraining factors influencing its implementation;
3) Analyze its contribution to pre-service teachers' ability to integrate technology into lesson planning, classroom practice, and reflective teaching; and
4) Propose policy recommendations to strengthen the integration of Hybrid Lesson Study as a sustainable professional learning model in the PPG program.

RESEARCH METHOD

A qualitative case study design was employed to capture the complexity of implementing Hybrid Lesson Study (HLS) within the authentic context of the PPG's Field Practice (*PPL*). This approach was deemed appropriate because it allows for an in-depth exploration of how pre-service teachers and mentors interact, plan, and reflect within a real-life educational setting where teaching, technology integration, and professional learning are naturally intertwined. Through this design, the study could generate rich, contextualized insights into the processes, challenges, and outcomes of HLS implementation that would not be attainable through quantitative or experimental methods. The participants of this study consisted of:

1) PPG pre-service teacher candidates who were actively undergoing their PPL while implementing Lesson Study as part of their professional teaching development, and
2) Supervising lecturers who played a key role in mentoring and facilitating the LS process.

This study was approved by the Teacher Education Institutions, therefore the participants were selected from two Teacher Education Institutions or Lembaga Pendidikan Tenaga Kependidikan (LPTK) across Indonesia, representing diverse geographical and institutional contexts. Each institution contributed a group of five student-teacher participants, resulting in a total of 10 PPG students involved in the study. In addition, at least one supervising lecturer from each institution—actively involved in the mentoring and implementation of Lesson Study—was included, making the total number of participants 12 individuals. Informed consent was obtained from all individual participants included in the study.

Purposive sampling was employed to ensure that participants met specific criteria, such as active participation in Lesson Study cycles during Field Practice, availability of documented teaching practices, and willingness to engage in reflective interviews and observations (Palinkas et al., 2015). This participant composition was

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considered sufficient to provide varied perspectives while maintaining depth of inquiry within each institutional case. Digital Tools Used in Hybrid Lesson Study Implementation are presented in table 1.

Table 1. Digital Tools Used in HLS Implementation

HLS stages	Main Activities	Tools	Function in the process
Plan	Collaborative lesson design, material sharing	Google Docs	Shared document editing, visual material creation, and brainstorming
Do	Teaching implementation, peer observation	Zoom (recording feature), Online Observation Sheet (Google Form)	Facilitate real-time and asynchronous observation and feedback collection
See	Reflection, discussion, feedback exchange	Google Drive (video sharing), WhatsApp Group	Enable video-based reflection, asynchronous peer comments, and mentor feedback

During the "Do" stage, classroom activities were conducted using a hybrid model that combined synchronous online sessions with in-person observations. The face-to-face component was managed through scheduled on-campus meetings where participants implemented their lesson plans, while researchers directly observed classroom practices to document pedagogical and technological integration. Data were collected using three primary instruments:

1) In-depth Interviews: Conducted with both student-teachers and supervising lecturers to gather rich, personal insights into their experiences, perceptions, and challenges in implementing LS.
2) Participant Observation: The researchers observed the LS cycle activities during PPL, including lesson planning meetings, open class sessions, and reflective discussions.
3) Document Analysis: Involved reviewing teaching-related artifacts produced by student-teachers, including Lesson plans, Digital learning materials, Teaching reflections, and relevant institutional documents pertaining to the LS process.

This triangulated data collection approach enabled a comprehensive understanding of both the process and outcomes of LS implementation within the PPG framework. The data were analyzed using a thematic analysis technique, consisting of the following steps:

1) Coding: Initial identification of key units of meaning from transcripts and notes. The coding process combined inductive and deductive approaches: data-driven codes were first generated inductively, then refined and organized deductively based on the TPACK dimensions to ensure analytical consistency and reliability.
2) Categorization: Grouping codes into broader thematic categories based on patterns and relevance to the research questions.
3) Interpretation: Synthesizing findings to draw meaning and insights from the emergent themes, particularly in relation to the development of TPACK and the factors influencing LS implementation.

