

Professional Teachers' Competencies in Improving the Learning Process in Elementary Schools

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Keywords	ABSTRACT
Competence; Professional Teacher; Elementary School; Classroom Management; Classroom Climate	Professional teacher competence is a key factor in improving the quality of the learning process in elementary schools. This study aims to analyze the effectiveness of professional teacher competence through a Systematic Literature Review (SLR). The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using articles retrieved from the Scopus database. A total of 37 articles that met the inclusion criteria were analyzed using narrative synthesis. The findings indicate that professional teacher competence positively contributes to lesson planning, instructional implementation, student engagement, and learning outcomes. Pedagogical and professional competencies were the most frequently examined dimensions, followed by digital, reflective, collaborative, and inclusive competencies. The effectiveness of teacher competence is influenced by continuous professional development, the integration of digital technology, organizational support, and reflective and collaborative practices. The review also identified several research gaps, including the limited use of mixed-methods and longitudinal designs, as well as the lack of studies examining teacher digital competence related to Artificial Intelligence. These findings provide a comprehensive overview of the current literature and offer directions for future research and educational policies aimed at enhancing the quality of elementary education.
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INTRODUCTION

The quality of the learning process in primary schools remains a major challenge in education systems in many countries, despite the implementation of various education reform policies, teacher certification, and professional development programs. The results of the Programme for International Student Assessment (PISA) 2022 show a decline in student achievement in reading and mathematics in more than half of the participating countries compared to the previous cycle, indicating that classroom learning has not produced optimal outcomes. The OECD also emphasized that improving learning outcomes does not depend only on the curriculum, but is greatly influenced by the quality of learning practices, teacher support mechanisms, and learning quality assurance systems in schools. On the other hand, UNESCO highlights that the quality of education cannot be separated from teachers' competence, as many education systems still face limitations in developing teachers with professional qualifications and adequate pedagogical abilities to foster effective

learning. This condition shows that increasing access to education has not been fully matched by improvements in the quality of the learning process, so that the competence of professional teachers is one of the strategic factors determining the success of learning in elementary schools.¹

Although teacher competence is recognized as one of the main determinants of learning success, various studies show that the implementation of professional competence in learning practice remains suboptimal.² Several studies report that teachers still face obstacles in designing student-centered learning, integrating learning technologies, implementing innovative learning strategies, and conducting formative assessments effectively. This condition causes the learning process to remain teacher-centered, does not encourage active student involvement, and has not fostered critical thinking, creativity, collaboration, and problem-solving skills that meet the demands of 21st-century learning.³ In addition, the increasing diversity of student characteristics and the development of digital technology require teachers to continually update their pedagogical, professional, social, and personal competencies to create an adaptive, inclusive, and meaningful learning process.⁴ Therefore, strengthening the competence of professional teachers is no longer seen as an individual need but as a key strategy for sustainably improving the quality of the learning process and primary education.

Previous studies have consistently shown that the competence of professional teachers has a positive relationship with the quality of the learning process in elementary schools. Pedagogic competence, mastery of teaching materials, digital literacy, assessment skills, and reflective practices of teachers are reported to contribute to improving the quality of learning, student involvement, and achievement of learning outcomes.⁵ In addition, continuous professional development, teacher training, academic supervision, and a collaborative culture in schools have also been proven to strengthen the implementation of teacher competencies in learning practices. However, these studies generally still examine teacher competencies from certain dimensions, such as pedagogic competence, professional competence, or professional development separately, and are carried out in limited research contexts and areas. As a result, the understanding of the effectiveness of professional teacher

¹ Anggun Gunawan and Irsyad Khoerul Imam, "Guru Profesional : Makna Dan Karakteristik," *Cendekia Inovatif Dan Berbudaya: Jurnal Ilmu Sosial Dan Humaniora* 1, no. 2 (2023): 181–85, <https://doi.org/10.59996/cendib.v1i2.256>.

² Mohamad Aso Samsudin, Universitas Ibrahimy Situbondo, and Learning Activities, "Peran Guru Profesional Sebagai Fasilitator Dan Komunikator Dalam Kegiatan Belajar Mengajar," *Edupeedia* 5, no. 2 (2021).

³ Yulinar Maharani Agetta Imelda Meyvita, Anisah Nur Azizah, Jihan Alya and Zulfadewina, "Membangun Kompetensi Profesional Guru Sekolah Dasar Dalam Menyambut Pendidikan Berkualitas," *Pendas : Jurnal Ilmiah Pendidikan Dasar* 10 (2025).

⁴ Nikmatul Rowiya and Daeng Ayub Natuna, "Kewibawaan Guru Profesional Dalam Pembelajaran Era Digital," *Seminar Nasional Ilmu Terapan (SNITER)*, 2022, 1–11.

⁵ Siti Nabila et al., "Peran Profesionalisme Guru Dalam Mengelola Kelas Dengan Baik : Kunci Sukses Pembelajaran Efektif," *GURUKU: Jurnal Pendidikan Dan Sosial Humaniora* 3 (2025): 34–47, <https://doi.org/https://doi.org/10.59061/guruku.v3i3.1052>.

competencies in improving the learning process in elementary schools is still fragmented and does not provide a complete picture.⁶

Although various studies have confirmed the importance of the competence of professional teachers in supporting learning success, existing studies still show some limitations.⁷ Most studies use an empirical approach that focuses on one or two dimensions of teacher competence, such as pedagogic competence or professional competence, without integrating all dimensions of teacher competence in a single comprehensive study.⁸ In addition, previous research has focused more on the influence of teacher competence on student learning outcomes.⁹ Meanwhile, the discussion on the effectiveness of teacher competence in improving the quality of the learning process, such as learning planning,¹⁰ classroom management,¹¹ learning interaction,¹² media use, and active involvement of learners,¹³ remains limited.¹⁴ On the other hand, the available research results also show diverse findings due to differences in the research context,¹⁵ characteristics of respondents, research methods,¹⁶ as well as the competency indicators used.¹⁷ This condition shows that until now no synthesis of scientific evidence can integrate various empirical findings regarding the effectiveness of professional teacher competence in systematically improving the learning process in elementary schools.¹⁸

⁶ Novi Mulyani, "Pengembangan Profesionalisme Guru Pada Mtsn 1 Serang Melalui Peningkatan Kompetensi Profesional Dan Pedagogik," *Tarbawi: Jurnal Keilmuan Manajemen Pendidikan* 5, no. 01 (2019): 87–96.

