



Systematic Review: Teachers' Professional Competence On Learning Effectiveness And Performance In Merdeka Curriculum

Nur Khadijah Shabrina Putri Suryodiningrat¹, Sabrina Nabilah², Suci Artika Putri Utami³, Sefti Ayu Rahmadani⁴, Mila Aristia Dewari⁵, Sri Lestari Handayani⁶

E-mail Korespondensi : nkshabrinaps@gmail.com

Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta, Indonesia

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ABSTRACT

This systematic review examines the influence of teachers' professional competence on learning effectiveness and performance in the implementation of Merdeka Curriculum. The research uses the Systematic Literature Review (SLR) method with descriptive qualitative approach, analyzing 42 scientific articles published between 2020-2025 from Google Scholar, Garuda Portal, DOAJ, and Scopus databases, selected through systematic screening from an initial pool of 87 articles following PRISMA guidelines. The inclusion criteria include national and international journals discussing professional competence, learning effectiveness, teacher performance, and Merdeka Curriculum. Data analysis was performed through content analysis and thematic synthesis. The results show that teachers' professional competence significantly affects learning effectiveness and teacher performance in Merdeka Curriculum implementation. Professional competence encompasses mastery of subject matter, teaching skills, use of technology, assessment abilities, and continuous professional development. Teachers with high professional competence demonstrate better performance in designing differentiated learning, implementing project-based learning, and developing innovative teaching materials. This study concludes that strengthening teachers' professional competence through structured training programs, mentoring, and professional learning communities is essential to optimize Merdeka Curriculum implementation and improve the quality of national education.

Keywords: professional competence; learning effectiveness; teacher performance; Merdeka Curriculum; systematic review

Introduction

The transformation of Indonesian education through the implementation of Merdeka Curriculum marks a new era in the national learning system that emphasizes flexibility, creativity, and character development of students (Fitriyah & Wardani, 2022). The Merdeka Curriculum was developed as a response to post-COVID-19 pandemic learning challenges and the need to prepare a generation capable of facing the complexities of the 21st century. In this context, the role of teachers becomes increasingly crucial as the spearhead of curriculum implementation that demands pedagogical adaptation, technology mastery, and the ability to design student-centered learning (Siswanto et al., 2024)

Teachers' professional competence is the main foundation in realizing learning effectiveness and improving educational performance (Muhammad et al., 2025). According to Law Number 14 of 2005 concerning Teachers and Lecturers, professional competence includes broad and deep mastery of learning materials that enables teachers to guide students to achieve established competency standards. This legal mandate aligns with contemporary pedagogical frameworks

such as Technological Pedagogical Content Knowledge (TPACK), which emphasizes the integration of technology, content, and pedagogy as core dimensions of teacher competence in the digital era (Mishra & Koehler, 2006). Furthermore, constructivist learning theory underscores that effective teachers must be able to design environments where students actively construct knowledge, a principle central to Merdeka Curriculum design. However, data from the Ministry of Education, Culture, Research, and Technology shows that the average national teacher competency score has only reached 50.64 out of 100 points, indicating a significant gap between expected competence and reality in the field. This figure is further corroborated by findings from the OECD Teaching and Learning International Survey (TALIS), which notes that Indonesian teachers report lower levels of self-efficacy in implementing student-centered learning compared to regional peers (OECD, 2020). Inconsistent findings across existing studies—some reporting significant competence improvements following training interventions while others find minimal transfer to classroom practice—further justify the need for a systematic, integrative review of the evidence base. (Suarlin et al., 2025). This gap becomes more urgent in the context of Merdeka Curriculum which demands teachers to have differentiated learning abilities, continuous formative assessment, and digital technology integration. Previous research on teacher competency development has shown that structured training and workshops can significantly improve teachers' assessment and evaluation skills (Aslam et al., 2021).

Learning effectiveness in Merdeka Curriculum heavily depends on teachers' ability to implement independent learning principles, namely student-centered, contextual learning that develops higher-order thinking skills (Momente et al., 2023). Research shows that teachers with high professional competence are able to create more interactive, dynamic, and meaningful learning for students (Reni et al., 2025). They are also more effective in managing classrooms, integrating learning technology, and conducting comprehensive assessments to monitor student development (Yuliana & Hidayat, 2024). Conversely, teachers whose professional competence is still low tend to experience difficulties in designing differentiated learning and implementing project-based learning which is a hallmark of Merdeka Curriculum (Lestari et al., 2023).

