Journal of Learning Improvement and Lesson Study
Volume 5 Number 1 2025, pp, 14-25
E-ISSN: 2798-9011
DOI: 10.24036/jlils.v5i1.136
Received May 7, 2025; Revised May 27, 2025; Accepted June 13, 2025
Availaible Online: https://jlils.ppj.unp.ac.id/index.php/

Mapping Research on Learning Models Lesson Study: A Bibliometric Study

Army Auliah[1], Vika Puji Cahyani[1], Islawati[1], Retno Aliyatul Fikroh[2], Rahmi Faradisya Ekapti[3], Lukmanul Hakim Samada[4], Nurul Ilmi[5]

[1] Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Makassar
[2] Chemistry Education Department, Faculty of Tarbiyah and Teacher Training, UIN Sunan Kalijaga
[3] Science Education and Teaching Department, Faculty of Tarbiyah and Teacher Training, IAIN Ponorogo
[4] School of Chemistry, University of Birmingham, United Kingdom
[5] Nara Institute of Science and Technology, Japan
*Corresponding author, e-mail: vika.puji.cahyani@unm.ac.id

Abstract
The body of lesson study research necessitates a comprehensive mapping of its development in academia. Bibliometric analysis tracks the evolution and research patterns of the lesson study learning model over time. This study aims to investigate lesson study development through a three-stage process: data collection using Publish or Perish and Mendeley, bibliometric analysis with VOSviewer, and final interpretation and discussion. Findings indicate that Lesson Study and Lesson Study for Learning Community are central in educational literature, with high frequency and strong associations with other keywords. Publication trends from 2015 to 2024 show fluctuations, with spikes in 2020 and 2023. Early research emphasized teacher competencies, while trends integrate Problem-Based Learning, 21st-century skills, and collaborative professional learning, offering insights for education stakeholders.

Keywords: Lesson Study; Collaborative Learning; Bibliometric; Network Visualisation; Mapping Research

Introduction

The Lesson Study learning model plays a very important role in the context of education, especially in Indonesia. Lesson Study, which was originally developed in Japan, has been widely adopted in various countries, including Indonesia, as a professional development model for teachers. This model focuses on collaboration between teachers to plan, implement, and reflect on learning, which in turn can improve their pedagogical understanding and teaching skills (Panbanlame et al., 2014; Vermunt et al., 2019).

One of the main advantages of Lesson Study is its ability to improve teachers' pedagogical content knowledge through peer collaboration. Research shows that teachers who participate in Lesson Study can gain better knowledge and teaching skills, which contributes to changes in their teaching practices in the classroom (Mengistu et al., 2024; Mon et al., 2016). In Indonesia, the implementation of Lesson Study has shown positive results. Teachers involved in the programme reported improvements in their teaching skills and confidence (Shabibi, 2023). In addition, Lesson Study also serves as a platform for sharing best practices among teachers, which is very important in the context of diverse and often fragmented education (Richit, 2020; Schipper et al., 2022). Thus, Lesson Study not only improves the quality of individual teaching but also contributes to the development of a collaborative culture in schools. In the Indonesian context, where challenges in education are often related to a lack of professional support for teachers, Lesson Study offers an effective solution by creating a sustainable professional learning community (Burhanudin et al., 2024; Thephavongsa, 2018).

Lesson Study also provides an opportunity for teachers to observe and analyse students' learning processes first-hand. Through this observation, teachers can identify the difficulties that students face and adjust their

teaching to meet those needs (Fox & Poultney, 2020; Wai & Wing, 2014). This approach not only improves teachers' teaching skills but also contributes to improving student learning outcomes, which is the main goal of every education system (Fadime, 2019). Students who learn through the Lesson Study model show significant improvement in their mathematical understanding compared to traditional learning methods (Roesdiana & Hidayati, 2018). Research shows that the use of technology in learning, when combined with the Lesson Study approach, can enrich students' learning experiences and increase their motivation (Damayanti & Nuzuli, 2023).

Previous research and findings show that Lesson Study contributes to improving teaching skills, collaboration between teachers, and student understanding. The large number of studies related to lesson study has led to the need for comprehensive mapping of the development of this research in the academic realm. (Auliah & Cahyani, 2024; Cahyani et al., 2024). Similar research was conducted by Deda et al. (2023) who examined global trends related to Lesson Study through bibliometric analysis of 997 documents from Google Scholar and 200 documents from Scopus. However, the main focus of this research is to identify prolific authors, key journals, and central themes such as community, context, observation, and participation in the implementation of Lesson Study. Meanwhile, research by Burhanudin et al. (2024) highlighted the application of Lesson Study in the context of school wellbeing, by exploring collaborations between researchers and mapping keywords that frequently appear, using a bibliometric approach as the main tool. However, both studies have not specifically addressed the integration of Lesson Study with innovative learning models, especially in the context of education in Indonesia. Deda et al. (2023) take a global approach without an in-depth focus on the development of Lesson Study in Indonesia, while Burhanudin et al. (2024) focus more on the welfare aspect of the school ecosystem, not on the innovation of learning models.

This research fills that gap by mapping how Lesson Study is integrated into innovative learning models in Indonesia. Through a bibliometric approach, this study not only presents publication trends and researcher collaborations, but also displays patterns of Lesson Study integration within the broader framework of learning innovation. The study also reinforces the urgency of using bibliometrics as a strategic tool in formulating evidence-based education policy and direction. With a better understanding of the direction of research and its influence on educational practice, policy makers can identify research gaps, prioritise funding and design more effective interventions to improve educational quality. As such, this research contributes to enriching the study of Lesson Study from a more contextualised and applicable perspective, as well as providing new directions in the development of future learning strategies.