⁷ Abdurrohman Nugraha, "Pemetaan Pengembangan E-Modul Sebagai Sumber Belajar MIPA Peserta Didik," *Jurnal Pendidikan Fisika Dan Sains (JPFS)* 6, no. 1 (2023): 14–21, <https://doi.org/10.52188/jpfs.v6i1.300>.

⁸ Hayani Wulandari and Isa Nurhaliza, "Mengembangkan Potensi Guru Yang Profesional Dalam Proses Belajar Mengajar," *Didaktik: Jurnal Ilmiah PGSD STKIP Subang* 9, no. 2 (2023): 2487–2509.

⁹ Happy Fitria and Alfroki Martha, "Kompetensi Profesional Guru Dalam Meningkatkan Mutu Pendidikan," *Journal of Education Research* 1, no. 3 (2020): 258–64.

¹⁰ Astuti T Isnaini, L, "Analisis Kompetensi Profesional Guru Dalam Penggunaan Media Pembelajaran Interaktif (Studi Kasus Di SD Muhammadiyah 01 Pencongan)," *Education, Journal Elementary* 12, no. 1 (2023): 10–18.

¹¹ Munawir Munawir and Muhammad Sabri Sahrir, "Transformation of Islamic Education Teacher Professionalism through the Metric Concept of Social Entrepreneurship in Malang," *Nazhruna: Jurnal Pendidikan Islam* 8, no. 3 (October 2025): 519–34, <https://doi.org/10.31538/nzh.v8i3.248>.

¹² Irma Budiana, "Inovasi Dalam Pengembangan Kurikulum Pendidikan," *Jurnal Pendidikan & Pengajaran (Jupe2)* 2, no. 2 (2024): 433–50.

¹³ Syakdia Apria Ningsih, "Pentingnya Profesionalisme Guru Dalam Meningkatkan Kualitas Pendidikan," *Jurnal Pendidikan Dan Ilmu Dan Sosial* 2, no. 3 (2024), <https://doi.org/10.54066/jupendis.v2i3.2056>.

¹⁴ Muslihudin Farihin, Suteja, "International Journal of Educational Methodology A Skill Application Model to Improve Teacher Competence and Professionalism," *International Journal of Educational Methodology* 8, no. 2 (2022): 331–46.

¹⁵ Suhud Aryana and Rahayu Pristiwati, "Tuntutan Kompetensi Guru Bahasa Indonesia Dalam Menghadapi Abad 21," *Semantik* 11, no. 1 (2022): 71–86, <https://doi.org/10.22460/semantik.v11i1.p71-86>.

¹⁶ Julien Chintya Pontoh, Rati Anggraini, "Pengaruh Kompetensi Profesional Guru Sd Terhadap Prestasi Belajar Siswa Rati Anggraini Pontoh 1, Julien Chintya 2 Universitas Negeri Manado, Pendidikan Guru Sekolah Dasar," *Jurnal Ilmiah Wabana Pendidikan* 11, no. 16 (2025): 373–78, <https://doi.org/https://jurnal.peneliti.net/index.php/JIWP/article/view/12908>.

¹⁷ Siti Resmi Sahara, Arie Rakhmat Riyadi, and Neni Maulidah Maulidah, "Identitas Profesional Guru Sekolah Dasar Berdasarkan Pengalaman Mengajar : Tinjauan Filosofis, Teoritis Dan Praktis," *ELEMENTARY JOURNAL* 8, no. 1 (2025): 136–50.

¹⁸ Irfan Romadhon, Kharisma, "Analisis Kompetensi Guru Terhadap Penyusunan Perangkat Pembelajaran Pada Kurikulum Merdeka Di Sekolah Dasar," *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, 2023, 111–23.

In contrast to previous studies that generally use an empirical approach in the context of a specific school or region, this study offers a more comprehensive perspective through a Systematic Literature Review (SLR) conducted in accordance with the PRISMA 2020 guidelines. This approach allows for a systematic synthesis of various research results to obtain a more complete picture of the effectiveness of professional teacher competencies in improving the learning process in elementary schools.¹⁹ In addition to identifying the influence of teacher competence on the quality of the learning process, this study also maps research characteristics, publication trends, the most studied dimensions of teacher competence, indicators of the affected learning process, and identifies research gaps²⁰ that are still open for further research development.²¹ Thus, this study not only presents a summary of the results of previous research, but also produces a synthesis of scientific evidence (evidence synthesis) that can be the basis for policy development, teacher competency improvement programs,²² and research direction in the field of primary education. Based on this description, this study aims to analyze the effectiveness of professional teachers' competencies in improving the learning process in elementary schools through the Systematic Literature Review approach, to obtain a comprehensive understanding of research developments, the strength of empirical evidence, and recommendations that can support improving the quality of learning in elementary schools.

RESEARCH METHOD

This study uses the Systematic Literature Review (SLR) method to identify, evaluate, and synthesize empirical evidence regarding the effectiveness of professional teacher competencies in improving the learning process in elementary schools. The SLR method was chosen because it provides a systematic, transparent, and replicable synthesis of previous research results, resulting in more comprehensive conclusions than a narrative literature review. The research implementation process refers to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines, which consist of the stages of identification, screening, eligibility, and determination of included articles.

The literature search was conducted in July 2026 using the Scopus database because it is one of the internationally reputable scientific databases that provides articles with a rigorous peer review process. The search strategy is carried out through the Title, Abstract, and Keywords (TITLE-ABS-KEY) feature using a combination of keywords related to professional teacher competencies, learning processes, and elementary schools, namely teacher competence, teacher competence, teacher professionalism, professional competence, learning process, teaching and learning, teaching effectiveness, primary school, and

¹⁹ Salma Nur Assyifa, Sephia Nurafiani, and Teguh Prasetyo, "Peran Guru Profesional Dalam Pembentukan Karakter Peserta Didik Di SDN Nagrak 02," *JIPSD: Jurnal Inovasi Pendidikan Sekolah Dasar* 1, no. 3 (2025): 191–200.