Teacher performance in implementing Merdeka Curriculum is also an important indicator of successful national education transformation. Teacher performance is not only measured by the ability to deliver material but also by their capacity in designing teaching tools, conducting authentic assessments, and developing themselves continuously (Shelvia, 2025). Studies show that improving teachers' professional competence has a positive impact on their performance, reflected in the ability to design learning modules based on Pancasila student profiles, implement inclusive learning, and provide constructive feedback to

students (Kusuma, 2024). However, challenges faced by teachers in improving their performance include limited access to training, lack of continuous mentoring, and minimal supporting infrastructure such as internet connectivity and digital devices.

Although there have been many studies examining teachers' professional competence, learning effectiveness, and teacher performance separately, there has been no comprehensive study that systematically integrates these three aspects in the context of Merdeka Curriculum. This systematic review becomes important to identify patterns, trends, and research gaps related to the relationship between teachers' professional competence and learning effectiveness and performance in Merdeka Curriculum implementation. This study is expected to provide evidence-based recommendations for developing more effective and contextual teacher competency improvement programs. Based on this background, this research aims to: (1) identify dimensions of teachers' professional competence that most influence learning effectiveness in Merdeka Curriculum, (2) analyze the relationship between teachers' professional competence and performance in Merdeka Curriculum implementation, and (3) formulate strategies for developing teachers' professional competence to improve learning effectiveness and performance in Merdeka Curriculum. This research provides theoretical benefits in enriching studies on teachers' professional competence and practical benefits as a basis for developing teacher quality improvement policies in Indonesia.

Research Methods

This research uses the Systematic Literature Review (SLR) method with a descriptive qualitative approach to identify, evaluate, and synthesize previous research results relevant to the topic of teachers' professional competence on learning effectiveness and performance in Merdeka Curriculum. The SLR method was chosen because it allows researchers to conduct literature review systematically, structurally, and accountably, thus producing a more comprehensive and balanced summary of knowledge (Triandini et al., 2019). The SLR process in this research follows the stages of planning, data collection, analysis, and synthesis to ensure transparency and objectivity of study results.

Data sources in this research are scientific articles published in accredited national and international journals from 2020-2025. Literature searches were conducted through academic databases such as Google Scholar, Garuda Portal, DOAJ (Directory of Open Access Journals), and Scopus using keywords: "teacher professional competence", "learning effectiveness", "teacher performance", "Merdeka Curriculum", "kompetensi profesional guru", "efektivitas pembelajaran", and "kinerja guru". The established inclusion criteria include: (1) articles published between 2020-2025, (2) discussing topics of teachers' professional competence, learning effectiveness, teacher performance, or Merdeka Curriculum, (3) being

empirical research results or conceptual studies that have undergone peer-review, and (4) available in full-text. Meanwhile, exclusion criteria include: (1) articles not relevant to the research focus, (2) duplicate articles, (3) articles without clear methodology, and (4) articles that cannot be accessed in full. The article selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and methodological rigor. From the initial database search, 87 articles were identified. After removing duplicates and applying title and abstract screening, the pool was reduced to 42 articles, and after full-text assessment for eligibility, these articles met the inclusion criteria and were analyzed further. To ensure reliability of the screening process, two researchers independently screened articles at each stage, with disagreements resolved through discussion and consensus, achieving an inter-rater agreement coefficient above 0.80 (Landis & Koch, 1977). A PRISMA flow diagram documenting the selection stages is presented in Figure 1. (Sucipto et al., 2024).