Method

This study uses bibliometric analysis to explore the development of research related to lesson study in learning. This approach is expected to provide deeper insights into research developments in the field under study, as well as identify opportunities for further research. This method is carried out in the following stages:

1. Data Collection Phase

   In the data collection stage, the research began by determining the Scopus reputable journal database using publish or perish software on 27 February 2025. Next, researchers formulated keywords. The keyword used in the search was "Lesson Study Learning Model". To ensure data validity, inclusion and exclusion criteria were set. The inclusion criteria included articles published between 2015 and 2024, written in English, and scientific articles or conference proceedings indexed in the Scopus database. In addition, the articles selected must explicitly discuss the Lesson Study learning model, either as the main focus or as an important part of learning studies. Meanwhile, the exclusion criteria included articles written in languages other than English, publication types such as books, book chapters, editorials, reader letters, literature reviews, theses, dissertations, and unpublished manuscripts. Articles published outside the specified year range and those not indexed in Scopus were also excluded from the analysis. In addition, articles that only mentioned Lesson Study briefly without in-depth discussion of its application in the learning context were also excluded from the final data. Based on the application of these criteria, 23 articles were deemed relevant for further analysis in this bibliometric study. The 23 relevant articles can be seen in Figure 1.

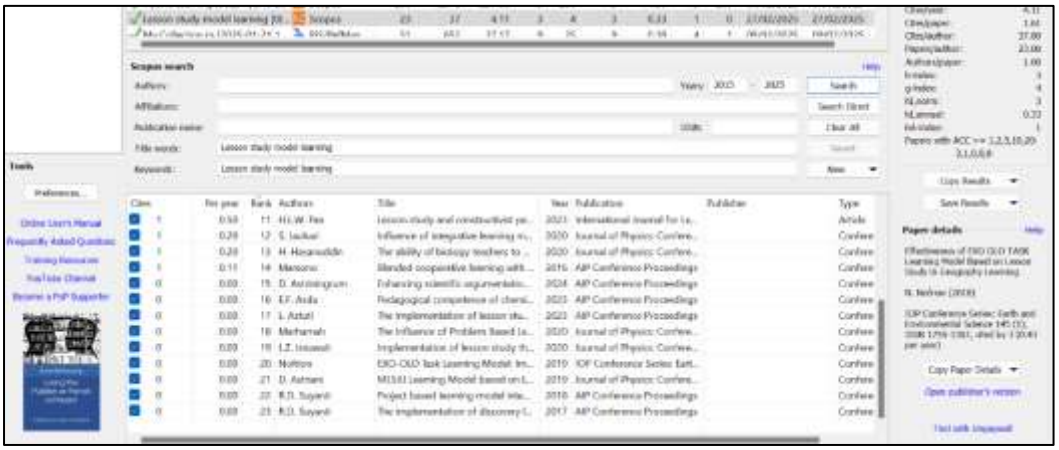

Figure 1. Searching for Articles with Publish or Perish Software

Researcher's documentation (2024)

2. Bibliometric Analysis Stage

Before conducting the bibliometric analysis, the researcher completes the data attributes using Mendeley desktop software. Attributes that are completed such as ensuring the completeness of the Title, Author name, Volume, Issue and most importantly, completing the author keywords section. The process at this stage can be seen in Figure 2.

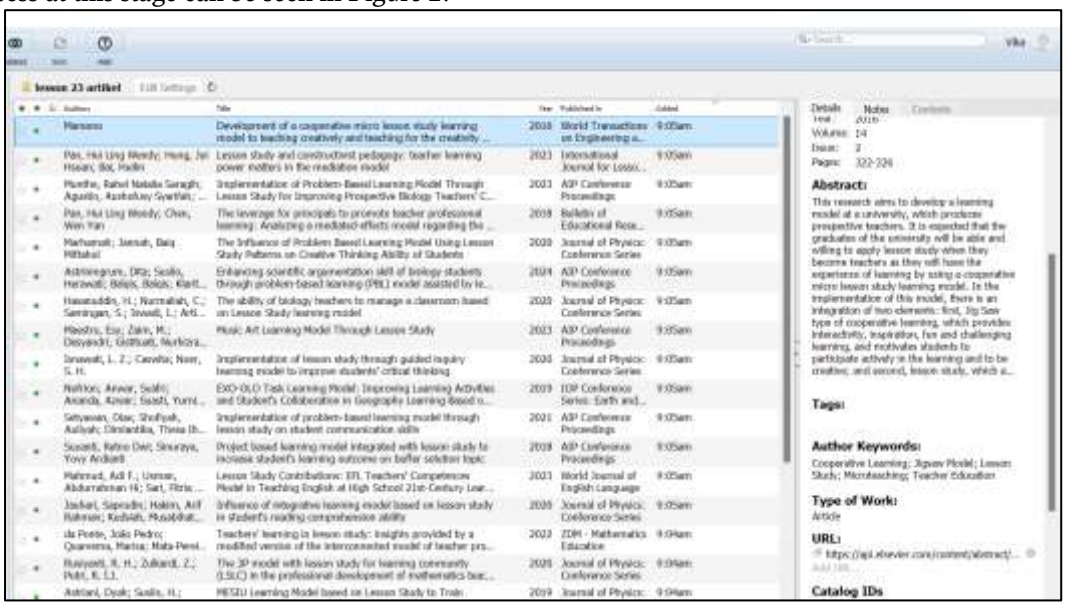

Figure 2. Complement the Attribute with Mendeley Desktop

Researcher's documentation (2024)

The next stage is bibliometric analysis, data extraction is carried out using software such as VOSviewer. This analysis includes identifying publication trends based on the number of articles per year, visualising keyword networks to understand the main topics, and analysing the relationships between authors and institutions to see patterns of collaboration in relevant research.