²⁰ Wilson Takaendengan, Indriani Julefta Maradesa, and Bertu Rianto Takaendengan, "Analisis Kompetensi Profesional Guru Sekolah Dasar," *Journal on Education* 05, no. 04 (2023): 16174–83.

²¹ Sri Wulandari, "Optimalisasi Penguasaan Materi Pelajaran Dan Kemampuan Mengelola Kelas Dalam Meningkatkan Kompetensi Mengajar Guru Pendidikan Agama Islam," *Chalim Journal of Teaching and Learning* 1 (2022): 129–37, <https://doi.org/https://doi.org/10.31538>.

²² Shalsadila Meida Putri, Rika Ayatin, and Iqbal Al Yumna Muttaqien, "Profesionalisme Guru Dalam Meningkatkan Proses Pembelajaran," *Jurnal Citra Pendidikan* 4, no. 2 (2024): 1690–95.

elementary school, which are connected using Boolean AND and OR operators. To obtain relevant and up-to-date articles, searches are limited to English-language journal articles published in 2020–2026.

The inclusion criteria used include: (1) research articles published in peer-reviewed journals; (2) discussing the competence of professional teachers in the context of elementary school or primary/elementary education; (3) examining the relationship between teachers' competencies and the learning process; (4) available in full-text form; and (5) written in English. Meanwhile, an article is excluded when: (1) it is a proceedings, book, book chapter, editorial, or review article; (2) it does not focus on the competence of professional teachers; (3) it does not discuss the elementary school level; or (4) it is a duplicate article.

The initial search results yielded 66 articles. After a duplicate check, one article was removed, leaving 65 articles for screening by title and abstract. At this stage, 18 articles were eliminated because they did not meet the inclusion criteria. Furthermore, 47 articles underwent a feasibility assessment through full-text reading. Of these, 8 articles were excluded because they did not align with the research focus, leaving 39 articles that met all criteria and were analyzed in this study. The article selection process follows the PRISMA 2020 flow diagram presented in Figure 1.

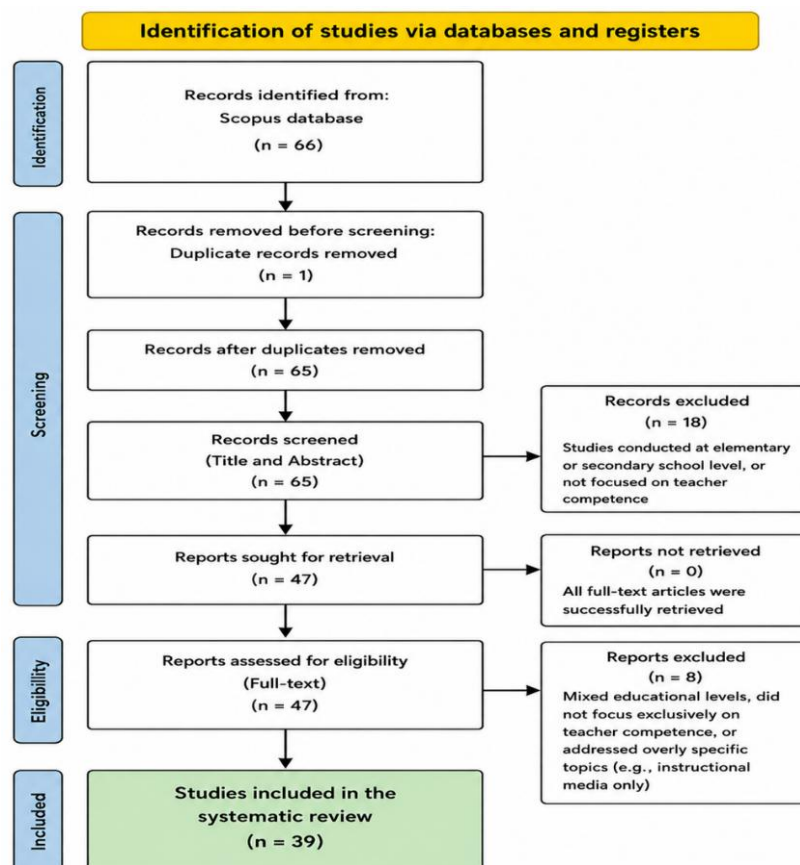


Figure 1.
PRISMA Diagram 2020
Analysis of the Effectiveness of Professional Teachers' Competencies in Improving
the Learning Process in Elementary School

Furthermore, the data extraction process is carried out using extraction sheets that have been systematically arranged. The information collected included the author's name, year of publication, country of research, research objectives, research methods, sample characteristics, dimensions of teacher competencies studied, indicators of the learning process, and main findings of the research. The extracted data is then analyzed using narrative synthesis, which involves grouping research results based on main themes to answer the research questions. The analysis focused on the effectiveness of professional teacher competencies on the learning process, factors that affect the effectiveness of teacher competency implementation, and the identification of research gaps as the basis for the preparation of further research recommendations.²³

RESULTS AND DISCUSSION

After the article selection process using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines was completed, 37 articles met the inclusion criteria and were further analyzed. The initial analysis focused on the general characteristics of the research, including the year of publication, the country of origin, the research method, the focus of teacher competence, and the effectiveness indicators used. The presentation of the characteristics of this research aims to provide an overview of the development of the competency study of professional teachers in elementary schools and identify the trend in the direction of research that has been carried out. A summary of the characteristics of the analyzed articles is presented in Table 1:

Table 1. Article Distribution Table

No.	Research Method	Number of Articles	Percentage (%)
1	Quantitative (survey, correlational, experimental, quasi-experimental)	15	40,54
2	Qualitative (case studies, phenomenology, ethnographic, interpretive)	10	27,03
3	<i>Action Research / Classroom Action Research</i>	3	8,11
4	<i>Mixed Methods</i>	2	5,41
5	<i>Research and Development (R&D)</i>	2	5,41
6	<i>Literature Review</i>	1	2,7
7	Longitudinal	1	2,7
8	Instrument Development	1	2,7
9	Implementation/Pilot Study	1	2,7
10	Descriptive Development Program	1	2,7
Total		37	100

²³ Rojaki. Much, "Gudang Jurnal Multidisiplin Ilmu Literature Review : Pendidikan Karakter Di Sekolah Menengah Kejuruan," *Gudang Jurnal Multidisiplin Ilmu* 2 (2024): 13–21, <https://doi.org/https://doi.org/10.59435/gjmi.v2i2.276>.

