



Lesson Study and School as a Learning Community to Support Sustainable Development Goals (SDGs): Definition, Literature Review, and Bibliometric Mapping

Jiraporn Chano¹, Bovornpot Choompunuch^{1,*}, Chi Cheng Wu²

¹Maharakham University, Thailand

²Kun Shan University, Taiwan

Correspondence: E-mail: bovonpot@msu.ac.th

ABSTRACT

This study reviews the development of research on lesson study and school as a learning community and positions bibliometric mapping as supporting evidence for understanding research trends. The review focuses on lesson study, school as a learning community, learning design, authentic learning, reflection, and embodied learning as interconnected concepts for improving teaching quality and collaborative professional learning. A literature review supported by bibliometric analysis was conducted using documents retrieved from Google Scholar through Publish or Perish and visualized using VOSviewer. Research in this field connects teacher collaboration, reflective practice, curriculum design, professional development, and student-centered learning. Bibliometric results show publication trends, document types, highly cited works, and keyword clusters. The study contributes a conceptual synthesis for strengthening school-based professional learning and SDGs-oriented educational transformation.

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1. INTRODUCTION

Lesson Study is widely recognized as a collaborative professional development approach that supports instructional improvement through lesson planning, classroom observation, analysis of student learning, and reflection. Rather than treating teacher development as a one-time training activity, Lesson study positions professional learning as an ongoing process embedded in classroom practice. This approach enables teachers to examine real learning situations, discuss student responses, and revise instructional strategies based on collective evidence [1, 2].

School as a learning community is closely related to Lesson Study because it expands the focus from classroom-level lesson improvement to whole-school professional culture. A school that functions as a learning community encourages teachers, students, administrators, and other stakeholders to participate in shared learning, collective responsibility, and continuous improvement. In this context, teachers are not isolated practitioners but members of a professional community who reflect together and support one another. Literature on professional learning communities and schools as learning organizations shows that collaboration, shared vision, and professional learning are important for improving school development and sustaining educational change [3, 4].

The relationship between lesson study and school as a learning community becomes stronger when connected with learning design, authentic learning, reflection, and embodied learning. Learning design supports teachers in planning meaningful learning experiences, organizing learning activities, and aligning instructional strategies with assessment. Authentic learning connects classroom activities with real-world problems and meaningful contexts, helping students apply knowledge beyond memorization. Reflection enables teachers to evaluate their practices and make informed decisions for improvement. Embodied learning emphasizes active, sensory, and experiential engagement in knowledge construction. Together, these concepts form a broader framework for improving teaching and learning through collaboration, meaningful design, reflective inquiry, and active engagement [5-10].

The importance of these concepts is also connected to Sustainable Development Goals (SDGs), especially SDG 4 on quality education. Collaborative professional learning and school-based improvement can support inclusive, equitable, and quality education by strengthening teacher competence, improving instructional quality, and creating meaningful learning environments. Literature on educational innovation, project-based learning, digital learning, community learning, and inclusive education also shows that quality education requires pedagogical adaptation, learner engagement, contextual relevance, and continuous teacher development [11-16]. Therefore, lesson study and school as a learning community can be positioned as educational approaches that support SDGs-oriented school transformation.

Although the literature on lesson study, school as a learning community, learning design, authentic learning, reflection, and embodied learning has expanded, the relationship among these concepts is often discussed separately. Some studies focus on teacher professional development, while others focus on curriculum design, reflection, authentic learning, or experiential engagement. This creates a need for a more integrated literature review that explains how these concepts relate to one another and how they contribute to collaborative educational improvement. In addition, bibliometric mapping can support this literature review by showing publication trends, document types, keyword relationships, and influential works in the research field.

Bibliometric analysis is useful for identifying patterns in scholarly publications, including publication productivity, citation patterns, keyword co-occurrence, and thematic clusters. It does not replace a literature review, but it can strengthen a review by providing quantitative evidence of how a field has developed. In educational research, bibliometric tools can help researchers map the intellectual structure of a research area and identify emerging themes. VOSviewer is commonly used to visualize relationships among keywords, authors, and publications, while Publish or Perish can assist in retrieving and organizing bibliometric data [17-20].

This study aims to review the development of research on lesson study and school as a learning community and to explain their relationship with learning design, authentic learning, reflection, and embodied learning. Bibliometric mapping is used as supporting evidence to show annual publication trends, document types, highly cited works, and keyword clusters. The originality of this study lies in positioning bibliometric analysis as a supporting component within a broader literature review, rather than treating it as the only focus. This study contributes a conceptual synthesis of collaborative professional learning and school-based improvement to support SDGs-oriented quality education. The study is guided by the following research questions:

- (i) How has research on Lesson Study and related innovative learning approaches developed from 2000 to 2026?
- (ii) What themes are represented in bibliometric trends, document types, citation patterns, and keyword visualizations?
- (iii) How do lesson study, school as a learning community, learning design, authentic learning, reflection, and embodied learning relate to one another in educational research?
- (iv) What implications do these concepts have for SDGs-oriented educational development and future research?

2. METHODS

This study employed a literature review supported by bibliometric mapping to synthesize research on lesson study, school as a learning community, learning design, authentic learning, reflection, and embodied learning. The literature review focused on conceptual and empirical works related to collaborative professional learning, school improvement, student-centered instruction, and SDGs-oriented quality education. The selected literature was examined thematically by identifying recurring concepts, theoretical foundations, pedagogical implications, and research gaps.

The bibliometric data were retrieved from Google Scholar through Publish or Perish. Google Scholar was selected because it provides broad coverage of scholarly publications, including journal articles, books, conference papers, reports, and other academic documents [21]. The search covered publications from 2000 to 2026 using keywords related to lesson study, school as a learning community, learning design, authentic learning, reflection, and embodied learning. The keywords were combined using the Boolean operator “OR,” and the search produced about 1,000 documents.