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RESULTS AND DISCUSSION

Results

A. Implementation of Hybrid Lesson Study within the Teacher Professional Education (TPE) Program.

The The data revealed four themes characterizing the implementation of Hybrid Lesson Study (HLS) within the Teaching Practicum (PPL): (1) collaborative lesson design supported by digital tools, (2) reflective practice and peer feedback across cycles, (3) integration of digital tools in teaching practice, and (4) contextual challenges in hybrid collaboration. These themes appeared consistently across the four stages of HLS—Plan, Do, See, and Reflect.

HLS was implemented in two cycles at two Teacher Education Institutions (LPTKs) involving ten pre-service teachers and two supervising lecturers. Each cycle followed the structure of Plan–Do–See/Reflect, combining face-to-face and online activities. The implementation process can be described in four stages:

1. Planning Phase (Plan)

During the planning phase, pre-service teachers and supervising lecturers collaboratively designed lesson plans (RPP) integrating technology. The process included face-to-face meetings and online discussions through video conferencing and messaging platforms.

a. Cycle 1: Initial drafts of lesson plans mainly incorporated PowerPoint presentations as the primary digital tool.
b. Cycle 2: Subsequent lesson plans included additional digital tools such as Google Forms and Kahoot for quizzes, videos for content delivery, and digital worksheets.
c. Revisions were made asynchronously between scheduled meetings, resulting in more detailed lesson designs.

2. Teaching Phase (Do)

During the teaching phase, pre-service teachers implemented the designed lessons in partner schools. Supervising lecturers and peers conducted observations both in person and virtually using shared observation sheets.

a. **Cycle 1:** Observations indicated limited use of digital tools, primarily for presenting materials. Student engagement with technology was minimal.
b. **Cycle 2:** Observations showed increased integration of technology into instructional strategies, including the use of online quizzes to monitor understanding and short videos to initiate classroom discussions.
c. Supervising lecturers recorded notes on classroom interactions and how technological tools were utilized during instruction.

3. Reflection Phase (See/Reflect)

Reflections were conducted in both offline and online formats.

a. **Cycle 1:** Reflection sessions focused on reporting technical challenges such as unstable internet connections and unfamiliarity with certain applications.
b. **Cycle 2:** Reflection notes contained descriptions of how digital tools were used to facilitate learning and how classroom interactions changed compared to the first

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cycle. Participants shared teaching videos, exchanged written comments, and discussed observed differences between the two LPTKs.

4. Outcomes of HLS Implementation
   Across both cycles, the following outcomes were recorded based on observation sheets, lesson plans, and reflection notes:
   a. Increased use of interactive digital tools across cycles.
   b. More collaborative lesson planning through hybrid meetings.
   c. Documented cross-institutional exchanges between pre-service teachers.
   d. Reported challenges related to internet connectivity and limited time during hybrid collaboration.

B. Key Factors Influencing the Effectiveness of Hybrid Lesson Study

The analysis of observations, interviews, and reflective reports identified several factors influencing the implementation of Hybrid Lesson Study (HLS). These factors were grouped into four dimensions: collaboration, technological infrastructure, mentoring, and institutional support.

1. Collaborative Engagement

Collaboration among pre-service teachers and supervising lecturers was a central component of the HLS process. Data from meeting records and interviews showed that joint lesson planning activities were conducted through both face-to-face and online modes. Online platforms such as WhatsApp and Google Meet were used for coordination and sharing of lesson plan drafts. Document analysis indicated differences in participation levels, with some pre-service teachers contributing more actively than others during online discussions.

2. Technological Infrastructure and Accessibility

All participants relied on digital devices and internet connectivity to conduct hybrid collaboration. Observation notes recorded several instances of unstable connections that caused delays in synchronous discussions and interruptions during online teaching sessions. Participants reported using offline materials or simplified digital tasks when connectivity problems occurred. These adjustments were documented in the reflection reports.