Based on Table 1, research on the competence of professional teachers in elementary schools is dominated by a quantitative approach, with 15 articles (40.54%), which are generally used to test the relationship between variables, measure the level of teacher competence, and evaluate the influence of competence on learning quality. The qualitative approach ranked second with 10 articles (27.03%), which focused on exploring teacher experience, implementation of professional competencies, as well as various challenges in learning practice. Furthermore, the Action Research method or Classroom Action Research was used in 3 articles (8.11%), while Mixed Methods and Research and Development (R&D) were applied in 2 articles (5.41%) each. Other methods, such as Literature Review, longitudinal, instrument development, implementation/pilot studies, and descriptive development programs, were only found in 1 article (2.70%) each. These findings show that empirical approaches, especially quantitative research, still dominate research on the competence of professional teachers, while the use of more comprehensive research designs, such as mixed methods, longitudinal, and model and instrument development, is still relatively limited, so it is an opportunity for further research.

The dominance of quantitative approaches shows that most research is still oriented toward testing the relationship between variables and measuring the effectiveness of teacher competence. On the other hand, the existence of qualitative research, action research, mixed methods, and various other research designs provides a more diverse perspective on the development of professional teacher competencies in elementary schools. Therefore, to gain a more comprehensive understanding, an in-depth analysis of each included article is needed. The analysis includes identifying the research objectives, main findings, and conclusions from each study to describe patterns of findings, similarities, differences, and research trends regarding the effectiveness of professional teacher competencies in improving the learning process in elementary schools. A summary of the results of the analysis of each article is presented in Table 2.

Table 2. Tabel Analisis Artikel

Themes	Subthemes	Findings Synthesis	Studies
The Effectiveness of Professional Teacher Competencies	Pedagogical Competence	Pedagogical competence improves teachers' ability to plan, implement, and evaluate learning so that it has an impact on increasing	Kwok & Pakey Chik ²⁴ , Atmojo, Ardiansyah, & Saputri ²⁵ , Decker et al. ²⁶ , Larrain &

²⁴ Wing Yin KWOK and Pui Man Pakey CHIK, "The Effect of Learning Studies on Student Learning Outcomes," in *For Each and Everyone: Catering for Individual Differences through Learning Studies* (Hong Kong University Press, 2005), 117–32.

²⁵ Idam Ragil Widiyanto Atmojo, Roy Ardiansyah, and Dwi Yuniash Saputri, "The Enhancement of Pedagogical Competence And Teachers' Profesiaonlism of Elementary School Teachers to Accelerate The Digilization Era in The Education Field Through Science, Technology, Engineering, Art, and Mathematics (STEAM) Approach," in *Proceedings of the 4th International Conference on Learning Innovation and Quality Education*, 2020, 1–4.

²⁶ Linda Cardoso, João Ponte, and Marisa Quaresma, "The Development of Pedagogical Content Knowledge of Prospective Primary Teachers in a Lesson Study," *International Journal for Lesson & Learning Studies* 12 (December 6, 2022): 152–65, <https://doi.org/10.1108/IJLLS-02-2022-0027>.

	student engagement and learning outcomes.	Kaiser ²⁷ , Shehu et al. ²⁸ , Mühle et al. ²⁹ , Shodiq et al. ³⁰
Professional Competence	Teachers' mastery of materials, self-development skills, and professionalism contribute to learning effectiveness and improvement of the quality of education.	Escalante ³¹ , Lo ³² , Gokyer ³³ , Atilla Bal ³⁴ , Isa, Neliwati, & Hadijaya ³⁵ , Siregar et al. ³⁶ , Valiullina ³⁷
Digital Competence	Digital competencies support innovative learning, technology integration, and 21st-century learning, although they still need reinforcement in various schools.	Cencič, Cotič, & Udovič ³⁸ , Levinsen ³⁹ , Atmojo, Ardiansyah, & Saputri ⁴⁰ , Rintayati, Rukayah, &

²⁷ Macarena Larrain and Gabriele Kaiser, "Interpretation of Students' Errors as Part of the Diagnostic Competence of Pre-Service Primary School Teachers," *Journal Für Mathematik-Didaktik* 43, no. 1 (2022): 39–66.

²⁸ Blerta Perolli Shehu et al., "Classroom-Based Experiential Learning: Experiences from Kosovo Primary Schools," *Journal of Experiential Education* 48, no. 2 (2025): 332–52.

²⁹ Johannes König et al., "Teachers' Professional Knowledge for Teaching Early Literacy: Conceptualization, Measurement, and Validation," *Educational Assessment, Evaluation and Accountability* 34 (June 25, 2022): 1–25, <https://doi.org/10.1007/s11092-022-09393-z>.

³⁰ Sadam Fajar Shodiq et al., "The Impact of The Learning Process, Teacher Quality, and School Management on The Academic Achievement of Elementary School Students In Indonesia," *The New Educational Review* 83 (2026): 223–36.

³¹ Shane D Escalante and Shane D Escalante, "Music Teachers' Motivations, Competencies, and Challenges in Public Elementary Schools in Sorsogon City, Philippines," 2025, 1–14.

³² Wing Yee Lo, "The Complexities of Mathematical Knowledge and Beliefs within Initial Teacher Education: An Analysis of Three Cases," *Education Sciences* 13, no. 7 (2023): 697.

³³ Necmi Gokyer, "Primary School Teachers' Perceptions of Teacher Competencies Realization Levels," *Energy Education Science and Technology Part B: Social and Educational Studies* 4, no. 2 (2012): 843–56.

³⁴ Esra ATILLA BAL, "Examining the Core Competencies for Teacher Success at Different Levels of K-12 Teaching," n.d.

³⁵ Muhammad Isa, Neliwati Neliwati, and Yusuf Hadijaya, "Quality Improvement Management in Teacher Professional Development," *Munaddhomah: Jurnal Manajemen Pendidikan Islam* 5, no. 2 (2024): 136–47.