The data cleaning process involved checking the completeness, relevance, and consistency of bibliographic records. Titles, authors, publication years, document types, and citation data were reviewed, and duplicate records were examined by comparing titles, author names, and publication years. The records were also screened for relevance to education, professional

development, collaborative learning, instructional innovation, and related concepts. After screening, the dataset of documents was retained for analysis.

The bibliometric analysis examined annual publication trends, document types, highly cited works, and keyword co-occurrence. VOSviewer was used to generate network, overlay, and density visualizations. In the network map, nodes represent keywords and links indicate co-occurrence relationships. In the overlay map, color variation indicates the average publication year of keywords. In the density map, warmer colors indicate higher keyword concentration. These visualizations helped identify thematic clusters, temporal patterns, and areas of research concentration [19, 20].

The bibliometric results were integrated with the literature review to connect quantitative mapping with conceptual interpretation. Publication trends, document types, citation patterns, and keyword visualizations were used as supporting evidence for interpreting the development of research on lesson study and school as a learning community. The study is limited by its use of Google Scholar retrieval through Publish or Perish and by the selected keywords; therefore, the findings should be interpreted as a broad overview rather than a complete representation of all publications in the field.

3. RESULTS AND DISCUSSION

3.1. Definition and Conceptual Scope

This study focuses on seven interconnected concepts: lesson study, school as a learning community, learning design, authentic learning, reflection, embodied learning, and SDGs-oriented education. These concepts explain how collaborative professional learning, meaningful instructional design, and sustainable education can support teaching quality, student learning, and school improvement. Lesson study and school as a learning community are positioned as the main conceptual foundations, while learning design, authentic learning, reflection, embodied learning, and SDGs-oriented education function as supporting concepts.

Lesson study supports collaborative lesson planning, classroom observation, and reflection based on student learning evidence [1, 2]. School as a learning community expands this process into a whole-school culture of shared learning, trust, and collective responsibility [3, 4]. Learning design, authentic learning, reflection, and embodied learning strengthen instructional quality by helping teachers design coherent, relevant, reflective, and experiential learning activities [5-10]. SDGs-oriented education provides a broader framework for linking these concepts with quality education, inclusion, meaningful learning, and sustainable educational transformation [22-26]. The conceptual scope of this study is summarized in **Table 1**.

3.2. Bibliometric Analysis

The annual publication trend is presented in **Figure 1**. Documents were identified from 2000 to 2026. The number of publications fluctuated across the period. In the early years, research output was relatively moderate, with 32 documents in 2000, 20 documents in 2001, and 42 documents in 2002. Publication output increased in the mid-2000s and reached the highest point in 2006 with 64 documents. After that, publication numbers remained relatively stable from 2007 to 2016, generally ranging between 41 and 61 documents per year. Research related to Lesson Study and innovative learning approaches has become an established area of educational inquiry. After 2016, the number of publications began to decline gradually. The dataset recorded 38 documents in 2017, 36 documents in 2018, 26 documents in 2019, and

36 documents in 2020. A sharper decrease appeared after 2020, with 15 documents in 2021, 22 documents in 2022, 22 documents in 2023, 5 documents in 2024, 16 documents in 2025, and 3 documents in 2026. This decline should be interpreted carefully because recent publications may not have been fully indexed or retrieved at the time of data collection. Therefore, the lower number of documents in recent years does not necessarily indicate a decrease in academic interest. Instead, it may reflect database coverage, indexing delay, keyword limitations, or the retrieval characteristics of Google Scholar.

Table 1. Definition and conceptual scope of the key concepts.

| CONCEPT | BRIEF DEFINITION | FUNCTION IN THIS STUDY |
|--------------------------------|--|--|
| Lesson study | A collaborative professional development process involving lesson planning, classroom observation, analysis of student learning, and reflection. | Serves as the main process for improving teaching through collaborative inquiry. |
| School as a learning community | A school culture in which teachers, students, leaders, and stakeholders learn together through trust, dialogue, and collective responsibility. | Provides the organizational culture for sustaining collaborative professional learning. |
| Learning design | The systematic planning of learning objectives, activities, resources, interaction, and assessment. | Supports teachers in designing coherent and student-centered learning experiences. |
| Authentic learning | Learning connected to real-world contexts, meaningful problems, and practical applications. | Makes classroom learning more relevant, transferable, and meaningful for students. |
| Reflection | The process of examining teaching experiences, student responses, and learning outcomes to identify improvements. | Functions as a core mechanism for teacher learning and instructional improvement. |
| Embodied learning | Learning through bodily movement, sensory experience, physical interaction, and active engagement. | Supports concrete, experiential, and active student participation. |
| SDGs-oriented education | Educational practice that supports quality education, inclusion, sustainability, and social responsibility. | Provides a broader framework for linking collaborative professional learning with sustainable educational development. |

The document type distribution is presented in **Table 2**. Journal articles were the most common type of publication, with 498 documents or 49.8% of the dataset. Books represented the second largest document type, with 324 documents or 32.4%. Other document types included HTML documents, PDFs, and citation records. The dominance of journal articles indicates that peer-reviewed publication remains an important channel for disseminating research on Lesson Study and related educational approaches. At the same time, the large number of books suggests that the field is also strongly supported by theoretical and conceptual works, which are important for developing educational frameworks, school improvement models, and professional learning theories.

