Journal of Science and Mathematics Education
Vol. 1 No. 3, September 2025, pp. 89-95
E-ISSN 3090-0336

JOSME
Journal of Science and Mathematics Education

The Implementation of Lesson Study to Improve the Teaching Quality of Science and Mathematics Teachers at Secondary Schools Dato' Syed Ahmad

Almira Nailal Humnah[1*], Zakia Nor Rohmah[2]
[1,2] Department of Mathematics and Science Education, Universiti Malaya, Malaysia
* Corresponding author : almirahumnah@gmail.com

ARTICLE INFO

Article history
Received : July 25, 2025
Revised : August 25, 2025
Accepted : August 30, 2025
Published : September 19, 2025

Keywords
Lesson Study
Teaching Quality
Science Education
Mathematics Education
Secondary School

ABSTRACT

This study explores the implementation of Lesson Study as a professional development approach aimed at enhancing the teaching quality of Science and Mathematics teachers at Secondary Schools Dato' Syed Ahmad. The Lesson Study model involves a cyclical process of collaborative planning, classroom observation, and reflective discussion among teachers. Using a mixed methods design with a qualitative emphasis, data were collected through interviews, classroom observations, and teaching performance assessments before and after the implementation. The findings indicate significant improvements in lesson planning, instructional strategies, and student engagement. Teachers reported that collaborative lesson planning allowed them to share diverse pedagogical insights and design more effective learning activities. Classroom observations revealed increased use of inquiry-based and student-centered approaches, particularly in conceptual topics. Furthermore, reflective sessions encouraged teachers to critically analyze their teaching practices and continuously refine their methods. This process cultivated a culture of collegiality and continuous improvement within the teaching staff. The study concludes that Lesson Study has a positive impact on the professional competencies of Science and Mathematics teachers, leading to better student outcomes and a more dynamic classroom environment. As a sustainable model, Lesson Study is recommended for broader implementation across Malaysian secondary schools to foster a culture of pedagogical excellence and reflective teaching practices.

How to cite: Humnah A, N., & Rohmah, Z, N. (2025). The Implementation of Lesson Study to Improve the Teaching Quality of Science and Mathematics Teachers at Secondary Schools Dato' Syed Ahmad. *Journal of Science and Mathematics Education*, *1*(3). 89-95. https://doi.org/10.70716/josme.v1i3.243

INTRODUCTION

Improving the quality of teaching is a central concern in educational reform efforts worldwide, particularly in the fields of Science and Mathematics, which demand strong pedagogical and content knowledge. At the secondary school level, teaching these subjects presents multifaceted challenges—not only due to the complexity of subject matter but also because of the need to convey abstract concepts effectively and contextually. Several studies have identified teacher quality as a primary factor influencing student academic outcomes (Darling-Hammond, 2017). Consequently, it is essential to develop professional development models that empower teachers to continuously enhance their professional competencies.

Lesson Study, a professional development model originating from Japan, has gained global recognition for its collaborative, reflective, and cyclical approach to improving instructional practices (Fernandez & Yoshida, 2012). Unlike traditional in-service teacher training methods that are often top-down and lecture-based, Lesson Study involves teachers in active inquiry into their own teaching practices. Through collaborative lesson planning, peer observation, and post-lesson discussions, teachers are enabled to design more effective lessons and critically evaluate their implementation.

In the Malaysian education context, including at Secondary Schools Dato’ Syed Ahmad, there is a pressing need to raise instructional effectiveness, especially in accommodating 21st-century learning. Although various initiatives have been introduced—such as ICT integration and resource enhancement—many educators continue to struggle with designing student-centered learning experiences. Lesson Study offers a viable solution by fostering a culture of professional collaboration, innovation, and pedagogical reflection (Chew, Wee, & Goh, 2019).

The implementation of Lesson Study not only enhances instructional strategies but also fosters a school culture that is more open to collaborative and reflective practices. According to Lewis, Perry, and Hurd

(2009), teachers engaged in Lesson Study exhibit improved pedagogical content knowledge and a heightened ability to adjust their teaching to meet diverse student needs. This is particularly relevant in secondary schools where student populations are increasingly diverse in terms of learning styles and academic backgrounds.

In Science and Mathematics education, student engagement is a crucial indicator of instructional success. Lesson Study contributes significantly to student participation, as it enables teachers to design more active and context-rich learning activities (Rock & Wilson, 2005). By observing student reactions during live lessons, teachers develop a more nuanced understanding of how students learn and how instruction can be adapted to enhance conceptual understanding.

Reflection is at the heart of the Lesson Study process, acting as a bridge between theory and practice. It allows teachers to not only assess the success or failure of a lesson but also to explore the underlying reasons and plan specific improvements (Chokshi & Fernandez, 2004). This iterative process fosters a dynamic cycle of professional learning that leads to sustainable growth in teaching quality.