³⁶ Zulfikar Ali Buto Siregar et al., "TEACHERS' PROFESSIONAL DEVELOPMENT AND REINFORCEMENT AT INTEGRATED ISLAMIC SCHOOLS IN INDONESIA," *Jurnal Ilmiah Islam Futura* 25, no. 1 (2025): 117–33.

³⁷ Gulnara V Valiullina, "To the Problem of Formation of the Professional Teachers' Competence in the Questions of the Diagnostics and Correction of Writing Disorders in Primary-School Children," *International Electronic Journal of Mathematics Education* 11, no. 4 (2016): 695–704.

³⁸ Majda Cencic, Mara Cotic, and Vida Medved Udovic, "CHANGES IN THE INSTRUCTION AND IN TEACHERS' COMPETENCES FOR THE USE OF INFORMATION COMMUNICATION TECHNOLOGY," *DIDACTICA SLOVENICA-PEDAGOSKA OBZORJA* 25, no. 2 (2010): 19–34.

³⁹ Karin Tweddell Levinsen, "Teacher Practice and Pedagogical Competence Building in a Digitally Permeated Learning Environment," in *European Conference on E-Learning* (Academic Conferences International Limited, 2017), 304–10.

⁴⁰ Atmojo, Ardiansyah, and Saputri, "The Enhancement of Pedagogical Competence And Teachers' Professionalism of Elementary School Teachers to Accelerate The Digitalization Era in The Education Field Through Science, Technology, Engineering, Art, and Mathematics (STEAM) Approach."

		Syawaludin ⁴¹ , Syahid, Herry Hernawan, & Dewi ⁴² , Fehrmann ⁴³ , Sumardi, Rohman, & Wahyudiati ⁴⁴
Reflective and Collaborative Competence	The practice of reflection, coaching, mentoring, and professional collaboration enhances teachers' ability to improve learning practices in an ongoing manner.	Burnett & Lingam ⁴⁵ , Budiastra, Wicaksono, & Erlina ⁴⁶ , Maniraho et al. ⁴⁷ , Rokhman Purnama et al. ⁴⁸ , Raval, Kaul, & McKenney ⁴⁹
Inclusive Competence	Inclusive competencies support learning that is responsive to the diversity of students, but collaboration with families and communities still needs to be strengthened.	Dinh et al. ⁵⁰ , Abdulah & Mahmud ⁵¹

⁴¹ Peduk Rintayati and Ahmad Syawaludin, "An Investigation of the Main Characteristics of Science Teachers in Elementary Schools Who Have Digital Pedagogical Skills," *Pegem Journal of Education and Instruction* 12, no. 4 (2022): 161–68.

⁴² Aah Ahmad Syahid, Asep Herry Hernawan, and Laksmi Dewi, "SMART for the Improvement of Primary School Teachers' Digital Competence in the 21st Century: An Action Research Study," *International Journal of Learning, Teaching and Educational Research* 22, no. 3 (2023): 448–69.

⁴³ Raphael Fehrmann, "Educational Robotics in Higher Education for Promoting Pre-Service Primary School Teachers: A Study on Expanding Computational Thinking," in *Revolutionizing Curricula Through Computational Thinking, Logic, and Problem Solving* (IGI Global Scientific Publishing, 2024), 1–23.

⁴⁴ Lalu Sumardi, Arif Rohman, and Dwi Wahyudiati, "Does the Teaching and Learning Process in Primary Schools Correspond to the Characteristics of the 21st Century Learning?," *International Journal of Instruction* 13, no. 3 (2020): 357–70.

⁴⁵ Greg Burnett and Govinda Ishwar Lingam, "Reflective Teachers and Teacher Educators in the Pacific Region: Conversations with Us Not about Us," *International Review of Education* 53, no. 3 (2007): 303–21.

⁴⁶ A A Ketut Budiastra, Iwan Wicaksono, and Nia Erlina, "The Effectiveness of Video-Based Interaction on Professional Science Teachers to Improve Elementary School Students Achievements," *Journal for the Education of Gifted Young Scientists* 8, no. 3 (2020): 1291–1304.

⁴⁷ Jean Francois Maniraho et al., "Changes in Rwandan Primary Mathematics School Subject Leaders as a Result of a CPD Certificate Program in Coaching and Mentoring," in *Mathematics Teaching and Professional Learning in Sub-Sahara Africa* (Springer, 2021), 189–201.

⁴⁸ M Rokhman Purnama et al., "Investigating Dimensions of Teacher Reflective Practice at Language Teachers," *International Journal of Language Education* 9, no. 2 (2025): 267–84.

⁴⁹ Harini Raval, Chittaranjan Kaul, and Susan McKenney, "The Effects of Coaching on the Teaching and Learning of English in Indian Government Schools" (Singapore: International Society of the Learning Sciences, 2016).

⁵⁰ T N T Dinh et al., "The Capacity of Primary School Inclusive Teachers Meets the Requirements of the 2018 General Education Program," *Multidisciplinary Science Journal* 7, no. 3 (2025): 2025170.

⁵¹ Nurul Nadiha Abdulah and Muhammad Sofwan Mahmud, "Teaching Competencies of Mathematics Teachers in Inclusive Education at Primary Schools," *International Journal of Learning, Teaching and Educational Research* 24, no. 1 (2025): 190–208.

Table 3. Synthesis of Factors Affecting the Effectiveness of Professional Teacher Competencies in Improving the Learning Process

Theme	Findings Synthesis	Studies
1. Sustainable Professional Development	Professional development through training, workshops, coaching, mentoring, Learning Studies, seminars, and CPD consistently improves pedagogical, professional, diagnostic, and learning quality competencies. The effectiveness of the program depends on its suitability to the teacher's needs and the learning context.	Kwok & Pakey Chik ⁵² , Raval, Kaul, & McKenney ⁵³ , Decker et al. ⁵⁴ , Maniraho et al. ⁵⁵ , Omar et al. ⁵⁶ , Isa, Neliwati, & Hadijaya ⁵⁷ , Usman et al. ⁵⁸ , Siregar et al. ⁵⁹ , Escalante ⁶⁰ .
2. Digital Tools Utilization	Digital competencies allow teachers to integrate technology in learning to increase innovation, interaction, and learning effectiveness. The main obstacles include limited infrastructure, digital literacy, and technology training.	Cencić, Cotić, & Udovič ⁶¹ , Levinsen ⁶² , Atmojo, Ardiansyah, & Saputri ⁶³ , Sumardi, Rohman, & Wahyudiati ⁶⁴ , Rintayati, Rukayah, & Syawaludin ⁶⁵ ,

⁵² KWOK and CHIK, "The Effect of Learning Studies on Student Learning Outcomes."