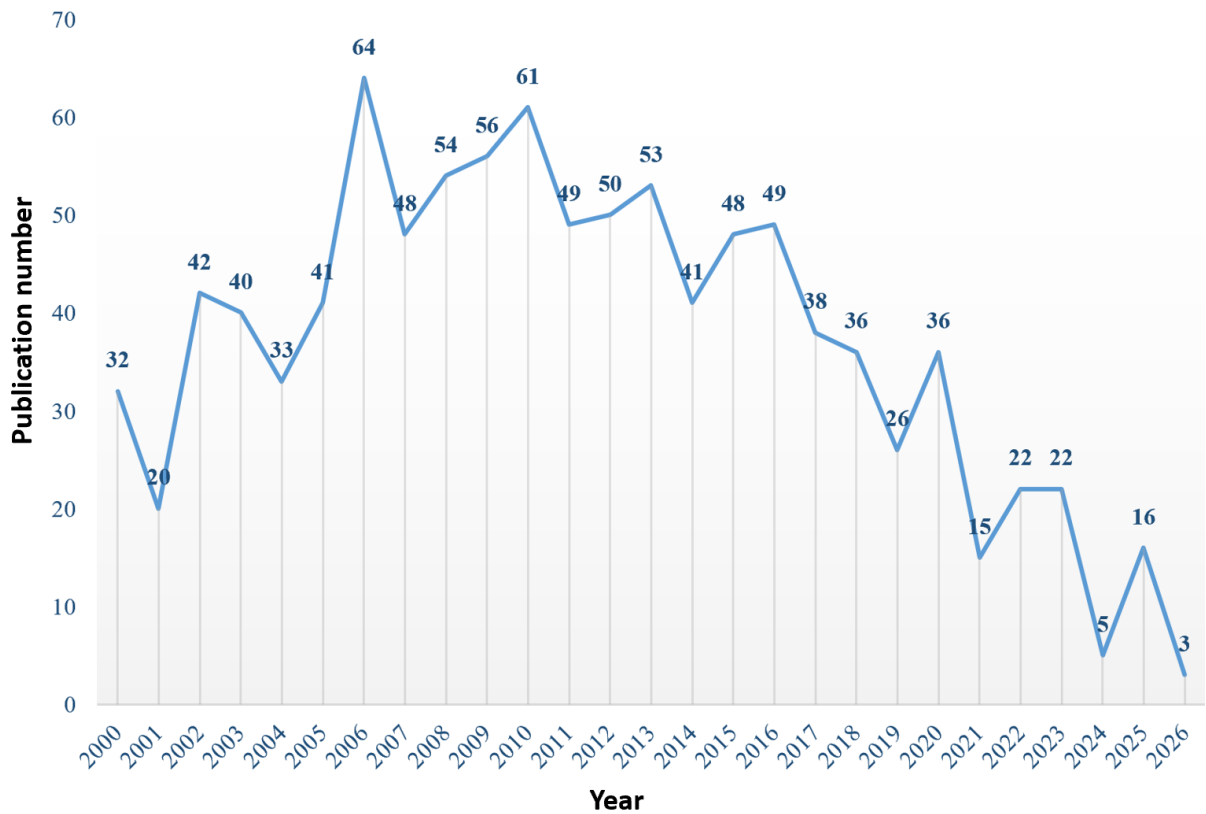


Figure 1. Annual report of publications from 2000 to 2026.

Table 2. Document types of the retrieved publications.

| DOCUMENT TYPE | NUMBER OF DOCUMENTS | PERCENTAGE |
|-----------------|---------------------|------------|
| Journal Article | 498 | 49.8 |
| Book | 324 | 32.4 |
| HTML | 98 | 9.8 |
| PDF | 59 | 5.9 |
| Citation | 21 | 2.1 |
| Total | 1000 | 100 |

The presence of different document types shows that this research field is broad and interdisciplinary. Journal articles provide empirical findings, while books contribute conceptual and theoretical foundations. Therefore, the field should be interpreted not only through publication counts but also through conceptual synthesis.

The keyword co-occurrence analysis identified 17 keywords that met the minimum occurrence threshold. The network visualization is presented in **Figure 2**. The most visible keywords included Lesson Study, Professional Development, Curriculum, Higher Education, Critical Reflection, Professional Learning Community, Student Learning, Action Research, Reflective Practice, Mathematics, Science Education, Diversity, and Educator. These keywords show that the research field is not limited to Lesson Study as a single method. Instead, it connects teacher learning, curriculum design, classroom inquiry, reflection, subject-specific learning, and professional collaboration.