3. Mentoring and Professional Guidance

Mentoring activities were observed during planning and reflection sessions. Mentor lecturers provided written and verbal feedback using shared digital documents and video conferencing tools. Feedback records showed that mentors focused on aspects of lesson structure, classroom management, and the use of digital tools. Some mentors reported challenges in determining the appropriate level of guidance to allow pre-service teachers to make independent decisions.

4. Institutional and Contextual Support

Institutional documents and interviews indicated that administrative approval and scheduling flexibility affected the timing and continuity of HLS activities. Physical and contextual aspects of schools such as classroom size, projector availability, and school policies on device use were also identified as factors influencing the integration of digital tools during classroom implementation..

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C. The Impact of Lesson Study on Pre-Service Teachers' TPACK Development

Based on classroom observations and document analysis of teaching artifacts (lesson plans, teaching reflections, and instructional materials), several key impacts of Lesson Study (LS) on pre-service teachers' TPACK (Technological Pedagogical Content Knowledge) development were identified.

1. Enhanced Lesson Planning through TPACK Integration

Document analysis revealed that lesson plans produced after the first LS cycle tended to show limited integration of technology, often restricted to basic presentation slides. However, by the second and third cycles, pre-service teachers began to demonstrate more sophisticated integration of content, pedagogy, and technology. For example, lesson plans incorporated interactive media, digital quizzes, and context-specific teaching strategies aligned with the learning objectives. Observers noted that these revisions were often based on collaborative discussions during LS reflection sessions.

2. Improved Classroom Practice with Technology Use

Observations indicated that pre-service teachers increasingly employed digital tools not just as supplementary aids but as integral components of pedagogy. For instance, students used multimedia resources to explain abstract concepts, online polling tools to check understanding, and videos to connect classroom learning with real-world contexts. Compared to earlier lessons, subsequent LS cycles showed stronger alignment between technology use, pedagogical strategies, and content delivery, reflecting growth in technological-pedagogical alignment.

3. Development of Pedagogical Responsiveness

Through iterative LS cycles, pre-service teachers demonstrated increased capacity to adapt their teaching strategies based on student needs. Observation notes highlighted that in early lessons, teaching often followed a rigid plan, whereas later cycles showed more responsiveness, such as modifying technology use or adjusting group activities when students appeared disengaged. Reflections documented by pre-service teachers emphasized this awareness, linking it to the feedback and collective analysis gained from LS sessions.

4. Strengthened Reflective Thinking on TPACK

Teaching reflections analyzed across cycles revealed a shift from descriptive accounts of teaching performance to more analytical discussions of TPACK dimensions. Early reflections tended to focus on whether technology functioned properly, while later ones evaluated how technology supported pedagogy and content delivery. For example, one student teacher reflected that "using online quizzes was not only fun for students, but it also helped me quickly identify which content areas needed re-explaining." This progression illustrates the impact of LS in fostering reflective habits that deepen understanding of TPACK.

5. Collaborative Construction of Professional Knowledge

Artifacts from group planning and reflection meetings highlighted how collaboration within LS supported collective knowledge building. Mentor teachers and peers frequently suggested adjustments in how technology could be integrated with content-specific pedagogy, which were then adopted in subsequent lesson plans. This

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collaborative dialogue provided pre-service teachers with multiple perspectives, accelerating their ability to apply TPACK in authentic classroom contexts.

Overall, the findings suggest that Hybrid Lesson Study was effective in strengthening pre-service teachers' TPACK. The cycles of planning, teaching, and reflecting supported by digital tools encouraged participants to integrate technology more meaningfully, enhance their pedagogical practices, and develop habits of reflective and collaborative inquiry. These outcomes highlight the potential of HLS as a sustainable professional learning framework in teacher education programs.