⁵³ Raval, Kaul, and McKenney, "The Effects of Coaching on the Teaching and Learning of English in Indian Government Schools."

⁵⁴ Cardoso, Ponte, and Quaresma, "The Development of Pedagogical Content Knowledge of Prospective Primary Teachers in a Lesson Study."

⁵⁵ Maniraho et al., "Changes in Rwandan Primary Mathematics School Subject Leaders as a Result of a CPD Certificate Program in Coaching and Mentoring."

⁵⁶ Ruzana Omar et al., "Towards the Sustainability of English Language Teachers Professionalism via Professional Development Programs: Extrinsic and Intrinsic Satisfaction," *Frontiers in Psychology* 13 (2022): 828060.

⁵⁷ Isa, Neliwati, and Hadijaya, "Quality Improvement Management in Teacher Professional Development."

⁵⁸ Herlina Usman et al., "Explore the Needs of Competency Development Model for Prospective Elementary School Teachers Based on Knowledge Management System in Indonesia," *Revista de Gestão Social e Ambiental* 18, no. 1 (2024): e06206–e06206.

⁵⁹ Siregar et al., "TEACHERS' PROFESSIONAL DEVELOPMENT AND REINFORCEMENT AT INTEGRATED ISLAMIC SCHOOLS IN INDONESIA."

⁶⁰ Escalante and Escalante, "Music Teachers' Motivations, Competencies, and Challenges in Public Elementary Schools in Sorsogon City, Philippines."

⁶¹ Cencić, Cotić, and Udovič, "CHANGES IN THE INSTRUCTION AND IN TEACHERS' COMPETENCES FOR THE USE OF INFORMATION COMMUNICATION TECHNOLOGY."

⁶² Levinsen, "Teacher Practice and Pedagogical Competence Building in a Digitally Permeated Learning Environment."

⁶³ Atmojo, Ardiansyah, and Saputri, "The Enhancement of Pedagogical Competence And Teachers' Professionalism of Elementary School Teachers to Accelerate The Digitalization Era in The Education Field Through Science, Technology, Engineering, Art, and Mathematics (STEAM) Approach."

⁶⁴ Sumardi, Rohman, and Wahyudiati, "Does the Teaching and Learning Process in Primary Schools Correspond to the Characteristics of the 21st Century Learning?"

⁶⁵ Rintayati and Syawaludin, "An Investigation of the Main Characteristics of Science Teachers in Elementary Schools Who Have Digital Pedagogical Skills."

		Syahid, Herry Hernawan, & Dewi ⁶⁶ , Fehrmann. ⁶⁷
3. Organizational Support and School Environment	The effectiveness of teacher competencies is influenced by school leadership support, organizational culture, availability of facilities, school policies, and opportunities to participate in training. A supportive school environment strengthens the implementation of teacher competence in learning.	Escalante ⁶⁸ , Rokhman Purnama et al. ⁶⁹ , Maniraho et al. ⁷⁰ , Isa, Neliwati, & Hadijaya ⁷¹ , Shodiq et al. ⁷² , Dinh et al.
4. Reflective and Collaborative Practices	Professional reflection, learning community, learning study, coaching, mentoring, and collaboration between teachers help improve pedagogic, diagnostic, and learning improvement skills sustainably.	Burnett & Lingam ⁷³ , Kwok & Pakey Chik ⁷⁴ , Budiastra, Wicaksono, & Erlina ⁷⁵ , Larrain & Kaiser ⁷⁶ , Maniraho et al. ⁷⁷ , Rokhman Purnama et al. ⁷⁸
5. Characteristics and Readiness of Teachers	Intrinsic motivation, professional beliefs, mastery of materials, pedagogic competence, communication, classroom management, and readiness to accept changes determine the	Lo ⁷⁹ , Erviana, Ghuftron, & Haryanto ⁸⁰ , Atilla Bal ⁸¹ ,

⁶⁶ Syahid, Hernawan, and Dewi, "SMART for the Improvement of Primary School Teachers' Digital Competence in the 21st Century: An Action Research Study."

⁶⁷ Fehrmann, "Educational Robotics in Higher Education for Promoting Pre-Service Primary School Teachers: A Study on Expanding Computational Thinking."

⁶⁸ Escalante and Escalante, "Music Teachers' Motivations, Competencies, and Challenges in Public Elementary Schools in Sorsogon City, Philippines."

⁶⁹ Purnama et al., "Investigating Dimensions of Teacher Reflective Practice at Language Teachers."

⁷⁰ Maniraho et al., "Changes in Rwandan Primary Mathematics School Subject Leaders as a Result of a CPD Certificate Program in Coaching and Mentoring."

⁷¹ Isa, Neliwati, and Hadijaya, "Quality Improvement Management in Teacher Professional Development."

⁷² Shodiq et al., "The Impact of The Learning Process, Teacher Quality, and School Management on The Academic Achievement of Elementary School Students In Indonesia."

⁷³ Burnett and Lingam, "Reflective Teachers and Teacher Educators in the Pacific Region: Conversations with Us Not about Us."

⁷⁴ KWOK and CHIK, "The Effect of Learning Studies on Student Learning Outcomes."

⁷⁵ Budiastra, Wicaksono, and Erlina, "The Effectiveness of Video-Based Interaction on Professional Science Teachers to Improve Elementary School Students Achievements."

⁷⁶ Larrain and Kaiser, "Interpretation of Students' Errors as Part of the Diagnostic Competence of Pre-Service Primary School Teachers."

⁷⁷ Maniraho et al., "Changes in Rwandan Primary Mathematics School Subject Leaders as a Result of a CPD Certificate Program in Coaching and Mentoring."

⁷⁸ Purnama et al., "Investigating Dimensions of Teacher Reflective Practice at Language Teachers."

⁷⁹ Lo, "The Complexities of Mathematical Knowledge and Beliefs within Initial Teacher Education: An Analysis of Three Cases."