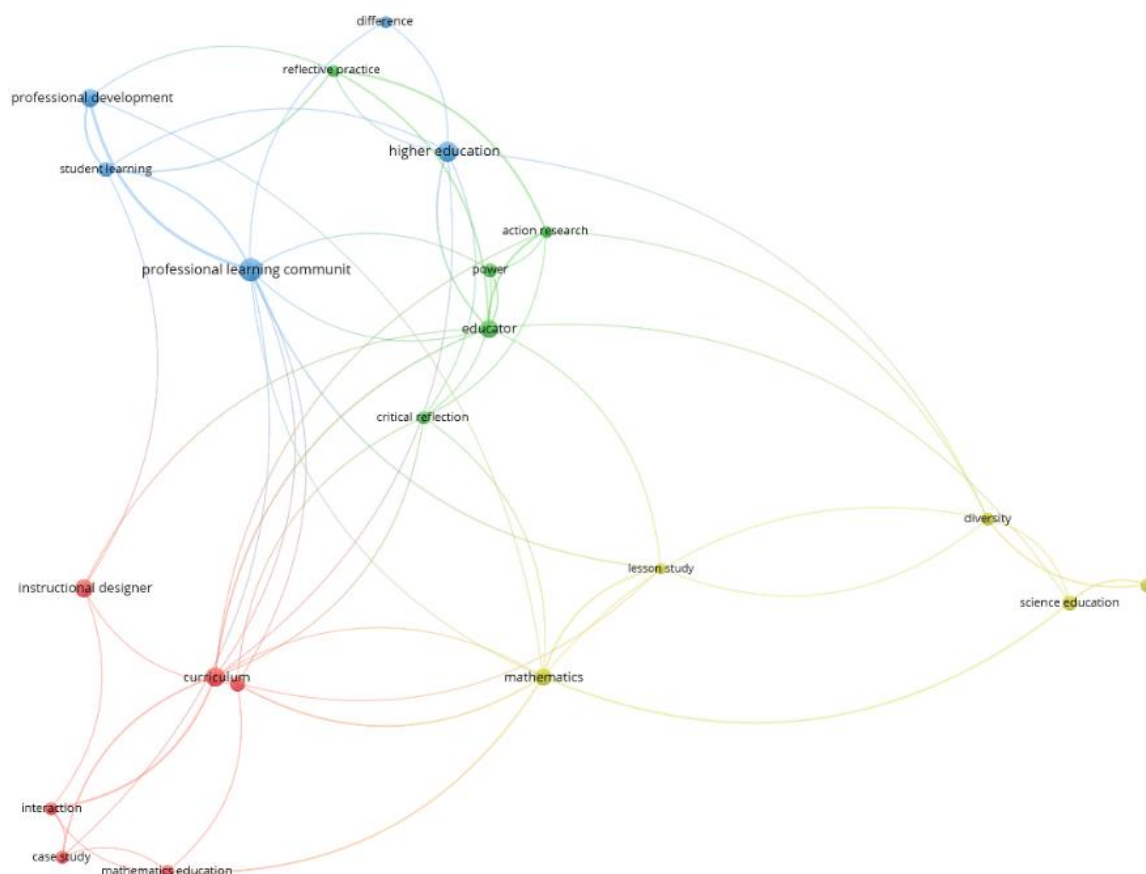


Figure 2. Network visualization of keyword co-occurrence related to Lesson Study and innovative learning approaches.

The keyword network showed several thematic clusters. One cluster focused on professional learning community, student learning, and professional development. This cluster reflects the role of teacher collaboration and school-based professional learning in improving classroom practice. A second cluster was related to reflective practice, higher education, and action research, showing that reflection and inquiry are central to teacher learning and instructional improvement. A third cluster was associated with curriculum, instructional design, and mathematics education, indicating the importance of designing structured learning experiences in subject-based contexts. A fourth cluster connected Lesson Study, diversity, and science education. Lesson Study has been applied across different educational settings and disciplinary areas.

The overlay visualization is presented in **Figure 3**. This map shows the temporal development of keywords based on average publication year. Earlier themes appeared to be associated with science education, diversity, and professional development, while relatively more recent themes were linked to curriculum, Lesson Study, critical reflection, and mathematics. This pattern suggests a gradual shift from broad professional development discussions toward more specific concerns with curriculum, reflection, and subject-based instructional improvement. The continuing presence of keywords such as professional learning community, educator, and higher education indicates that collaborative professional learning remains an important and stable theme in the field.

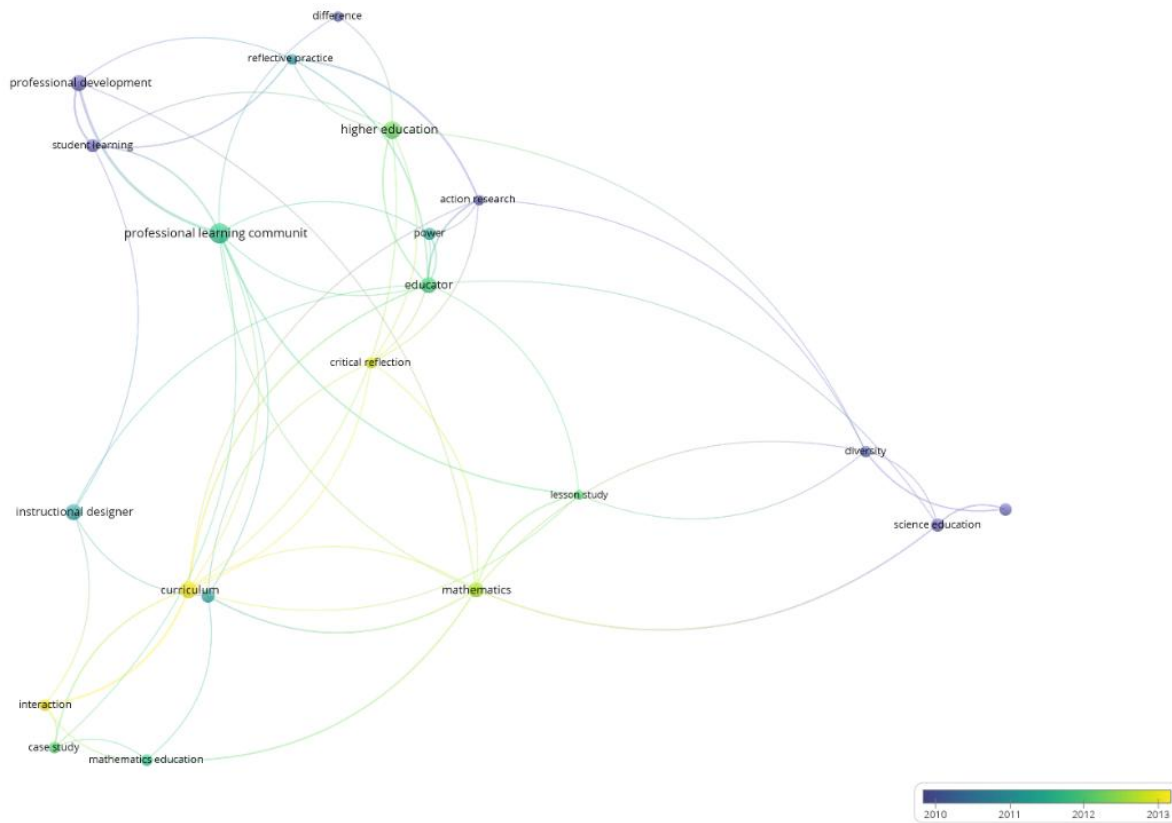


Figure 3. Overlay visualization of keyword co-occurrence related to Lesson Study and innovative learning approaches.