3. Interpretation and Discussion

The interpretation and discussion stage aims to discuss the results of the bibliometric analysis so as to provide a comprehensive overview of research trends, gaps, and opportunities for further research.

Results and Discussion

The use of a bibliometric approach to analyse literature related to lesson study allows researchers and educators to better understand trends, patterns, and relationships between existing research. By clustering themes in publications, we can identify how lesson study is implemented, the challenges faced, the adaptations made in the local context, and its relationship to teacher professional development. By analysing these relationships, we can better design professional development strategies based on collaboration and innovation in learning (Cahyani et al., 2024; Cahyani & Fadly, 2024).

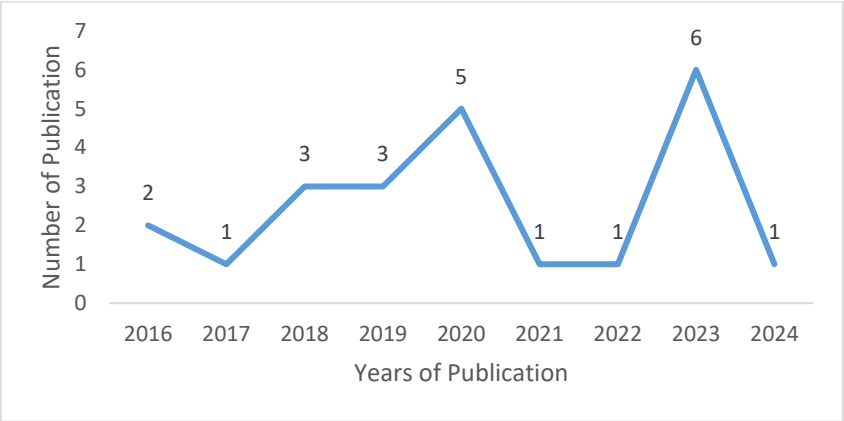

Figure 3. Complement the Attribute with Mendeley Desktop

Researcher's documentation (2024)

Publication data from 2015 to 2024 shows a trend in the number of publications that fluctuates every year. At the beginning of the period (2016-2019), the number of publications is relatively low and tends to be stable, ranging from 1 to 3 publications per year. 2020 showed a significant increase with 5 publications, which may indicate an increase in research interest or external factors that encourage increased academic productivity, such as developments in educational technology or new research policies. However, in 2021 and 2022 there was a drastic decline with only 1 publication per year, which could be due to changes in research priorities, external constraints, or institutional factors. The trend picked up again in 2023 with the highest number of publications (6 publications) in the last nine years, indicating a surge in research activity. The year 2024 again shows a decline with only 1 publication, but as the year is still ongoing, the number of publications may increase over time. Overall, this data reflects an inconsistent pattern of growth, with some years seeing a significant increase and others a sharp decline. So, it can be concluded that the overall trend of research on Lesson Study has been declining despite a brief spike. It is likely that the topic of Lesson Study is experiencing a shift in theme or integration with other approaches, so further examination through keyword or co-occurrence analysis is needed to identify new directions for this research theme.

Table 1. Interrelated Keywords

Keywords	Occurrences	Total Link Strength
Lesson study	17	63
Lesson study for learning community	17	63
Problem-based learning	3	12
Communication skills	2	8
Cooperative learning	2	8
Student achievement	2	8
Teacher education	2	8
3p model	1	6
Teacher competency development	1	6
Teacher professionalism	1	6
21 st-century skills	1	4

Researcher's documentation (2024)

From the VOSviewer output, it can be interpreted that the keywords 'Lesson Study' and 'Lesson Study for Learning Community' have the highest frequency of occurrence (17 times) with a total link strength of 63. This shows that these two concepts are the main focus of the research analyzed and have a strong connection with various other keywords. This means that research on Lesson Study and Lesson Study for Learning Community has a broad influence in the field of education. In addition, 'Problem-based learning' (PBL) appears three times with a total link strength of 12, which shows that this method is often associated with Lesson Study, although with a lower connection compared to the two main keywords. 'Communication skills,' 'Cooperative learning,' 'Student achievement,' and 'Teacher education' each have a frequency of 2 times with a total link strength of 8, which indicates that these aspects also have relevance in the context of Lesson Study, but not as strong as the main concept. Meanwhile, terms such as '3P Model,' 'Teacher Competency Development,' and 'Teacher Professionalism' only appear once with a total link strength of 6, indicating that these concepts are related but not overly dominant in the analysis. The same thing also happens to '21st-century skills', which has an occurrence frequency of 1 and a total link strength of 4, indicating that although it is relevant, its connection to the main concept is still limited. Overall, these results show that Lesson Study and Lesson Study for Learning Community are central concepts in the analysed research, with several supporting concepts such as Problem-Based Learning, Communication Skills, and Cooperative Learning that contribute to the development of collaborative-based learning models and teacher professionalism.

The keywords in Table 1 can be combined into a finding. Including: Lesson Study as part of teacher education plays an important role in improving teacher professionalism and teacher competency development through a reflective and collaborative approach. In the context of Lesson Study for Learning Community, teachers can work together to design, implement, and evaluate learning to improve teaching effectiveness and support the development of 21st-century skills in students. Lesson Study is recognised as an innovative approach to teacher professional development that strengthens collaboration and reflection among educators. This concept serves as a platform for teachers to work together in designing, implementing, and evaluating their learning practices, with the aim of improving teaching effectiveness and supporting the development of 21st-century skills in students (Azhar et al., 2022; Lee & Madden, 2019; Wai & Wing, 2014). Based on the research results, it is known that Lesson Study is not only beneficial for teachers in improving their pedagogical knowledge, but also has positive implications for student learning (Akiba & Wilkinson, 2016; Lomibao, 2016; Mon et al., 2016). In addition, Lesson Study creates opportunities for teachers to engage in reflective feedback and dialogue, which is essential in collaborative learning. Through this process, teachers can draw on each other's experiences to improve their lesson plans and teaching practices, enabling them to share more effective teaching strategies and understandings (Mengistu et al., 2024; Richit, 2020). The regular evaluation process enables the continuous development of pedagogical competence and the adaptation of teaching to the needs of students (Mengistu et al., 2024). In the context of a learning community, Lesson Study encourages the formation of a supportive professional community. Research Da Ponte et al. (2024) has found that the implementation of Lesson Study provides significant support in building a learning community among teachers. They form teams to collaborate, share best practices, and take joint responsibility for improving the quality of their teaching. This is in line with the emphasis on the importance of collaboration in professional development approaches (Azhar et al., 2022; Seino & Foster, 2021).