Data analysis was conducted through two main stages, namely content analysis and thematic synthesis. In the content analysis stage, researchers extracted data from selected articles including information about authors, publication year, research objectives, methodology, main findings, and conclusions. The extracted data were then categorized based on key themes: dimensions of teachers' professional competence, indicators of learning effectiveness, factors affecting teacher performance, and strategies for developing professional competence in the context of Merdeka Curriculum. Subsequently, in the thematic synthesis stage, researchers conducted inductive coding to identify patterns, trends, and relationships between findings from various studies (Francis & Baldesari, 2006). The thematic synthesis process allows researchers to integrate diverse research results into a coherent narrative that answers research questions. The validity of findings was maintained through independent dual-researcher coding (inter-rater agreement) and peer debriefing to ensure credibility, transferability, dependability, and confirmability of study results (Anggini et al., 2024).

Results and discussion

The results of systematic review show that teachers' professional competence has a significant influence on learning effectiveness and teacher performance in Merdeka Curriculum implementation. This finding is consistent with research by Muhammad, Suryani, and Jannah (Muhammad et al., 2025) which analyzed the implementation of professional teacher competency standards in improving learning effectiveness. From the thematic analysis conducted, five main dimensions of professional competence that are most influential were identified: (1) mastery of subject matter and scientific substance, (2) pedagogical and didactic skills, (3) ability to integrate learning technology, (4) assessment and evaluation competence, and (5)

capacity for continuous professional development. Each of these dimensions has a specific role in supporting learning effectiveness and teacher performance in the context of Merdeka Curriculum which emphasizes differentiated, project-based, and student-centered learning.

1.1 Dimensions of Teachers' Professional Competence Affecting Learning Effectiveness

Mastery of subject matter and scientific substance is the main foundation of teachers' professional competence that directly influences learning effectiveness. The study results show that teachers with deep understanding of subject matter are able to design more contextual and meaningful learning for students (Lestari et al., 2023). In the context of Merdeka Curriculum, subject matter mastery is not limited to cognitive aspects but also includes the ability to relate concepts to real life and develop authentic problem-based learning. Research by Momente et al., (2023) proves that teachers with strong subject matter mastery are better able to adapt learning according to students' needs and characteristics, and are more flexible in responding to questions and challenges that arise during the learning process. This is in line with the principles of Merdeka Curriculum which emphasize learning that provides space for exploration and optimal development of students' potential (Fitriyah & Wardani, 2022).

Pedagogical and didactic skills are the second dimension that is very crucial in improving learning effectiveness in Merdeka Curriculum. Systematic review findings reveal that teachers who master various learning strategies and methods are able to create more varied and interesting learning experiences (Siswanto et al., 2024). In Merdeka Curriculum, pedagogical skills include the ability to design differentiated learning that accommodates diversity in learning styles, ability levels, and students' interests. Research by Lestari et al., (2023) shows that teachers' pedagogical competence is still a main challenge in Merdeka Curriculum implementation, especially related to understanding and applying differentiated learning. Teachers with high pedagogical skills are able to design flexible learning scenarios, using various approaches such as project-based learning, problem-based learning, and collaborative learning that suit Merdeka Curriculum characteristics (Sucipto et al., 2024). They are also more skilled in managing classes, facilitating discussions, and creating conducive learning environments for developing 21st-century skills such as critical thinking, creativity, collaboration, and communication.

The ability to integrate learning technology is the third dimension that is very relevant to Merdeka Curriculum demands in the digital era. Study results show that teachers who are able to integrate technology in learning create more interactive, dynamic, and interesting learning experiences for digital native generation students

(Reni et al., 2025). Technology is not only used as a tool to deliver material but also as a medium to develop creativity, collaboration, and students' problem-solving abilities. Research by Yuliana & Hidayat, (2024) proves that teachers who are able to integrate technology in learning show better effectiveness and student engagement improvements. The Merdeka Mengajar Platform (PMM) becomes one of the important innovations supporting teacher competency development in integrating technology, providing various digital learning resources, teaching modules, and inspirational videos that can be utilized to improve learning quality (Kusuma, 2024). However, challenges faced are limited technology infrastructure in some areas, unstable internet connections, and lack of adequate technology training, especially for senior teachers (Reni et al., 2025).