The density visualization is presented in **Figure 4**. The highest density areas appeared around keywords such as professional learning community, student learning, professional development, educator, higher education, and curriculum. These high-density areas indicate that collaborative learning, teacher development, and instructional design are central topics in the research field. Keywords such as critical reflection, action research, and reflective practice also appeared in relatively dense areas, confirming that reflection is an important mechanism for improving teacher learning and instructional quality. Meanwhile, keywords such as Lesson Study, mathematics, diversity, and science education appeared in moderate-density areas. These themes function as specialized applications within the broader research field.

The intellectual foundation of this research field is supported by influential works on experiential learning, instructional design, human learning, technological pedagogical content knowledge, culturally responsive teaching, differentiated instruction, project-based learning, artificial intelligence in higher education, and science education frameworks. These highly cited works indicate that research on Lesson Study and innovative learning approaches is connected to broad educational theories, not only to a single professional development model. Foundational works on experiential learning and learning spaces are especially relevant because lesson study and school as a learning community emphasize learning from practice, reflection, and shared experience.

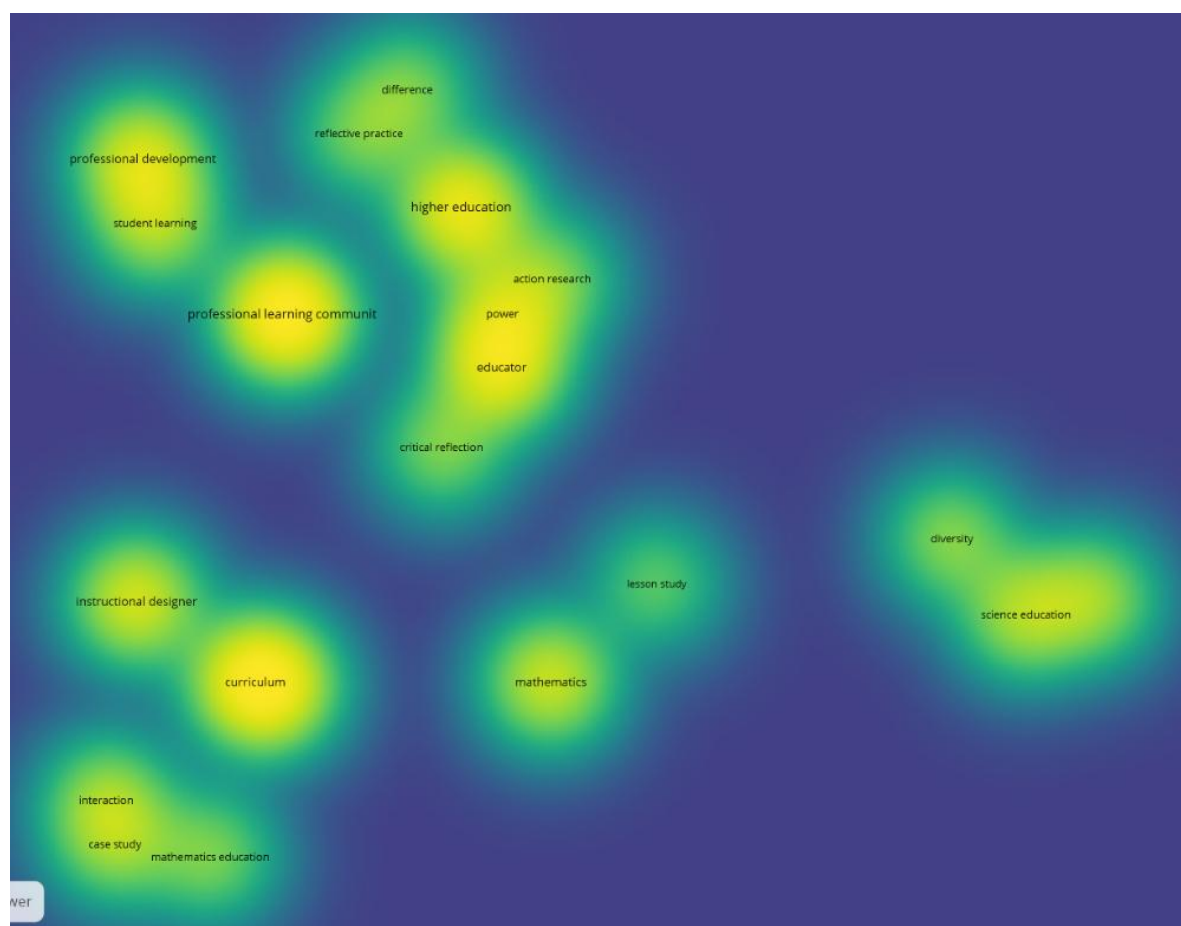


Figure 4. Density visualization of keyword co-occurrence related to Lesson Study and innovative learning approaches.

The highly cited works also show the interdisciplinary nature of the field. Some publications focus on general learning theory and instructional design, while others focus on technology integration, science education, adult learning, gamification, differentiated instruction, and project-based learning. Research on lesson study and school as a learning community can be strengthened by connecting teacher collaboration with broader concepts of learning design, authentic learning, reflective practice, and experiential engagement. These connections are important for SDGs-oriented education because quality education requires not only access to schooling but also effective teaching, meaningful learning, teacher competence, and continuous instructional improvement.