The integration of problem-based learning and cooperative learning in the Lesson Study process allows teachers to develop learning strategies that encourage active student engagement, improve communication skills, and improve student achievement through a more contextual and problem-solving-based approach. Cooperative learning requires students to work together and collaborate with their classmates. These two approaches complement each other and create a rich context for learning(Azhar et al., 2022; Wai & Wing, 2014). Collaboration can improve students' communication skills and also provide an environment that supports social-emotional learning (Lomibao, 2016; Mon et al., 2016).

In addition, the application of the 3P model (Pedagogy, Professionalism, and Practice) in Lesson Study further strengthens teachers' competence in creating a learning environment that is more interactive, innovative, and in line with the 21st century learning needs. Teachers involved in Lesson Study have the opportunity to share knowledge and skills, as well as build professional networks that strengthen collaborative learning (Seino & Foster, 2021). This 3P model supports the application of relevant learning theories as well as pedagogical practices that can be tailored to the needs of students in the classroom (Da Ponte et al., 2024). Thus, Lesson Study is an effective strategy in building a learning community that is oriented towards improving the quality of education through collaboration and continuous innovation.

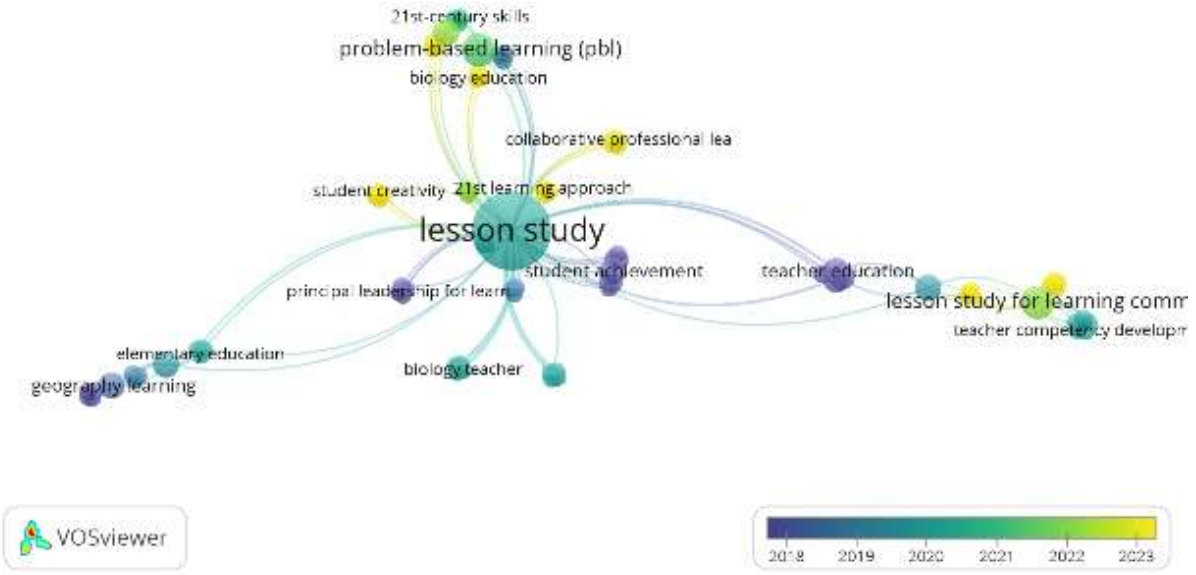

Figure 4. Overlay Visualisation

Researcher's documentation (2024)

The next output from the bibliometric analysis is a network of keywords that are connected to each other, as shown in Figure 3. The keywords 'Lesson Study' and 'Lesson Study for Learning Community' are the main concepts with a large font size and a central position, indicating that these two terms have a high frequency of occurrence and a strong relationship with other keywords. The keywords 'Teacher Education', 'Student Achievement', and 'Teacher Competency Development' have strong connections with Lesson Study, indicating that this learning model plays an important role in developing teacher professionalism and improving student learning outcomes.

'Problem-Based Learning (PBL)', '21st-Century Skills', and 'Collaborative Professional Learning' are connected to Lesson Study, showing that problem-based and collaborative learning models are integral to improving 21st-century skills. 'Student Creativity' and '21st Learning Approach' are also connected to Lesson Study, which confirms that this approach contributes to the development of creativity and modern learning strategies. 'Geography Learning' and 'Elementary Education' have a relationship with Lesson Study, indicating that this method is not only applied in higher education but also at the primary school level.