Assessment and evaluation competence is the fourth dimension that is very important in measuring learning effectiveness in Merdeka Curriculum. Systematic review results show that teachers with good assessment competence are able to conduct formative and summative assessments continuously to monitor students' learning development and provide constructive feedback (Lestari et al., 2023). Merdeka Curriculum emphasizes authentic assessment that not only measures cognitive aspects but also students' skills and attitudes through various methods such as observation, portfolios, and performance assessment. Research by Putu et al., (2024) identifies that teachers still face various problems in conducting assessments in Merdeka Curriculum, including difficulties in designing comprehensive assessment rubrics and integrating assessments in daily learning. Teachers who master assessment competence are able to use evaluation results to improve learning, identify students' learning difficulties early, and design appropriate interventions to support learning objectives achievement (Muhammad et al., 2025).

The fifth dimension is the capacity for continuous professional development that reflects teachers' commitment to continue learning and improving their competence. Study results show that teachers who actively participate in professional development programs such as training, workshops, learning communities, and further studies show significant improvements in learning effectiveness (Suarlin et al., 2025). Guru Penggerak (Driving Teacher) Program launched by the Ministry of Education, Culture, Research, and Technology is one of the strategic initiatives to develop teachers' capacity as learning leaders and agents of change in schools (Lubis et al., 2023). Research by Aditiya & Fatonah, (2023) shows that driving teachers have a vital role in Merdeka Curriculum implementation through developing learning communities, mentoring colleagues, and learning innovation. However, challenges faced are limited access to quality professional development programs, especially in remote areas, as well as lack of

systematic and continuous support from local governments and schools (Revina et al., 2020).

1.2 Relationship Between Teachers' Professional Competence and Performance in Merdeka Curriculum

Analysis of literature shows that there is a positive and significant relationship between teachers' professional competence and their performance in Merdeka Curriculum implementation. Teachers with high professional competence show better performance in various aspects, including learning planning, learning implementation, learning outcomes evaluation, and teaching materials development (Shelvia, 2025). Research by Momente et al., (2023) proves that teachers' pedagogical competence has a positive and significant effect on teacher performance, reflected in their ability to design innovative learning, manage classes effectively, and create conducive learning environments. In the context of Merdeka Curriculum, teacher performance is not only measured by administrative abilities such as creating learning tools but also by learning impact on students' competency and character development according to Pancasila student profiles (Sevia et al., 2025).

Teacher performance in designing differentiated learning is one of the main indicators of successful Merdeka Curriculum implementation. Systematic review results reveal that teachers with high professional competence are better able to identify diversity in students' characteristics and design learning strategies that accommodate these differences (Lestari et al., 2023). Differentiated learning requires deep understanding of learning theories, students' learning styles, and skills in designing learning activity variations appropriate to students' readiness levels, interests, and learning profiles. Research by Fitriah & Widiyono, (2023) identifies that teachers still face difficulties in implementing differentiated learning, especially related to time constraints, large numbers of students in one class, and lack of understanding about how to design learning that accommodates diversity. However, teachers who have attended intensive training and received continuous mentoring show significant improvements in ability to design and implement differentiated learning (Sucipto et al., 2024).

Implementation of Project-Based Learning is also an important aspect of teacher performance in Merdeka Curriculum, especially in Pancasila Student Profile Strengthening Projects (P5). Study results show that teachers with strong professional competence are better able to design meaningful, contextual projects that develop students' 21st-century skills (Sutrisno et al., 2023). P5 is designed as co-curricular learning that is interdisciplinary in nature, oriented toward character development and general competencies according to Pancasila student profiles. Research by Sevia et al., (2025) shows that teachers still face challenges in designing

and implementing P5, especially related to concept understanding, inter-subject integration, and comprehensive project assessment. However, schools that have strong learning communities and receive support from principals show more effective P5 implementation Affandi et al., (2022). Teacher performance in implementing P5 is also influenced by their ability to collaborate with colleagues, involve the community, and utilize learning resources outside school to enrich students' learning experiences.

Development of innovative teaching materials and learning media is another aspect of teacher performance that is greatly influenced by professional competence. Systematic review results show that teachers with high professional competence are more creative and innovative in developing teaching materials appropriate to local contexts and students' needs (Kusuma, 2024). Merdeka Curriculum provides flexibility for teachers to choose and develop teaching materials appropriate to students' characteristics and school contexts. Research by Sholikhah & Prayitno, (2025) shows that utilization of the Merdeka Mengajar Platform (PMM) can improve teacher performance in developing quality teaching materials. PMM provides various references for teaching modules, learning videos, and assessments that can be adapted by teachers according to needs. However, not all teachers have equal access to this digital platform, and teachers' digital literacy is still a challenge that needs to be addressed through systematic and continuous training programs.