The field has developed through interconnected themes of professional development, professional learning community, curriculum, reflection, instructional design, and student learning. Research activity increased and stabilized during the early and mid-2000s before declining in the later years. The document type analysis shows that journal articles and books dominate the dataset. The field is supported by both empirical studies and theoretical works. The keyword maps show that Lesson Study is closely related to professional development, reflective practice, curriculum, and subject-based education. These findings provide a useful foundation for the next section, which reviews the main concepts and explains how lesson study, school as a learning community, learning design, authentic learning, reflection, and embodied learning can be integrated to support SDGs-oriented educational development.

3.3. Review Results

Research on lesson study and school as a learning community is closely connected to broader educational concepts, including professional learning communities, learning design, authentic learning, reflection, and embodied learning. These concepts are not isolated from one another. Instead, they form an integrated framework for improving teacher professional learning, instructional quality, student engagement, and school development. In this review, the main findings are organized into five thematic areas: Lesson study and collaborative professional development, school as a learning community and professional learning culture, learning design and authentic learning, reflection and embodied learning, and the integration of these concepts for SDGs-oriented education.

3.3.1. Lesson Study and Collaborative Professional Development

Lesson Study is one of the most important approaches to collaborative teacher professional development. It provides a structured process through which teachers collaboratively plan lessons, observe classroom learning, analyze student responses, and reflect on instructional improvement. This process shifts teacher development from individual training toward collective inquiry grounded in real classroom practice. In Lesson Study, teachers do not only discuss teaching strategies in abstract terms; they examine how students actually respond to learning activities and use that evidence to improve instruction [1, 2].

Lesson Study supports professional dialogue, shared instructional knowledge, and continuous improvement. It encourages teachers to become researchers of their own classrooms because they observe learning processes, discuss evidence, and revise teaching practices. This is important for educational improvement because sustainable change requires teachers to understand how instructional decisions influence student learning. Lesson Study also supports the development of professional trust because teachers work together to examine lessons, identify challenges, and improve teaching without positioning evaluation as individual judgment [1, 2].

Lesson Study is also relevant to SDGs-oriented quality education because it strengthens teacher competence and instructional quality. SDG 4 emphasizes inclusive and quality education, and teacher professional learning is one of the key conditions for achieving this goal. When teachers engage in collaborative inquiry, they are more likely to design lessons that respond to student needs, improve learning participation, and support meaningful classroom experiences. Therefore, Lesson Study can be understood not only as a teacher development model but also as a school-based strategy for improving educational quality.

3.3.2. School as A Learning Community and Professional Learning Culture

School as a learning community expands the idea of teacher collaboration from the lesson level to the whole-school level. While lesson study focuses on collaborative lesson planning, classroom observation, and reflection, a school as a learning community emphasizes the transformation of school culture. A learning community is characterized by shared vision, collective responsibility, professional collaboration, and continuous improvement. In such schools, teachers, leaders, students, and other stakeholders are expected to participate in learning and improvement as a collective process [3, 4].

Collaboration is essential for school improvement. Schools that support professional learning create conditions for teachers to discuss classroom problems, share knowledge,

analyze evidence, and develop solutions together. This professional culture is important because many educational challenges cannot be solved by individual teachers alone. Issues such as student engagement, curriculum implementation, learning assessment, inclusion, and instructional innovation require collective capacity and shared responsibility [3, 4].

School as a learning community also provides an organizational foundation for lesson study. Lesson study is more likely to be sustained when schools have a culture of trust, collaboration, and shared learning. Without such a culture, Lesson Study may become a technical activity rather than a meaningful professional learning process. Therefore, lesson study and school as a learning community should be understood as complementary. Lesson study provides a practical mechanism for collaborative inquiry, while school as a learning community provides the school culture that sustains collaborative professional learning.

3.3.3. Learning design and authentic learning

Learning design is another important theme in the literature because teacher collaboration must lead to meaningful instructional planning. Learning design refers to the systematic organization of learning objectives, activities, resources, interaction patterns, and assessment. It helps teachers create learning environments that are coherent, purposeful, and responsive to learner needs. In the context of Lesson Study, learning design is important because teachers must collaboratively plan lessons that are not only content-based but also student-centered and evidence-informed [5, 6].

Effective learning design requires alignment between learning goals, instructional activities, and assessment. This alignment is important because students learn more effectively when activities are clearly connected to intended learning outcomes. Learning design also encourages teachers to consider how students interact with materials, peers, teachers, and real-world problems. Therefore, learning design strengthens Lesson Study by giving teachers a framework for planning, observing, and revising instructional experiences.

Authentic learning is closely related to learning design because it emphasizes meaningful learning experiences connected to real-world contexts. Authentic learning encourages students to apply knowledge to practical situations, solve problems, collaborate with others, and develop transferable skills. This approach helps students see the relevance of learning beyond the classroom. In the context of SDGs-oriented education, authentic learning is important because students need to understand real social, environmental, cultural, and educational challenges, not only abstract academic content [7].

The relationship between learning design and authentic learning shows that collaborative teacher learning should not only improve lesson structure but also improve the meaning and relevance of student learning. Teachers need to design activities that connect subject knowledge with real contexts, student experience, and practical application. This is consistent with the broader direction of educational reform, which emphasizes active learning, problem-solving, creativity, collaboration, and lifelong learning.

3.3.4. Reflection and embodied learning

Reflection is a central element in lesson study, school as a learning community, and teacher professional development. Through reflection, teachers examine classroom events, interpret student responses, evaluate instructional decisions, and identify areas for improvement. Reflection transforms classroom experience into professional learning because teachers do

not simply complete teaching activities; they analyze what happened, why it happened, and how instruction can be improved [1-4].