Blue to green indicates older research (2018-2020), while yellow indicates more recent research (2022-2023) (Auliah & Cahyani, 2024; Cahyani & Romadin, 2024). Lesson Study and Lesson Study for Learning Community have been the focus of research for a long time and continue to evolve. Keywords such as 'Problem-Based Learning,' '21st-Century Skills,' and 'Collaborative Professional Learning' are more dominant in recent years (yellow), indicating that current research trends are beginning to lead to the integration of Lesson Study with problem-based learning and the development of 21st-century skills. In addition, there are other keywords such as: Student creativity, teaching strategies, collaboration skills, twenty-first century learning, scientific argumentation, model competencies, learning power, constructivist pedagogy, student-centered teaching, pedagogical abilities, prospective chemistry teachers, guided discovery learning, pedagogical competence, micro teaching, guided inquiry learning, chemistry education. 'Teacher Competency Development' and 'Teacher Education' are teal, indicating that the focus on developing teacher competencies emerged early and continues to this day.

The next output is the item cluster. In bibliometric analysis using VOSviewer, the item cluster output functions to group research items, such as keywords, authors, or institutions, based on their similarities or relationships in a dataset. The main function of this output is to identify research patterns and trends by grouping terms that often appear together, so as to illustrate interconnected research areas. In addition, visualising the relationships between items in the form of clusters helps to understand conceptual connections in academic literature, where each colour represents a different group. The output of the item cluster also plays a role in analysing research developments and identifying how certain subtopics develop and contribute to broader disciplines. In the context of collaboration networks, this output can reveal patterns of cooperation between researchers and institutions, which is useful in understanding the dynamics of academic

collaboration. Thus, the output of the item cluster in VOSviewer is an effective tool for systematically and visually analysing research relationships, trends and developments.

Table 2. Cluster Items

Cluster	Keywords
Cluster 1	collaboration, elementary education, exo olo task learning model, exo-olo task learning model, geography learning, integrative learning model, learning activities, learning outcome, learning outcome, quasi-experimental research, reading comprehension ability, student learning activity
Cluster 2	chemistry education, guided discovery learning (gdl), guided inquiry learning (gil), lesson study for learning community (lslc), micro teaching, microteaching, pedagogical abilities, pedagogical competence, prospective chemistry teachers
Cluster 3	buffer solution, cognitive aspect, cognitive aspect (c3 - application), discovery learning, lesson study, project based learning, student achievement, t-test analysis
Cluster 4	21st-century skills, biology teacher education, classroom action research, collaboration skills, communication skills, lesson study (ls), twenty-first century learning
Cluster 5	biology education, collaborative learning, learning media, oral communication skills, plant physiology, problem-based learning (pbl), scientific argumentation
Cluster 6	3p model, assessment, guidance, mathematics education, teacher competency development, teacher professionalism
Cluster 7	be-cools study, cooperative learning, jigsaw model, teacher education
Cluster 8	biology teacher, classroom management, learning process observation, teacher professional development
Cluster 9	collaborative professional learning, constructivist pedagogy, learning power, student-centered teaching
Cluster 10	elementary school, music education, student creativity, teaching strategies
Cluster 11	critical thinking skills, guided inquiry, linear function, student learning improvement
Cluster 12	principal leadership for learning, teacher efficacy, teacher leadership for learning, teacher professional learning
Cluster 13	21st learning approach, efl teachers, model competencies
Cluster 14	natural science teacher, thinking skills
Cluster 15	imtpg, professional development, teacher learning
Cluster 16	creative thinking, problem based learning

Researcher's documentation (2024)

The output of the item cluster in VOSviewer shows the grouping of various keywords that have thematic relevance in the research. Each cluster represents an interconnected main topic and can be interpreted as follows:

Cluster 1 (Collaborative Learning and Integrative Model in Elementary Education) Keywords such as collaboration, elementary education, integrative learning model, and learning outcome indicate that research in this cluster focuses on collaborative and integrative learning strategies at the primary education level to improve student activity and learning outcomes. The research method used in this cluster tends to be quasi-experimental, which examines the effectiveness of a particular learning model on student learning outcomes and reading comprehension ability. Cluster 2 (Chemistry Education and Pedagogical Competence of Prospective Teachers). This cluster contains keywords related to chemistry education, inquiry-based learning strategies (guided inquiry learning, guided discovery learning), and the lesson study for learning community (LSLC) approach in improving the abilities of prospective chemistry teachers. In addition, aspects of prospective chemistry teachers' pedagogical competence, pedagogical abilities, and pedagogical competence and micro teaching practices, microteaching, are part of the research in this cluster.

Cluster 3 (Project-Based Learning and Cognitive Analysis in Science Education). This cluster focuses on improving student achievement through approaches such as discovery learning and project-based learning, with evaluation of the cognitive aspect (C3 - application). Data analysis in this cluster uses statistical techniques such as t-test analysis to measure the impact of learning on student understanding, especially in the topic of buffer solutions. Cluster 4 (21st Century Skills in Biology Education and Lesson Study). Keywords such as 21st-century skills, twenty-first century learning, collaboration skills, and communication skills indicate that this cluster focuses on developing 21st-century skills in biology education. Classroom

action research and lesson study (LS) are the approaches used in this study to improve teaching effectiveness. Cluster 5 (Collaborative Learning and Scientific Argumentation in Biology Education). This cluster highlights biology education with a collaborative learning approach and the development of scientific argumentation skills. Learning methods such as problem-based learning (PBL) and the use of learning media contribute to improving oral communication skills.

Cluster 6 (Teacher Competence and Professionalism Development in Mathematics Education). This cluster covers topics related to mathematics education, teacher competency development, teacher professionalism, and learning evaluation through the 3P model (Pedagogy, Professionalism, and Practice). Cluster 7 (Teacher Education and Cooperative Learning Models). Research in this cluster highlights the cooperative learning approach, especially through the jigsaw model, as well as teacher education programmes. Cluster 8 (Development of Biology Teacher Professionalism and Classroom Management). This cluster focuses on the professional development of biology teachers, learning process observation, and classroom management. Cluster 9 (Constructivist Learning and Collaborative Teacher Professionalism). This cluster covers the concepts of constructivist-based learning (constructivist pedagogy) and collaborative professional learning approaches, with an emphasis on student-centred learning (student-centred teaching).