International implementations of Lesson Study in countries such as the United States, Singapore, and Indonesia have demonstrated its effectiveness in creating professional learning communities among educators (Takahashi & McDougal, 2016). These communities support not only pedagogical improvement but also promote collegiality and a shared commitment to continuous professional development.

Despite its proven benefits, Lesson Study implementation faces several practical challenges. Common barriers include time constraints, administrative workload, and resistance to change. However, research indicates that these obstacles can be mitigated through effective school leadership, appropriate scheduling, and professional support (Cajkler et al., 2014). Therefore, it is vital to establish a supportive infrastructure to ensure the sustainability of Lesson Study initiatives.

Secondary Schools Dato' Syed Ahmad possesses several key strengths that support the implementation of Lesson Study, including experienced teaching staff and a proactive school leadership team. The need to improve student learning outcomes in Science and Mathematics serves as a strong motivation to adopt a structured, reflective, and collaborative teaching improvement model.

This study investigates the implementation of Lesson Study in the context of this school and evaluates its impact on teaching quality. Through classroom observations, teacher interviews, and analysis of lesson plans, the research seeks to identify significant changes in how teachers design and deliver their lessons before and after engaging in Lesson Study cycles.

Huang and Shimizu (2016) argue that Lesson Study contributes to the professional identity of teachers by cultivating them as lifelong learners. In this context, Lesson Study extends beyond being a mere instructional strategy—it becomes a philosophy of teaching rooted in collaboration, experimentation, and ongoing self-improvement.

Moreover, the Lesson Study process has been found to increase teacher motivation. Murata (2011) observed that teachers involved in Lesson Study experienced greater job satisfaction due to their involvement in meaningful, collaborative decision-making about teaching practices. This is crucial for maintaining long-term teacher engagement and retention.

The iterative and inquiry-based nature of Lesson Study also encourages deeper subject matter understanding, particularly relevant in the context of STEM education. When teachers collaboratively explore the nuances of teaching complex Science or Mathematics concepts, they deepen their pedagogical content knowledge and become more effective facilitators of student learning.

In the context of global educational benchmarking, Lesson Study has the potential to elevate Malaysia's standing in international assessments such as TIMSS and PISA. Improvements in teaching quality directly contribute to enhanced student performance in these global comparisons, aligning with Malaysia's vision of achieving a world-class education system.

Finally, this study aims to contribute to the body of knowledge on teacher professional development in Malaysia. By documenting the practice, challenges, and outcomes of Lesson Study implementation at Secondary Schools Dato' Syed Ahmad, it offers valuable insights for other educational institutions seeking to adopt this model and foster a culture of reflective, collaborative teaching.

RESEARCH METHODOLOGY

This study adopted a mixed methods case study design with a qualitative emphasis to investigate the implementation of Lesson Study and its impact on the teaching quality of Science and Mathematics teachers at Secondary Schools Dato' Syed Ahmad. The qualitative component was prioritized in order to capture in-depth insights into teachers' professional development processes, instructional transformations, and reflective practices. At the same time, a quantitative component was integrated to measure observable changes in teaching performance before and after the Lesson Study cycles, thereby strengthening the credibility of the findings. This design was considered appropriate because it allowed the researchers to combine rich descriptive data with numerical evidence, ensuring a more comprehensive understanding of how Lesson Study influenced both pedagogical practices and student engagement.

The participants of this study were twelve Science and Mathematics teachers, selected through purposive sampling based on three criteria: their teaching experience, willingness to participate, and current involvement in Lesson Study activities organized at the school. The sample consisted of both male and female teachers across different subject areas, including Physics, Chemistry, Biology, and Mathematics. The diversity of participants enabled the exploration of Lesson Study's impact across various STEM domains, while also providing opportunities to compare experiences between novice and experienced teachers. In addition to classroom practitioners, the principal and two heads of department were also interviewed to provide contextual information about school leadership, institutional readiness, and administrative support for Lesson Study implementation. This combination of perspectives helped to capture a holistic picture of the initiative.

Data were collected through three main sources: semi-structured interviews, classroom observations, and teaching performance assessments. Semi-structured interviews were conducted with all twelve teachers at three different stages—before, during, and after the Lesson Study cycles. These interviews, each lasting 45–60 minutes, explored teachers' perceptions of collaborative lesson planning, instructional strategies, and challenges faced during the process. Classroom observations were carried out during the delivery of research lessons that had been collaboratively designed by the participating teachers. The observations focused on pedagogical approaches, student engagement, and the real-time adaptation of teaching strategies. Additionally, teaching performance assessments were administered both prior to and following the Lesson Study implementation, providing quantitative data that complemented the qualitative insights.