1.3 Strategies for Developing Teachers' Professional Competence to Improve Effectiveness and Performance

Development of teachers' professional competence through structured and continuous training programs is the main strategy recommended based on systematic review results. Research by Suarlin et al., (2025) analyzes various teacher competency development programs in the Merdeka Curriculum era, including Teacher Professional Education (PPG), Guru Penggerak Program, and zonation-based Learning Competency Improvement (PKP). Analysis results show that these programs are effective in improving teacher competence when designed considering teachers' specific needs, providing continuous mentoring, and integrating practice-based learning. The Merdeka Mengajar Platform (PMM) is also an important innovation supporting teachers' competency development independently and collaboratively (Hidayat et al., 2025). PMM provides features such as Independent Training, My Evidence of Work, and Inspirational Videos that allow teachers to learn flexibly according to their needs and time.

Development of Professional Learning Communities (PLC) in schools is the second strategy that is very effective in improving teachers' professional competence. Study results show that teachers who are active in learning

communities such as Teacher Working Groups (KKG) or Subject Teacher Consultations (MGMP) show significant improvements in pedagogical competence and teaching performance (Affandi et al., 2022). Learning communities provide space for teachers to share best practices, discuss learning challenges, and collaborate in designing innovative solutions. Research shows that KKG effectiveness can be improved through applying more practice-based approaches such as lesson study and peer teaching, as well as utilizing digital technology to support collaboration among teachers. The role of principals as learning leaders is very crucial in facilitating and encouraging development of productive learning communities in schools (Purwanti et al., 2025).

Digital-based academic supervision is the third strategy that is relevant to technological developments and efficiency demands in teacher development. Research by Shelvia, (2025) shows that digital-based academic supervision is effective in improving teacher performance in the Merdeka Curriculum era. Digital supervision allows principals or supervisors to conduct monitoring and development more flexibly, provide faster and more specific feedback, and systematically document teachers' competency development. Digitalization of supervision also enables the use of data to make more evidence-based decisions in teacher professional development (Nugroho & Rahmawati, 2023). However, digital supervision implementation requires technology infrastructure readiness, training for supervisors, and paradigm shifts from administrative and evaluative supervision to developmental and coaching supervision.

Improving teachers' digital literacy is the fourth strategy that is very important in the context of 21st-century learning and Merdeka Curriculum implementation. Systematic review results show that digital literacy not only includes the ability to use technology devices but also critical understanding of digital information and ability to create innovative digital-based learning materials (Listiyoningsih et al., 2022). Digital literacy assistance programs for teachers have proven effective in improving teachers' competence in integrating technology in learning. Research shows that digital literacy assistance with the Goal, Reality, Options, Will (GROW) method successfully improved teachers' competence by 85% and confidence by 75% in integrating digital learning applications (Pane et al., 2024). However, challenges still faced are gaps in technology access between regions, unstable internet connections in some areas, and the need for continuous training programs adapted to teachers' ability levels.

The fifth strategy is strengthening local government roles in allocating budgets and providing systematic support for teacher professional development. Research by Pratama & Wijaya, (2022) shows that adequate budget allocation greatly influences the effectiveness of teacher professional development programs. Local governments have crucial roles in adjusting training programs to local needs,

facilitating partnerships with universities and professional training institutions, and monitoring and evaluating teacher competency development policy implementation (Rahman, 2016). However, there are still significant gaps in local government commitment and capacity in supporting teacher professional development, especially in areas with budget and resource limitations (Revina et al., 2020). Therefore, stronger national policies are needed to ensure equal access to teacher professional development programs throughout Indonesia, including through incentive schemes for teachers who consistently innovate and improve their competence.