Cluster 10 (Primary Education, Student Creativity, and Teaching Strategies). This cluster focuses on elementary school, music education, and student creativity development through the application of teaching strategies. Cluster 11 (Critical Thinking and Inquiry-Based Learning in Mathematics). Keywords such as critical thinking skills, guided inquiry, and linear function indicate that this cluster focuses on improving critical thinking skills through a guided inquiry learning approach, especially in the context of mathematics education. Cluster 12 (Teacher Leadership and Efficacy in Learning). This cluster includes studies on teacher leadership for learning, teacher efficacy, and the effect of principal leadership on learning.

Cluster 13 (21st Century Learning Approaches and Model Competences in English as a Foreign Language Education). The main focus of this cluster is the education of English as a foreign language (EFL) teachers, with the use of a 21st century learning approach and the development of model competencies. Cluster 14 (Science Education and Science Teacher Thinking Skills). This cluster links research on natural science teachers with the development of thinking skills. Cluster 15 (Development of Teacher Professionalism through the IMTPG Programme). This cluster emphasises teacher professional development (teacher learning), with a focus on the IMTPG programme that supports the improvement of teacher skills. Cluster 16 (Creative Thinking and Problem-Based Learning). This cluster contains research on the development of creative thinking through problem-based learning.

The output results of the VOSviewer item cluster show various interconnected research topics in the field of education. In general, these clusters can be categorised into several major themes, such as:

1. Teacher education and professionalism development (Clusters 2, 6, 7, 8, 12, 15).

   The development of teacher professionalism requires a holistic and integrated approach, involving aspects of academic qualifications, relevant training, the active role of the principal, and collaboration in the learning community. Relevant ongoing training is also needed to ensure that teachers have knowledge and skills that are in line with the latest developments in teaching methods and educational technology (Handayani et al., 2023; Mahdalina, 2017). Schools that actively implement strategies to develop teacher professionalism, such as ongoing supervision and facilitation in training, have a significant impact on the quality of learning in those schools (Dendodi et al., 2024). In addition, research by Fathurrahman emphasises the importance of effective teaching supervision, which includes classroom observation and practical support in teaching to improve teacher competence (Fathurrahman, 2018). Teacher cooperation in collaborative settings contributes to improving the pedagogical competence and professionalism of teachers in their schools (Gunadi & Sumarni, 2023). In the 21st century education era, where interpersonal competence and collaboration are increasingly needed, this activity has become very relevant (Herawati et al., 2023; Syawalia, 2022). By focusing on these elements, it is hoped that teachers can develop the competencies needed to improve the quality of education and produce students who are ready to face the challenges of the 21st century.

2. Innovative learning strategies such as Lesson Study, Problem-Based Learning, Guided Inquiry, and Collaborative Learning (Clusters 1, 3, 4, 5, 9, 11, 16).

   Innovative learning strategies such as Lesson Study, PBL, Guided Inquiry, and Collaborative Learning complement each other in improving the quality of education.
   Research shows that through Lesson Study, teachers can develop pedagogical skills and provide students with a more contextual and participatory learning approach (Pilz & Gengaiah, 2019; Singerin

et al., 2020). This model strengthens collaboration between teachers which has a positive impact on the learning culture in an educational community (Syarif et al., 2020). Students who are involved in problem-based learning tend to show a better understanding of the subject matter and can relate theory to real-world practice (Kanyesigye et al., 2023; Safaruddin et al., 2020). Research shows that guided inquiry can improve students' conceptual understanding because it allows them to be directly involved in the research process (Gencer & Ekici, 2022). Collaborative learning emphasises the importance of interaction between students in learning and exchanging ideas. Through cooperation, students can learn from each other, improve social skills, and strengthen their understanding of subject matter. This approach not only improves academic achievement, but also builds trust and communication among students (Tapilouw et al., 2017). Through the implementation of these models, teachers can provide an interactive learning environment that stimulates active student engagement. This will encourage the development of academic competencies and 21st-century skills in students, preparing them for future challenges.

3. Development of 21st century skills in learning, including creativity, critical thinking, communication, and collaboration (Clusters 4, 5, 10, 13, 14).

   The development of 21st-century skills, which include creativity, critical thinking, communication, and collaboration, is becoming increasingly important in order to prepare students to face complex global challenges. These skills, often known as the 4Cs, are key to creating superior human resources that are ready to compete in the modern era. Several innovative learning strategies applied in various educational institutions have proven effective in developing these skills. These skills are identified by the National Education Association as basic abilities that every individual must master ((Wai & Wing, 2014). Interaction between students improves 21st century skills. This interaction can help students develop communication and collaboration skills that are equally important for success in the modern world (Lomibao, 2016).

   The combination of lesson study with other learning models can also support 21st-century skills. Problem-based learning models are very helpful in training 21st-century skills, with an emphasis on activities that involve critical thinking and student collaboration (Lee & Madden, 2019). Project-based learning allows students to explore creative ideas and work together in teams, thus improving their communication and collaboration skills (Akiba & Wilkinson, 2016). The guided inquiry learning model can improve students' critical thinking and problem solving skills, which are in line with the demands of 21st century skills (Mon et al., 2016).