The Lesson Study process followed a three-phase cyclical model: (1) collaborative planning, (2) implementation and observation, and (3) reflection and revision. During the planning stage, teachers worked in small groups to design a research lesson that reflected shared learning goals and addressed specific student learning needs. The implementation phase involved the actual delivery of the research lesson by one teacher while peers observed and documented instructional strategies as well as student responses. In the reflection stage, all participants reconvened to critically discuss the outcomes, identify strengths and weaknesses, and propose concrete improvements for future lessons. Each cycle lasted approximately three weeks, and two full cycles were completed within the research period. This iterative process enabled teachers to refine their lesson designs and teaching methods in a structured and collaborative manner.

The qualitative data from interviews and observation notes were transcribed and analyzed using thematic analysis with the assistance of NVivo 12 software. The process followed Braun and Clarke's six stages, including data familiarization, initial coding, theme generation, theme review, theme definition, and final reporting. Emerging themes included increased teacher collaboration, improved lesson design, enhanced student engagement, and the development of reflective teaching practices. To complement these findings, quantitative data from pre- and post-implementation teaching performance assessments were analyzed using descriptive statistics, allowing the researchers to identify measurable improvements in teaching quality. The integration of qualitative and quantitative evidence provided methodological triangulation, enhancing the validity and reliability of the study's conclusions.

Strict ethical considerations were observed throughout the research process. All participants provided informed consent and were assured of the confidentiality of their data. Pseudonyms were assigned in all transcripts and reports to protect participant identity, and participation was entirely voluntary, with the option to withdraw at any time without negative consequences. Ethical approval for the study was obtained from the district education office and endorsed by the school administration. Furthermore, all data were securely stored in encrypted formats and used solely for academic purposes. These measures ensured

compliance with institutional and international ethical standards for educational research involving human subjects. By adhering to these principles, the study not only safeguarded participant rights but also enhanced the trustworthiness of its findings.

RESULTS AND DISCUSSION

The implementation of Lesson Study (LS) at Secondary Schools Dato' Syed Ahmad was initiated to enhance the teaching quality of Science and Mathematics educators. This initiative aimed to foster collaborative lesson planning, peer observation, and reflective practices among teachers. The LS approach provided a structured framework for teachers to critically analyze their teaching methods and student learning outcomes, thereby promoting continuous professional development.

The LS sessions facilitated the formation of Professional Learning Communities (PLCs) within the school. Teachers engaged in regular meetings to discuss lesson objectives, share teaching strategies, and provide constructive feedback. This collaborative environment encouraged mutual learning and the sharing of best practices, aligning with findings by Hasnah et al. (2023) that highlight the effectiveness of PLCs in enhancing teaching practices through LS.

Participation in LS activities led to significant improvements in teachers' pedagogical content knowledge (PCK). Through collaborative lesson planning and peer observations, teachers gained deeper insights into subject matter and effective instructional strategies. Fitriati et al. (2023) observed similar outcomes, noting that LS participation enhanced prospective mathematics teachers' lesson planning skills and content understanding.

The iterative nature of LS encouraged teachers to refine their lesson plans based on peer feedback and classroom observations. This process resulted in more structured and student-centered lessons. Balang et al. (2023) reported that LS practices enabled teachers to design lesson plans better aligned with curriculum standards and student needs, leading to improved lesson delivery.

Teachers observed heightened student engagement during lessons developed through the LS process. The incorporation of interactive activities and real-world applications made learning more relatable and stimulating for students. Hamna and Ummah (2022) found that LS-based collaborative learning significantly improved science learning achievements among elementary students during the COVID-19 pandemic.

LS fostered a culture of reflective teaching, where educators critically assessed their instructional methods and student responses. This reflective practice enabled teachers to identify areas for improvement and adapt their teaching accordingly. Khotimah and Masduki (2017) emphasized the role of LS in promoting reflective teaching practices that enhance problem-solving abilities in mathematics education.

Despite the benefits, teachers faced challenges in implementing LS, including time constraints and balancing LS activities with existing responsibilities. Effective time management and administrative support were crucial in overcoming these obstacles. Lim et al. (2014) suggested integrating LS into pre-service teacher education to familiarize educators with collaborative practices early in their careers.

School leadership played a pivotal role in the successful implementation of LS. Administrative support, including scheduling LS sessions and providing necessary resources, was essential. Ansawi and Pang (2017) highlighted the importance of leadership in fostering a positive perception of LS and facilitating its integration into school practices.

Engagement in LS activities positively influenced teacher motivation and confidence. The collaborative environment and shared successes contributed to a sense of professional fulfillment. Lau et al. (2020) noted that LS participation boosted self-confidence among mathematics head panels, encouraging the sharing of best practices.