⁸⁰ Vera Yuli Erviana and Anik Ghuftron, "The Level of Understanding towards Teachers Competency among Elementary School in Urban Areas of Yogyakarta.," *Pegem Journal of Education and Instruction* 11, no. 4 (2021): 360–69.

⁸¹ BAL, "Examining the Core Competencies for Teacher Success at Different Levels Of K-12 Teaching."

effectiveness of teacher competencies in improving the quality of learning.	Mühle et al. ⁸² , Abdulah & Mahmud ⁸³ , Escalante. ⁸⁴
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Research Characteristics

A total of 37 articles that met the inclusion criteria were analyzed to describe research characteristics related to the effectiveness of professional teacher competencies in improving the learning process in elementary schools. The analysis of research characteristics includes the distribution of research methods, while a more in-depth analysis of the objectives, findings, and conclusions of each article is presented to identify research patterns, trends in results, and the direction of study development in this field. A summary of the characteristics of the research is presented in Table 1, while the results of the analysis of each article are presented in Tables 2 and 3.

The Effectiveness of Professional Teacher Competencies in Improving the Learning Process in Elementary Schools

The synthesis of 37 articles shows that the competence of professional teachers plays a significant role in improving the quality of the learning process in elementary schools. Although each study has a different focus, in general, all articles indicate that improving teacher competence contributes to more effective, innovative, student-centered learning and improved learning outcomes. These competencies not only include mastery of teaching materials, but also pedagogical skills, technology utilization, reflective practice, professional collaboration, and the ability to adapt to changing educational needs of the 21st century. Based on the results of the synthesis, the effectiveness of professional teacher competencies can be grouped into five main themes, namely pedagogic competence, professional competence, digital competence, reflective and collaborative competence, and inclusive competence.

The Effectiveness of Pedagogical Competence

The synthesis shows that pedagogic competence is the most dominant aspect in increasing the effectiveness of the learning process. Teachers with strong pedagogic competence can design student-centered learning, choose learning strategies that suit student characteristics, develop appropriate assessments, and create an active and meaningful learning environment.⁸⁵ Various studies have also shown that improving pedagogical competence increases student participation, higher-order thinking skills, and learning outcomes. The implementation of approaches such as Learning Study, STEAM, Video-

⁸² König et al., "Teachers' Professional Knowledge for Teaching Early Literacy: Conceptualization, Measurement, and Validation."

⁸³ Abdulah and Mahmud, "Teaching Competencies of Mathematics Teachers in Inclusive Education at Primary Schools."

⁸⁴ Escalante and Escalante, "Music Teachers' Motivations, Competencies, and Challenges in Public Elementary Schools in Sorsogon City, Philippines."

⁸⁵ Ratu Ilma et al., "Enhancing Teacher Competence through Collaborative Worksheet Development: An Empirical Investigation," *International Journal of Evaluation and Research in Education (IJERE)* 13, no. 3 (2024): 1690–1702, <https://doi.org/10.11591/ijere.v13i3.27266>.

Based Interaction, and experiential learning has been proven to improve the quality of learning practices in elementary schools.⁸⁶

The Effectiveness of Professional Competence

Professional competence is also an important factor in determining the quality of learning. The results of the synthesis show that mastery of teaching materials, Pedagogical Content Knowledge (PCK), diagnostic skills, and continuous professional development contribute to improving the quality of teaching.⁸⁷ Teachers who participate in coaching, mentoring, Continuous Professional Development (CPD), and professional training programs show improved ability to choose learning methods, reflect on teaching practices, and improve students' academic achievement. In addition, teacher quality has proven to be one of the most influential factors in the success of the learning process compared to other factors.⁸⁸

The Effectiveness of Digital Competence

Technological developments encourage the emergence of digital competence as an important dimension of professional teacher competence. The results of the synthesis show that teachers who can integrate technology in the learning process can create more interesting, interactive, and in accordance with the characteristics of 21st-century students.⁸⁹ Various digital competency development programs, such as the SMART model, robotics-based learning, ICT integration, and STEAM approaches, have been proven to improve teachers' ability to utilize technology as a learning medium. However, several studies also show that teachers' digital skills still face obstacles in the form of limited infrastructure, training, and teachers' readiness to implement technology optimally.

The Effectiveness of Reflective and Collaborative Competencies

In addition to pedagogic and professional competence, reflective practice and professional collaboration are also factors that contribute to improving the quality of learning. Teachers who regularly reflect on their teaching practices can identify learning weaknesses and make continuous improvements. Meanwhile, Learning Study activities, coaching, mentoring, teacher learning community⁹⁰ and collaboration with fellow teachers and parents have been proven to strengthen professional competence and increase learning effectiveness. However, some studies show that collaborative competencies, especially in

⁸⁶ Thathit Manon et al., "Increasing Teacher Professionalism through Learning Innovative , Creative and Effective at Aisiyah Boarding School Malang," *Journal of Community Service and Empowerment* 5, no. 2 (2024): 307–15.

⁸⁷ Marleny Leasa and John Rafafy Batlolona, "The Development of Innovative Science Learning Tools to Develop 21st Century Skills for Elementary School Teachers Naskat II Santo Ignatius Olilit Timur," *Unram Journal of Community Service* 5, no. 3 (2024): 218–25, <https://doi.org/10.29303/uics.v5i3.693>.

⁸⁸ Endang Yunarti, "Increasing Teacher Competency Using the Contextual Inquiry Learning Model through In-House Training at SD Negeri 1 Giripurwo Kapanewon Girimulyo Kulon Progo Regency Academic Year 2022 / 2023," *IJCER: International Journal of Chemistry Education Research* 8 (2024), <https://doi.org/10.20885/ijcer.vol8.iss1.art10>.

⁸⁹ Muhammad Sholahuddin Amrulloh and Andarula Galushasti, "Professional Development Teacher to Improve Skills of Science Process and Creativity of Learners," *Journal of Education and Learning (EduLearn)* 16, no. 3 (2022): 299–307, <https://doi.org/10.11591/edulearn.v16i3.20404>.