Conclusion

The conclusion of this study shows that Lesson Study and Lesson Study for Learning Community are key concepts in the education literature, as evidenced by the frequency of occurrence and high correlation with various other keywords. Analysis of publication trends from 2015 to 2024 shows a fluctuating pattern, with the trend of research on Lesson Study declining despite a brief spike. The topic of Lesson Study has been integrated with other approaches that lead to 21st century student-centred learning approaches such as Problem-Based Learning, guided discovery learning, collaborative professional learning and the 3P Model (Pedagogy, Professionalism, and Practice). This study is important because it provides a comprehensive development map of the evolution of Lesson Study in the context of educational innovation, as well as providing a basis for educators and policy makers to formulate strategies for improving the quality of teaching. By placing these results in the context of previous work, our research demonstrates originality in identifying deep thematic trends and relationships, thus presenting a significant contribution to the scientific community and practical relevance in the development of modern learning models. Suggestions or recommendations for further researchers can further explore the relationship of Lesson Study with more innovative learning approaches, such as technology-based learning and adaptation in various disciplines. Future research focus can examine how Lesson Study can be more effective in improving 21st-century skills, especially in the context of higher education and teacher professionalism.

References

Akiba, M., & Wilkinson, B. (2016). Adopting an International Innovation for Teacher Professional Development: State and District Approaches to Lesson Study in Florida. *Journal of Teacher Education*, *67*(1), 74–93. https://doi.org/10.1177/0022487115593603

Auliah, A., & Cahyani, V. P. (2024). Exploring Trends in Chemical Education: A Bibliometric Analysis (2019-2024. *Jurnal Inovasi Pembelajaran Kimia (Journal Of Innovation in Chemistry Education*, *6*(2), 297–307.

Azhar, A., Nurgaliyeva, G., Nurlan, A., Kairat, O., Berikzhan, O., & Mariyash, A. (2022). Implementation of the lesson study approach to develop teacher professionalism. *Cypriot Journal of Educational Sciences*, *17*(2), 652–663. https://doi.org/10.18844/CJES.V17I2.6862

Burhanudin, M., Ayu Neina, Q., Prasandha, D., Putri, D. A. W. C., Septiani, L., & Ayu, A. N. S. (2024). Bibliometric Analysis of School Well-Being Factors in School Ecosystem Through Lesson Study Program. *Revista de Gestao Social e Ambiental* , *18*(5), 6863. https://doi.org/10.24857/rgsa.v18n5-121

Cahyani, V. P., & Fadly, D. (2024). The Development of Ethnoscience in Chemistry Learning in Indonesia: A Bibliometric Analysis of Literacy and Cultural Relevance. *Jurnal Studi Guru Dan Pembelajaran*, *7*(3), 1201–1211. https://doi.org/10.30605/jsgp.7.3.2024.4797

Cahyani, V. P., & Romadin, A. (2024). A Comprehensive Bibliometric Analysis of Distance Learning Assessments : Key Themes and Future Directions. *Internasional Journal of Integrative Sciences (IJIS)*, *3*(11), 1265–1280.

Cahyani, V. P., Romadin, A., Erniyani, Fahri Anwar, & Nawi, M. Z. (2024). Optimising Assessment in Project-Based Learning to Improve the Quality of STEM Learning. *International Journal of Scientific Multidisciplinary Research*, *2*(11), 1645–1656. https://doi.org/10.55927/ijsmr.v2i11.12392

Da Ponte, J. P., Quaresma, M., & Faria, F. (2024). Establishing links between research and practice. *Educação, Sociedade & Culturas*, *67*(67), 1–15. https://doi.org/10.24840/esc.vi67.735

Damayanti, D., & Nuzuli, A. K. (2023). Evaluasi Efektivitas Penggunaan Teknologi Komunikasi Dalam Pengajaran Metode Pendidikan Tradisional Di Sekolah Dasar. *Journal of Scientech Research and Development*, *5*(1), 208–219. https://doi.org/10.56670/jsrd.v5i1.130

Deda, Y. N., Disnawati, H., & Daniel, O. (2023). Research Trends on Lesson Study Based on Google Scholar and Scopus Database: a Bibliometric Analysis. *Jurnal Varidika*, *35*(1), 33–53. https://doi.org/10.23917/varidika.v1i1.22663

Dendodi, D., Sufianti, I., Aulia, M., & Widari, N. (2024). Strategi Kepala Sekolah Dalam Upaya Meningkatkan Profesionalisme Guru di Sekolah Islam Muhammad Al-Fatih Indonesia. *ALACRITY : Journal of Education*, 439–451. https://doi.org/10.52121/alacrity.v4i2.373

Fadime, Y. A. (2019). The role of lesson study in teacher learning and professional development of EFL teachers in Turkey: A case study. *TESOL Journal*, *10*(2). https://doi.org/10.1002/tesj.409

Fathurrahman, F. (2018). Peningkatan Profesionalisme Guru Bahasa Melalui Supervisi Pengajaran Kepala Sekolah. *Jurnal Reforma*, *7*(1), 25. https://doi.org/10.30736/rfma.v7i1.38

Fox, A., & Poultney, V. (2020). Teacher professional learning through lesson study: teachers' reflections. *International Journal for Lesson and Learning Studies*, *9*(4), 397–412. https://doi.org/10.1108/IJLLS-03-2020-0011

Gencer, S., & Ekici, F. (2022). Preservice Chemistry Teachers' Understanding of Surface Tension through Guided-Inquiry. *Journal of Chemical Education*, *99*(12), 3946–3953. https://doi.org/10.1021/acs.jchemed.2c00330

Gunadi, G., & Sumarni, D. (2023). Menilai Kompetensi Pedagogik dan Profesionalisme Guru: Studi Kasus di SD Cisarua. *Jurnal Pengajaran Sekolah Dasar*, *2*(1), 28–38. https://doi.org/10.56855/jpsd.v2i1.257

Handayani, P. H., Yus, A., & Diputera, A. M. (2023). Praktikalitas dan Efektivitas Buku Pedoman PLP Calon Guru PAUD berbasis TPACK. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *7*(2), 1611–1625.