Discussion

The integration of Lesson Study (LS) within the PPL program illustrates how collaborative and iterative professional learning can effectively nurture preservice teachers' TPACK development. Rather than focusing solely on outcomes, these findings underscore the *process* through which pedagogical reasoning evolved. The observed shift from technical concerns to pedagogical reflection reflects the TPACK model's dynamic nature—particularly the growth of Technological Pedagogical Knowledge (TPK), where teachers began to conceptualize technology as a means for transformation, not mere supplementation. This interpretation aligns with (Niess, 2011) and (Darsih, Agustiana, Rahmatunisa, et al., 2024; Subasman, 2024), who emphasize that authentic TPACK development occurs when teachers move beyond operational fluency toward pedagogical intentionality.

From a theoretical standpoint, the hybrid adaptation of LS expanded its original framework by embedding technological mediation into each cycle. Drawing on Hrastinski's (Hrastinski, 2021) notion of online participation as a "sustained presence," the hybrid format enabled reflection and dialogue to extend beyond the physical classroom. This reconceptualization of LS suggests that technology can serve not only as a tool for instruction but also as a space for professional learning, echoing the arguments of Al-Hattami and Bawaneh (Al-Hattami & Bawaneh, 2024) that collaborative structures are most effective when supported by flexible digital environments.

The challenges identified—particularly unstable internet connectivity and time constraints—reveal the fragility of the Technological–Pedagogical (T–P) dimension in contexts with infrastructural limitations. While preservice teachers demonstrated adaptability through improvisations, such as replacing interactive quizzes with static slides, these modifications often led to pedagogical trade-offs. Reduced interactivity constrained opportunities for real-time feedback and collaborative meaning-making, which are central to technology-enhanced learning (Mishra & Koehler, 2006) This finding aligns with evidence from developing-country contexts (Alsaeed, 2022; Aryanti et al., 2024; Darsih et al., 2021, 2023; Darsih, Agustiana, & Rahmatunisa, 2024; Iqbal Maulana et al., 2023), where resource limitations can restrict teachers' ability to fully enact transformative TPACK practices despite strong pedagogical intent.

Furthermore, the hybrid LS model sheds light on how mentoring and collaborative reflection function as mediating factors for TPACK growth. Consistent with Fernandez and Yoshida (Kasi et al., 2022; Mohd Ramli & Borhan, 2024), reflective dialogue among lecturers, mentor teachers, and preservice teachers facilitated deeper pedagogical inquiry, helping novices internalize principles of lesson design and learner engagement.

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However, the uneven quality of reflection observed across cycles suggests the need for more structured mentoring protocols and institutional support to sustain reflective depth and equitable participation.

In the broader landscape of Indonesian teacher education, these interpretations position Hybrid Lesson Study (HLS) as both a *technological innovation* and a *pedagogical reform strategy*. By bridging institutional, technological, and practical domains, HLS provides a model for integrating TPACK within authentic teaching contexts. Its success depends not merely on the digital infrastructure available, but on systemic collaboration among LPTKs, PPG programs, and partner schools to ensure sustained mentorship, adequate resources, and a culture of reflective practice. Thus, HLS offers a theoretically grounded and contextually responsive framework for preparing reflective, adaptive, and technologically competent teachers in the digital era.

The hybrid nature of the model further amplified this process. Online collaboration platforms enabled sustained reflection, resource sharing, and peer feedback beyond face-to-face sessions, fostering *Technological Knowledge (TK)* in authentic teaching contexts. This combination of in-person and virtual engagement encouraged teachers to integrate technology not as an add-on, but as an essential element of pedagogical reasoning and content delivery. Consequently, Hybrid Lesson Study served as both a professional learning and technological mediation space—bridging theory and practice, and reinforcing TPACK as an interconnected and evolving framework within the PPG program. (Darsih et al., 2023; Darsih, Agustiana, & Rahmatunisa, 2024; Hrastinski, 2021; Mohd Ramli & Borhan, 2024).