⁹⁰ Bambang Budi Arwildayanto, Wiyono, Sari Dewi, and Hariadi Said Ashokan, Varun Ashokan, Eduart Wolok, "In-Service Training Governance , for Elementary School Teachers in Indonesia," *Cakrawala Pendidikan Jurnal Ilmiah Pendidikan* 42, no. 2 (2023): 507–24, <https://doi.org/https://doi.org/10.21831/cp.v42i2.56724>.

inclusive schools, still need to be improved through institutional support and school culture that supports collaborative learning.

The Effectiveness of Inclusive Competencies

The results of the synthesis also show that teachers' competence in implementing inclusive learning contributes to improving the quality of educational services for all students. Teachers who have the ability to conduct assessments, understand student characteristics, manage inclusive classes, and apply adaptive learning strategies are able to create a more inclusive and effective learning environment. However, some studies still find weaknesses in the aspects of collaboration with parents, the community, and the ability to handle diverse learning needs, so it is necessary to strengthen inclusive competencies through more continuous training.

Factors Affecting the Effectiveness of Professional Teacher Competencies in Improving the Learning Process

The results of synthesizing 37 articles show that the effectiveness of professional teacher competence is influenced not only by teachers' individual abilities but also by various interrelated internal and external factors. These factors determine the extent to which teachers' competencies can be implemented optimally in the learning process. Based on the results of the analysis, five main factors are consistently found in various studies: continuous professional development, use of digital technology, organizational support and school environment, reflective and collaborative practices, and teacher characteristics and readiness.

The first factor is Continuous Professional Development. Various studies show that training, coaching, mentoring, learning studies, workshops, and certification programs contribute to improving teachers' pedagogic and professional competence. These programs not only improve mastery of materials and learning strategies, but also strengthen teachers' ability to evaluate, reflect, and innovate learning so that they have a positive impact on student learning outcomes.

The second factor is the use of digital technology. Several articles emphasized that teachers' ability to integrate information and communication technology, digital learning, STEAM, and educational robotics affects the creation of learning that is more interactive, innovative, and aligned with the demands of 21st-century education. However, the effectiveness of technology implementation is still influenced by the availability of infrastructure, access to training, and teachers' readiness to adopt digital innovations.

The third factor is organizational and school support. Several studies show that school leadership, organizational culture, quality management, availability of facilities and infrastructure, and support from peers are factors that strengthen the implementation of teacher competence in the learning process. On the other hand, limited facilities, low institutional support, and lack of opportunities to participate in training are obstacles that reduce the effectiveness of teacher competence in elementary schools.

The fourth factor is reflective and collaborative practice. Teachers who actively reflect on teaching practices and collaborate with fellow teachers, parents, and the educational community tend to have better professional competencies. Reflection activities help teachers identify learning weaknesses, while collaboration allows for the exchange of experiences and the development of more effective learning strategies. However, some studies show that

collaborative competence, especially in the context of inclusive education, still needs to be strengthened through school policy support and a collaborative work culture.

The last factor is the characteristics and readiness of the teacher. Teacher competence is influenced by intrinsic motivation, professional beliefs, teaching experience, material mastery, and readiness to face curriculum changes and technological developments. Teachers who have high motivation and a positive attitude towards learning tend to be more likely to develop professional competencies and implement learning innovations. On the contrary, low individual readiness is one of the causes of the lack of optimal implementation of teacher competence in improving the quality of the learning process.

Overall, the synthesis results show that the effectiveness of professional teacher competencies is the result of the interaction between teachers' individual capacity and the support of the work environment and professional development opportunities. Therefore, efforts to improve the quality of learning in elementary schools are not enough to focus only on improving individual teacher competencies; they also need to be supported by school policies, sustainable professional development programs, the use of technology, and the creation of a collaborative culture that encourages teachers to continue developing.

Research Gap and Further Research Agenda

The synthesis of 37 articles shows that research on the competence of professional teachers in improving the learning process in elementary schools has developed rapidly and consistently demonstrated a positive influence on learning quality. However, there are still some research gaps that need attention to enrich the development of science and educational practices in the future. These gaps relate to methodological aspects, study focus, research context, and the development of teacher competencies in accordance with the demands of 21st-century education.

First, in terms of methodology, most research still uses quantitative and qualitative approaches, while research with mixed methods, longitudinal, and model development designs remains relatively limited. Research design has the potential to provide a more comprehensive understanding of the process of developing teacher competencies and their long-term impact on learning.

Second, in terms of research substance, most of the articles still focus on pedagogic and professional competencies, while studies on digital competencies, collaborative competencies, reflective competencies, and competencies in utilizing artificial intelligence-based technology (Artificial Intelligence (AI) are still relatively limited. In fact, digital transformation in the world of education requires teachers to have competencies that are more adaptive to technological developments and 21st-century learning needs.

Third, in terms of the research context, most of the studies were conducted in primary school environments in developing countries with certain educational characteristics. This shows that cross-country and cross-system comparative research remains limited, providing only a partial picture of how professional teacher competencies are implemented across different cultural contexts, policies, and student characteristics.

Based on these gaps, further research is recommended to develop more diverse research designs, such as mixed methods, longitudinal, and experimental research that involves long-term evaluation of teacher competency development. In addition, future

research needs to expand the study of digital competence, the use of Artificial Intelligence in learning, collaborative competence, and the development of teacher competency models that align with the challenges of 21st-century education. Cross-country and cross-level research is also needed to produce more comprehensive findings and achieve greater generalizability. Thus, future research is expected to make a stronger contribution to the development of policies and practices to improve the competence of professional teachers in elementary schools.

CONCLUSION

Based on the results from various sources, the competence of professional teachers has a very important role in improving the quality of the learning process in elementary schools. Pedagogic, professional, digital, reflective, collaborative, and inclusive competencies have been proven to contribute to improving the quality of learning planning and implementation, student involvement, and learning outcomes. Various factors, such as continuous professional development, the use of digital technology, support from school organizations, reflective practices, and collaboration among teachers, influence the effectiveness of teacher competencies. However, this study also identifies research gaps, especially the limited number of longitudinal studies, mixed-methods research, and research examining digital competence and the use of Artificial Intelligence in learning. Therefore, further research is recommended to develop a more comprehensive research design, expand the research context across various education systems, and explore teacher competency development models that are adaptive to technological developments and 21st-century educational needs, to make a stronger contribution to improving the quality of primary education.

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