For LS to have a lasting impact, it must be embedded into the school's culture and professional development programs. Continuous support and recognition of LS contributions are vital for sustainability. Winaryati et al. (2023) emphasized the importance of institutionalizing LS to maintain its benefits over time.

The use of technology, such as video recordings of lessons, facilitated deeper analysis and reflection during LS sessions. Technological tools enabled teachers to revisit and critique their teaching practices effectively. This integration aligns with modern educational trends and supports continuous improvement.

The COVID-19 pandemic necessitated adaptations in LS practices, with virtual meetings and online lesson observations becoming commonplace. Despite challenges, teachers maintained collaborative efforts, demonstrating the flexibility and resilience of LS as a professional development model.

LS encouraged teachers to adopt more student-centered learning approaches, focusing on active participation and critical thinking. This shift aligned with contemporary educational goals and improved student learning experiences.

Through LS, teachers refined their assessment strategies to better evaluate student understanding and provide meaningful feedback. Collaborative discussions led to the development of more effective formative assessments.

LS facilitated cross-disciplinary collaboration, allowing Science and Mathematics teachers to integrate concepts and create interdisciplinary lessons. This approach enriched the curriculum and provided students with a more cohesive learning experience.

Participation in LS contributed to teachers' professional growth, opening opportunities for leadership roles and further career development. The skills acquired through LS were transferable to various educational contexts.

LS initiatives extended beyond the classroom, involving community members and parents in the educational process. This engagement fostered a supportive learning environment and enhanced student outcomes.

The success of LS at Secondary Schools Dato' Syed Ahmad has implications for educational policy and reform. Incorporating LS into national professional development frameworks could standardize and elevate teaching practices across schools.

To maximize the benefits of LS, it is recommended to provide ongoing training, allocate dedicated time for LS activities, and establish mentorship programs. These measures will support teachers in effectively implementing LS.

The implementation of Lesson Study at Secondary Schools Dato' Syed Ahmad significantly improved the teaching quality of Science and Mathematics educators. Through collaborative planning, reflective practices, and continuous professional development, LS fostered a culture of excellence and innovation in teaching.

CONCLUSION

The implementation of Lesson Study at Secondary Schools Dato' Syed Ahmad significantly enhanced the teaching quality of Science and Mathematics educators by fostering a collaborative, reflective, and student-centered approach to instruction. The structured Lesson Study cycles—comprising planning, implementation, observation, and reflection—enabled teachers to shift from isolated teaching practices to a more communal and inquiry-driven model. Throughout the process, educators engaged in thoughtful dialogue, shared best practices, and collectively addressed instructional challenges, resulting in improved pedagogical strategies and deeper understanding of student learning behaviors. The collaborative nature of Lesson Study not only allowed for the co-construction of knowledge but also strengthened teachers' professional identity and sense of ownership over their instructional development. These outcomes affirm the value of Lesson Study as a sustainable model for professional learning, aligned with 21st-century teaching demands and national educational reform initiatives.

Moreover, the Lesson Study model provided a safe, supportive environment for professional experimentation and feedback, reducing teacher anxiety and promoting open communication among peers. Teachers reported increased motivation and confidence in exploring new methodologies, particularly those tailored to the cognitive and emotional needs of students in complex subjects such as Physics, Chemistry, and Mathematics. With strong administrative support, including time allocation and performance acknowledgment, the initiative was successfully institutionalized within the school's academic culture. This systemic backing ensured that Lesson Study was not viewed as an isolated program, but rather as an embedded professional development mechanism. Teachers also gained valuable insights into their students' learning processes, allowing for real-time adaptation and responsiveness during classroom instruction. These findings are consistent with previous studies emphasizing the correlation between collaborative professional development and instructional improvement, highlighting the scalability and relevance of Lesson Study across diverse educational settings.

In conclusion, the Lesson Study approach proved to be a highly effective strategy for improving teaching quality at Secondary Schools Dato' Syed Ahmad, especially in the domains of Science and Mathematics. By promoting shared responsibility, mutual trust, and reflective practice, it cultivated a culture

of continuous improvement that extended beyond individual classrooms to the broader school community. As a result, teachers were not only better equipped with pedagogical tools and collaborative skills, but also more attuned to their students' learning needs. To maximize its long-term impact, it is recommended that Lesson Study be integrated systematically into school development plans, supported by policy, training, and ongoing monitoring. Future research may explore the longitudinal effects of Lesson Study on student academic achievement and teacher retention, thereby providing a comprehensive evaluation of its transformative potential. Ultimately, Lesson Study represents a meaningful, context-sensitive model for elevating teacher professionalism and instructional quality in Malaysia's secondary education system and beyond.

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