Reflection is especially powerful when it is conducted collaboratively. In collaborative reflection, teachers can compare interpretations, challenge assumptions, and develop a deeper understanding of student learning. This process supports professional growth because teachers learn not only from their own experience but also from the perspectives of colleagues. Reflection also strengthens school learning culture because it encourages openness, inquiry, and continuous improvement.

Embodied learning adds another dimension to the review because it emphasizes the role of physical movement, sensory experience, and active engagement in learning. This perspective suggests that learning is not only cognitive but also connected to bodily action, emotion, perception, and interaction with the environment. Embodied learning is relevant to learning design because teachers can create activities that involve movement, manipulation, observation, and experiential participation. Such activities can make learning more concrete and meaningful for students [9-11].

The connection between reflection and embodied learning is important because both emphasize learning from experience. Reflection helps teachers and students make sense of experience, while embodied learning emphasizes the active and sensory nature of experience itself. In classroom practice, this means that effective learning should provide opportunities for students to engage actively and for teachers to reflect on how those experiences support understanding. Therefore, reflection and embodied learning can strengthen Lesson Study by focusing attention on how students experience and construct knowledge during learning activities.

3.3.5. SDGs-oriented education and sustainable learning transformation

The relationship between lesson study, school as a learning community, and relevant SDGs is summarized in **Table 3**. SDG 4 is the central SDG in this study because the reviewed concepts mainly address quality education through teacher professional learning and instructional improvement. SDG 9, SDG 10, SDG 11, and SDG 17 function as supporting goals because the framework also involves educational innovation, inclusive learning, community-oriented school development, and collaboration among educational stakeholders.

SDGs-oriented education provides a broader framework for interpreting lesson study and school as a learning community. In this study, the strongest connection is with SDG 4 because both approaches support quality education through teacher collaboration, reflective practice, instructional improvement, and school-based professional learning. Previous studies have shown that SDGs can be integrated into educational research through curriculum development, science education, collaborative practicum, technology-supported learning, and bibliometric mapping [22-26]. These studies indicate that SDGs-oriented education requires not only sustainability-related content but also appropriate pedagogy, teacher readiness, meaningful learning design, contextual learning resources, and assessment practices.

Table 3. Relationship between lesson study, school as a learning community, and relevant SDGs.

| SDG | RELEVANCE TO THIS STUDY | CONTRIBUTION OF LESSON STUDY AND SCHOOL AS A LEARNING COMMUNITY |
|---|---|---|
| SDG 4: Quality Education | The main focus of this study is improving teaching quality, teacher competence, student-centered learning, and school-based professional development. | Lesson study supports collaborative lesson planning, classroom observation, and reflection, while school as a learning community strengthens professional learning culture and continuous school improvement. |
| SDG 9: Industry, Innovation, and Infrastructure | Educational innovation is reflected in learning design, authentic learning, embodied learning, reflective practice, and bibliometric mapping. | The reviewed concepts support innovative instructional design, evidence-based improvement, and the use of research mapping to understand educational development. |
| SDG 10: Reduced Inequalities | Quality education requires inclusive learning opportunities and teaching approaches that respond to diverse student needs. | Collaborative teacher learning helps educators design more responsive lessons, while authentic and embodied learning can support varied learner participation. |
| SDG 11: Sustainable Cities and Communities | Schools are part of communities and can contribute to sustainable social development through collaborative learning cultures. | School as a learning community promotes shared responsibility, community-oriented school improvement, and stronger connections among teachers, students, leaders, and stakeholders. |
| SDG 17: Partnerships for the Goals | Sustainable educational development requires collaboration among teachers, school leaders, researchers, institutions, and communities. | Lesson study and school as a learning community depend on partnership, professional dialogue, shared learning, and collective responsibility for educational improvement. |

In this context, lesson study supports SDGs-oriented education by providing a structured process for collaborative planning, classroom observation, and reflection. School as a learning community strengthens this process by creating a professional culture based on shared learning, leadership support, and collective responsibility. Learning design, authentic learning, reflection, and embodied learning further support SDGs-oriented transformation by making learning more coherent, real-world connected, reflective, active, and student-centered. The relationship between these concepts and SDGs-oriented education is summarized in **Table 4**.

3.3.6. Integrated framework for Lesson Study, School as a Learning Community, and SDGs-oriented education

Lesson study, school as a learning community, learning design, authentic learning, reflection, embodied learning, and SDGs-oriented education form an integrated framework for educational improvement. Lesson study provides the collaborative process, school as a learning community provides the supporting professional culture, and the other concepts strengthen the design, relevance, reflection, and experiential quality of learning. This framework is relevant to SDG 4 because it supports quality education through teacher collaboration, meaningful pedagogy, student engagement, and continuous school improvement.

Table 4. Relationship between key concepts and SDGs-oriented education.

| CONCEPT | CONTRIBUTION TO SDGS-ORIENTED EDUCATION | EDUCATIONAL IMPLICATION |
|--------------------------------|---|--|
| Lesson study | Improves teaching quality through collaborative planning, observation, and reflection. | Supports SDG 4 by strengthening teacher competence and evidence-based instructional improvement. |
| School as a learning community | Builds a collaborative school culture based on shared learning and collective responsibility. | Supports sustainable school improvement through leadership, trust, and professional collaboration. |
| Learning design | Organizes learning objectives, activities, resources, and assessment coherently. | Helps teachers create meaningful and structured learning experiences. |
| Authentic learning | Connects classroom learning with real-world contexts and social issues. | Strengthens relevance, problem-solving, and student engagement. |
| Reflection | Supports continuous improvement through analysis of teaching and learning evidence. | Helps teachers improve instructional decisions and professional learning. |
| Embodied learning | Encourages active, sensory, experiential, and student-centered participation. | Makes learning more concrete, meaningful, and engaging. |
| Bibliometric mapping | Shows research trends, keyword relationships, and knowledge structures. | Supports evidence-based literature review and identifies future research directions. |

The bibliometric findings support this interpretation because the keyword clusters show strong relationships among professional learning community, professional development, student learning, curriculum, reflection, action research, and Lesson Study. Thus, bibliometric mapping shows the structure of the field, while the literature review explains the conceptual meaning of that structure. The synthesis of the review results is presented in **Table 5**.