https://doi.org/10.31004/obsesi.v7i2.3109

Herawati, F. I., Aminarti, D., & Rosdiana. (2023). Penguatan Paradigma Profesi Guru AbAd 21. *SETYAKI : Jurnal Studi Keagamaan Islam*, *1*(4), 48–53. https://doi.org/10.59966/setyaki.v1i4.667

Kanyesigye, S. T., Uwamahoro, J., & Kemeza, I. (2023). Effect of problem-based learning on Ugandan secondary school physics classroom practices: an observational study. *F1000Research*, *12*, 245. https://doi.org/10.12688/f1000research.129221.1

Lee, V., & Madden, M. (2019). "We're in This Together": Principals and Teachers as Partners and Learners in Lesson Study. *NASSP Bulletin*, *103*(1), 51–64. https://doi.org/10.1177/0192636519826717

Lomibao, L. S. (2016). Enhancing mathematics teachers' quality through Lesson Study. *SpringerPlus*, *5*(1). https://doi.org/10.1186/s40064-016-3215-0

Mahdalina, M. (2017). Manajemen Pengembangan Profesionalisme Guru SLTA di Kabupaten Hulu Sungai Utara. *STILISTIKA: Jurnal Bahasa, Sastra, Dan Pengajarannya*, *2*(2). https://doi.org/10.33654/sti.v2i2.394

Mengistu, M. A., Worku, M. Y., & Melesse, T. (2024). Examining the impact of lesson study on teachers' professional development: A quasi-experimental study. *Bahir Dar Journal of Education*, *24*(1), 25–36. https://doi.org/10.4314/bdje.v24i1.3

Mon, C. C., Dali, M. H., & Sam, L. C. (2016). Implementation of lesson study as an innovative professional development model among Malaysian school teachers. *Malaysian Journal of Learning and Instruction*, *13*(1), 83–111. https://doi.org/10.32890/mjli2016.13.1.5

Panbanlame, K., Sangaroon, K., & Inprasitha, M. (2014). Students' Intuition in Mathematics Class Using Lesson Study and Open Approach. *Psychology*, *05*(13), 1503–1516. https://doi.org/10.4236/psych.2014.513161

Pilz, M., & Gengaiah, U. (2019). Teacher Training Education for VET Teachers in India. In *Handbook of Vocational Education and Training* (pp. 1–15). https://doi.org/10.1007/978-3-319-49789-1_38-1

Richit, A. (2020). Lesson study in the perspective of teacher educators. *Revista Brasileira de Educacao*, *25*, 1–24. https://doi.org/10.1590/s1413-24782020250044

Roesdiana, L., & Hidayati, N. (2018). Pencapaian Kemampuan Pemahaman Matematis Siswa Menggunakan Model Lesson Study pada Pembelajaran Matematika Ekonomi. *SJME (Supremum Journal of Mathematics Education)*, *2*(2), 71–76. https://doi.org/10.35706/sjme.v2i2.1292

Safaruddin, Degeng, I. N. S., Setyosari, P., & Murtadho, N. (2020). The effect of PJBL with WBL media and cognitive style on students' understanding and science-integrated concept application. *Jurnal Pendidikan IPA Indonesia*, *9*(3), 384–395. https://doi.org/10.15294/jpii.v9i3.24628

Schipper, T. M., Willemse, T. M., & Goei, S. L. (2022). Supporting teacher educators' professional learning through lesson study. *Journal of Education for Teaching*, *48*(3), 316–331. https://doi.org/10.1080/02607476.2021.1988825

Seino, T., & Foster, C. (2021). Analysis of the final comments provided by a knowledgeable other in lesson study. *Journal of Mathematics Teacher Education*, *24*(5), 507–528. https://doi.org/10.1007/s10857-020-09468-y

Shabibi, S. Al. (2023). The Effectiveness of Lesson Study as a Professional Development Approach for Omani Teachers. *Journal of Education and Practice*, *14*(26), 60–75. https://doi.org/10.7176/jep/14-26-07

Singerin, S., Huliselan, E. K., & Latununuwe, A. (2020). Development of Integrated Science Learning Devices Using Problem Based Learning (Pbl) Learning Model Through Lesson Study. *Edu Sciences*

Journal, *1*(2), 124–132. https://doi.org/10.30598/edusciencesvol1iss2pp124-132

Syarif, E., Syamsunardi, S., & Saputro, A. (2020). Implementation of Discovery Learning to Improve Scientific and Cognitive Attitude of Students. *Journal of Educational Science and Technology (EST)*, 23–31. https://doi.org/10.26858/est.v6i1.11975

Syawalia, N. N. (2022). *Guru Profesional Di Era Milenial*. 1–12. https://doi.org/10.31219/osf.io/6pv7z

Tapilouw, M. C., Firman, H., Redjeki, S., & Chandra, D. T. (2017). Science teacher's perception about science learning experiences as a foundation for teacher training program. In *AIP Conference Proceedings* (Vol. 1848). https://doi.org/10.1063/1.4983978

Thephavongsa, S. (2018). Enhancing the teaching skills of the multi-grade teachers through lesson study. *International Journal of Learning, Teaching and Educational Research*, *17*(4), 71–87. https://doi.org/10.26803/ijlter.17.4.5

Vermunt, J. D., Vrikki, M., van Halem, N., Warwick, P., & Mercer, N. (2019). The impact of Lesson Study professional development on the quality of teacher learning. *Teaching and Teacher Education*, *81*, 61–73. https://doi.org/10.1016/j.tate.2019.02.009

Wai, M. C., & Wing, Y. W. (2014). Does Lesson Study work? : A systematic review on the effects of Lesson Study and Learning Study on teachers and students. *International Journal for Lesson and Learning Studies*, *3*(2), 137–149. https://doi.org/10.1108/IJLLS-05-2013-0024