The findings of this study also indicate that the implementation of Hybrid Lesson Study (HLS) provided significant benefits for pre-service teachers in terms of professional development and TPACK enhancement. The hybrid format, which combined face-to-face and digital collaboration, enabled participants to engage more flexibly in lesson planning, classroom practice, and reflective dialogue. This aligns with (Al-Hattami & Bawaneh, 2024; Nguyen et al., 2024; Subasman, 2024), who emphasized that the success of Lesson Study lies in its collaborative and iterative structure. In the hybrid adaptation, digital tools amplified this collaborative dimension by extending opportunities for interaction beyond the constraints of time and space.

Taken together, the implementation of LS in PPL supports the development of reflective, adaptive, and technology-integrated teaching practices among pre-service teachers. By situating teaching practice within a collaborative and iterative cycle, LS not only enhances the quality of field experiences but also contributes to the broader goal of preparing teachers who are capable of navigating the complex demands of 21st-century classrooms.

The integration of Lesson Study (LS) within the PPL program has important implications for teacher education. For the PPG program, LS ensures that teaching practice becomes a structured process of collaborative planning, reflection, and iterative improvement. For LPTKs, the findings highlight the need to strengthen the capacity of lecturers and mentor teachers to guide reflective practice and support the integration of TPACK through access to technology and training. For partner schools, institutional support in terms of resources, time allocation, and leadership commitment is crucial to sustain LS activities. Strengthening collaboration among PPG programs, LPTKs, and schools will enable LS to function as a transformative model for preparing reflective, adaptive, and technologically competent teachers.

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CONCLUSION

Fundamental Finding : This study examined the implementation of Hybrid Lesson Study (HLS) in two Indonesian Teacher Education Institutions, involving 10 pre-service teachers and 2 supervising lecturers. The findings show that HLS strengthened pre-service teachers' TPACK by improving lesson design, classroom practice, reflective skills, and collaborative knowledge-building. Through hybrid cycles of planning, teaching, and reflection, participants moved from superficial uses of technology to more meaningful and pedagogically integrated practices. Despite challenges such as unstable internet access and time limitations, HLS proved to be a flexible and sustainable model. Reflection sessions conducted both offline and online enabled deeper critical analysis of teaching practices, while collaboration with mentors and peers created a supportive professional learning community. These outcomes highlight the potential of HLS to prepare pre-service teachers for technology-rich classrooms. **Implication :** This study highlights key implications for teacher education institutions (LPTKs) implementing the PPG program. First, LPTKs should adopt Hybrid Lesson Study (HLS) as a structured framework that systematically embeds TPACK development into pre-service teacher learning. Integrating HLS within the PPG curriculum ensures that technology use is meaningfully aligned with pedagogical and content goals. Second, mentor capacity building is essential. Mentor teachers and university supervisors must be trained to model technology-enhanced instruction and provide TPACK-informed feedback during reflection cycles. Structured professional development programs focusing on digital pedagogy and feedback literacy will strengthen this role. Third, institutions need to enhance digital infrastructure and establish supportive policies that sustain hybrid collaboration and mentor engagement. **Future Research :** This study has several limitations that should be acknowledged. The small sample size—comprising 10 pre-service teachers and 2 supervising lecturers from only two teacher education institutions—limits the generalizability of the findings to other PPG contexts. Moreover, the study focused on a single cycle of Hybrid Lesson Study implementation within a specific academic semester, which may not capture long-term changes in teaching practice or TPACK development. Future research with a larger and more diverse sample across multiple institutions and extended timeframes is recommended to validate, expand and to strengthen the generalizability of findings. Longitudinal investigations would also be valuable in examining the sustained influence of Hybrid Lesson Study on teachers' professional growth and instructional practices. Additionally, comparative studies with alternative professional development models and the integration of emerging digital technologies could provide deeper insights into the adaptability and effectiveness of Hybrid Lesson Study across varied educational contexts.

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