Conclusion

Based on systematic review results of scientific articles published from 2020-2025, it can be concluded that teachers' professional competence has a significant influence on learning effectiveness and teacher performance in Merdeka Curriculum implementation. The most influential dimensions of professional competence include mastery of subject matter and scientific substance, pedagogical and didactic skills, ability to integrate learning technology, assessment and evaluation competence, and capacity for continuous professional development. Teachers with high professional competence show better ability in designing contextual and meaningful learning, adapting learning strategies according to diversity of students' characteristics, integrating technology to create interactive learning experiences, conducting formative and summative assessments continuously, and committing to continuously improve their competence through various professional development programs.

The relationship between teachers' professional competence and performance in Merdeka Curriculum implementation is positive and significant, reflected in teachers' ability to design differentiated learning, implement project-based learning through P5, and develop innovative and contextual teaching materials. Teachers with strong professional competence show better performance in various aspects, including systematic learning planning, effective and interesting learning implementation, comprehensive learning outcomes evaluation, and teaching materials development appropriate to students' needs and characteristics. However, there are still challenges faced by teachers in improving their performance, especially related to limited access to quality training, lack of continuous mentoring, minimal supporting infrastructure such as technology and internet, and competency gaps among teachers in various regions of Indonesia. These findings carry broader implications for educational and civic policy in Indonesia. The Merdeka Curriculum represents a form of curriculum decentralization that aligns with global trends toward teacher autonomy and school-based management; however, decentralization can only succeed when

accompanied by equitable investment in teacher professional development (Revina et al., 2020). Strengthening teacher competence is therefore not merely a pedagogical concern but a matter of educational equity and national development policy. Several limitations of this review should be acknowledged. First, the review is restricted to articles published between 2020 and 2025, which means earlier foundational studies on teacher competence may not be fully captured. Second, the primary databases used – Google Scholar, Garuda Portal, DOAJ, and Scopus – may not encompass all relevant publications, particularly grey literature and institutional reports. Third, the predominance of Indonesian-language national journals in the corpus limits the generalizability of findings to international contexts. Future research should expand the database scope, include a broader time range, and employ mixed-method approaches to deepen understanding of causal mechanisms linking teacher competence to student learning outcomes in the Merdeka Curriculum era.

Effective strategies for developing teachers' professional competence to improve learning effectiveness and performance in Merdeka Curriculum include: (1) structured and continuous training programs designed according to teachers' specific needs and providing practical mentoring, (2) development of professional learning communities in schools that facilitate collaboration, sharing best practices, and collaborative learning among teachers, (3) implementation of digital-based academic supervision that enables more flexible and data-based monitoring and development, (4) improvement of teachers' digital literacy through systematic and continuous assistance programs, and (5) strengthening local government roles in allocating budgets and providing systematic support for teacher professional development. Implementation of these strategies requires commitment and collaboration from various stakeholders, including central and local governments, schools, universities, and professional training institutions, to ensure that all teachers have equal access to quality professional development programs that will improve their learning effectiveness and performance in Merdeka Curriculum implementation.

Suggestion

Based on this systematic review findings, several suggestions are recommended for various stakeholders. First, to the Ministry of Education, Culture, Research, and Technology, it is suggested to design more comprehensive, structured, and continuous teacher professional competency development programs with blended learning approaches that combine face-to-face and online training, and provide stricter monitoring and evaluation systems to ensure program effectiveness. Second, to local governments, it is suggested to increase education budget allocation specifically for teacher training programs, provide adequate

technology infrastructure in all schools, and facilitate partnerships with universities for continuous mentoring programs. Third, to school principals, it is suggested to strengthen their role as learning leaders by facilitating development of professional learning communities in schools, conducting coaching and collaborative academic supervision, and creating school cultures that support innovation and teacher professional development. Fourth, to teachers, it is suggested to increase commitment to continuous professional development through active participation in various training programs, learning communities, and utilization of digital platforms such as PMM, and actively conduct reflection and continuous improvement of learning practices. Finally, to future researchers, it is suggested to conduct research with mixed-method approaches that combine quantitative surveys and in-depth interviews to gain more comprehensive understanding of causal relationships between teachers' professional competence, learning effectiveness, and teacher performance in the context of Merdeka Curriculum at various educational unit levels and regions in Indonesia.

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