3.4. Discussion, Implications, Suggestions, and Future Works

Research on lesson study and school as a learning community is connected to wider educational themes, including professional development, reflective practice, learning design, authentic learning, and embodied learning. The bibliometric findings show that professional learning community, student learning, professional development, curriculum, higher education, and reflection are central keywords in the field. This indicates that Lesson Study should not be viewed only as a lesson-improvement technique but also as part of a broader school-based professional learning system.

Lesson study and school as a learning community are complementary because lesson study provides the collaborative improvement process, while school provides the professional culture that sustains it. When both are integrated, they can support continuous professional growth, shared responsibility, and evidence-based instructional improvement [1-4].

Table 5. Synthesis of key concepts in lesson study, school as a learning community, and SDGs-oriented education.

| KEY CONCEPT | MAIN IDEA FROM THE LITERATURE | RELATIONSHIP WITH OTHER CONCEPTS | EDUCATIONAL IMPLICATION |
|--------------------------------|---|--|---|
| Lesson study | Collaborative planning, observation, and reflection to improve classroom instruction. | Provides a practical process for teacher collaboration and reflective inquiry. | Supports teacher professional development and evidence-based instructional improvement. |
| School as a learning community | Whole-school professional culture based on shared learning, trust, and collective responsibility. | Provides the organizational culture needed to sustain Lesson Study. | Strengthens school improvement, teacher collaboration, and professional learning. |
| Learning design | Systematic planning of objectives, activities, resources, interaction, and assessment. | Helps teachers design meaningful lessons within Lesson Study. | Improves instructional coherence, student engagement, and learning outcomes. |
| Authentic learning | Learning connected to real-world contexts, problem-solving, and meaningful application. | Strengthens learning design by increasing relevance and transferability. | Supports student motivation, critical thinking, and real-life learning application. |
| Reflection | Critical examination of teaching experience and student learning evidence. | Functions as a core mechanism in Lesson Study and professional learning communities. | Promotes continuous teacher learning and instructional improvement. |
| Embodied learning | Learning through bodily movement, sensory experience, and active engagement. | Extends learning design and authentic learning through experiential participation. | Makes learning more concrete, active, and meaningful for students. |
| SDGs-oriented education | Education that supports quality learning, inclusion, sustainability, and social responsibility. | Provides a broader purpose for integrating collaborative and innovative learning approaches. | Positions of lesson study and school as a learning community as strategies for sustainable educational development. |

The findings have important implications for SDGs-oriented education, especially SDG 4 on quality education. Collaborative professional learning can improve teacher competence, instructional quality, student engagement, and school improvement. Learning design and authentic learning can help teachers create meaningful activities connected to real-world contexts. Reflection and embodied learning can strengthen active participation and deeper understanding. Therefore, integrating these concepts can support more inclusive, meaningful, and sustainable educational transformation.

For practical implementation, schools should promote Lesson Study as a regular part of teacher professional development rather than as a temporary project. School leaders should create time, trust, and organizational support for collaborative planning, classroom observation, and reflective discussion. Teachers should be encouraged to design authentic and student-centered learning activities that connect curriculum content with real-life contexts. In addition, embodied and experiential learning activities should be included to increase student engagement and make learning more meaningful.

Future research should expand the bibliometric scope by using multiple databases, such as Scopus, Web of Science, ERIC, and Google Scholar, with broader and more systematic keyword combinations. Qualitative, mixed-methods, and classroom-based studies are also needed to examine how lesson study, school as a learning community, and related concepts are implemented in real school contexts and how they influence teacher learning and student outcomes.

The main discussion points, implications, suggestions, and future research directions are summarized in **Table 6**.

Table 6. Summary of discussion, implications, suggestions, and future works.

| ASPECT | MAIN POINT | IMPLICATION OR FUTURE DIRECTION |
|---------------------------|--|---|
| Bibliometric finding | Research themes are centered on professional learning community, professional development, curriculum, student learning, and reflection. | Lesson Study should be understood as part of a broader professional learning and school improvement framework. |
| Literature review finding | Lesson study and school as a learning community are complementary. | Lesson study provides the process, while school as a learning community provides the professional culture. |
| SDGs relevance | Collaborative professional learning supports quality education. | The framework can contribute to SDG 4 through teacher competence, instructional quality, and meaningful student learning. |
| Practical implication | Schools need time, trust, and leadership support for collaboration. | School leaders should institutionalize Lesson Study and reflective professional learning. |
| Teaching implication | Learning design, authentic learning, and embodied learning support student-centered instruction. | Teachers should design real-world, active, reflective, and experiential learning activities. |
| Future research | Current bibliometric mapping is limited by the database and keyword scope. | Future studies should use multiple databases, broader keywords, and classroom-based empirical research. |

4. CONCLUSION

This study reviewed research on lesson study and school as a learning community supported by bibliometric mapping. This field is strongly connected to professional development, reflective practice, curriculum, learning design, authentic learning, and embodied learning. Bibliometric results indicate that collaborative professional learning and instructional improvement are central research themes. Lesson study and school as a learning community can support SDGs-oriented quality education when integrated with meaningful learning design, reflection, and experiential engagement. Future research should expand bibliometric sources and examine implementation in real school contexts.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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