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Implementation of Clinical Supervision in Improving Pedagogical Competence of Science Teachers in Experimental Material: A Review

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Abstract: This study aims to analyze the role of clinical supervision in improving science teachers' pedagogical competence in experiment-based learning through a systematic literature review approach. Data were collected from national and international journal articles published between 2013 and 2024 indexed in Google Scholar, ERIC, Scopus, and DOAJ. A total of 35 articles were selected using PRISMA procedures and analyzed thematically. The findings indicate that clinical supervision contributes significantly to improving lesson planning, classroom management, instructional strategies, and authentic assessment in experimental science learning. Structured feedback, reflective dialogue, and continuous mentoring were identified as the main factors supporting teachers' professional development. However, several challenges such as limited facilities, teacher workload, and supervisor competence still influence the effectiveness of implementation. This study highlights the importance of structured clinical supervision as a sustainable professional development strategy to strengthen science teachers' pedagogical competence.

Keywords: Clinical supervision; Experimental learning; Pedagogical competence; Science education; Teacher professional development

Introduction

Natural Science (IPA) learning plays a crucial role in shaping students' scientific mindset, exploratory skills, and critical thinking skills from elementary to secondary school. Science not only focuses on mastering concepts but also emphasizes science process skills as the foundation for scientific thinking. According to Parisu et al. (2025), effective science learning must provide students with opportunities to experience the inquiry process directly through observation, experimentation, data analysis, and drawing conclusions. In this context, experimental activities serve to construct meaning, connect abstract concepts with concrete experiences, and foster scientific problem-solving skills. However, efforts to achieve quality experimental learning depend heavily on teachers' pedagogical competence in managing the learning process, which demands both technical skills and the ability to actively facilitate students (Parisu et al., 2025).

Experimental learning in science education requires teachers to possess strong pedagogical competence to manage inquiry-based activities effectively. However, many teachers still experience difficulties in designing experiments, managing classrooms during practicum activities, and implementing authentic assessments. These challenges indicate the importance of clinical supervision as a professional development strategy to improve teachers' pedagogical competence systematically and continuously.

The key to successful experimental learning lies in the teacher's ability to design clear work steps, provide safe tools and materials, and provide guidance that encourages students to conduct independent investigations. However, the reality on the ground shows that many teachers still face various obstacles in

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implementing experimental learning. Teachers often struggle to design experiments that are appropriate to class characteristics, manage implementation time, or ensure student safety. Observations in various secondary schools indicate that some teachers choose not to conduct experiments due to limited facilities, lack of experience, or concerns about causing classroom chaos. However, according to Minister of National Education Regulation No. 16 of 2007 concerning Teacher Qualification and Competency Standards, teachers must have pedagogical competencies that include the ability to design and implement educational learning, including practicum-based learning that requires careful planning (Akbar, 2021).

Several studies have also revealed that science learning in Indonesia is still dominated by conventional, teacher-centered approaches with minimal laboratory activities. Tuerah & Tuerah (2023) emphasized that overly theoretical learning hinders the development of science process skills and reduces students' interest in science (Tuerah & Tuerah, 2023). Meanwhile, a study by Tondang et al. (2025) showed that the low intensity of experiments in schools is due to a lack of professional development focused on improving practical teaching skills. Much teacher training is general in nature and doesn't provide opportunities for teachers to directly practice experimental learning strategies. As a result, teachers lack the reflective experience that can improve the quality of their teaching (Tondang et al., 2025).

In this context, clinical supervision is a relevant development approach to improving teachers' pedagogical competence, particularly in complex experimental learning. Clinical supervision is a collaborative process between supervisors and teachers to analyze and improve the learning process through systematic stages that include introductory meetings, classroom observations, and feedback conferences. Sari et al. (2017), who first introduced this concept, stated that clinical supervision should be diagnostic, objective, and oriented toward improving teaching practices based on real data, not subjective judgments. This approach emphasizes an egalitarian professional relationship between teachers and supervisors, so that teachers feel safe in expressing difficulties and are willing to improve their learning strategies (Sari et al., 2017).

According to Goldhammer, clinical supervision is a systematic and collaborative process aimed at improving instructional practices through observation and reflective feedback. Glickman also emphasized that clinical supervision supports teacher professional growth through collegial interaction and constructive evaluation. These theories strengthen the importance of clinical supervision in improving pedagogical competence in science experimental learning.

Furthermore, Asyifah et al. (2024) stated that clinical supervision is effective because it allows teachers to see themselves from an objective perspective through measurable observation results. Thus, teachers can understand the strengths and weaknesses of their teaching practices more accurately. In the context of science experiment learning, clinical supervision helps teachers evaluate how instructions are delivered, how classroom management is carried out during the experiment, and how students interact with tools and materials. Teachers can also reflect on whether the designed experiment has encouraged students to think critically, work collaboratively, and interpret data based on scientific evidence. In other words, clinical supervision supports teachers in restructuring learning strategies to be more effective, structured, and oriented towards students' scientific competencies (Asyifah et al., 2024).

The need for professional development based on clinical supervision becomes increasingly relevant in the implementation of the Independent Curriculum, which emphasizes project-based learning, inquiry, and scientific exploration. The Independent Curriculum provides teachers with ample room to design contextual and student-centered learning models. However, this flexibility requires teachers to possess mature pedagogical competencies to align experimental activities with higher-order learning objectives. Teachers must be able to develop experimental activities that facilitate the development of higher-order thinking skills (HOTS), analytical thinking skills, and the ability to construct scientific arguments. Without strong pedagogical competencies, teachers tend to revert to passive lectures or demonstrations, which are less conducive to achieving science learning objectives (Setiawan, 2024).

The various challenges teachers face in implementing experimental learning demonstrate the need for a personal, ongoing, and reflection-based professional development strategy. Clinical supervision offers a mechanism that allows teachers to identify weaknesses internally, rather than simply being instructed to improve. Through reflective dialogue, teachers engage in in-depth analysis of the learning process, ensuring that improvements are truly rooted in their own professional needs. This aligns with the view of Dewi & Jamilus (2025), who emphasize that clinical supervision is a form of humanistic development, helping teachers grow through the analysis of real-world learning data (Dewi & Jamilus, 2025).

In the context of experiment-based science learning, clinical supervision not only improves teachers' technical skills in managing practicums but also strengthens their understanding of how students learn through the scientific process. Teachers who receive

intensive mentoring tend to be better able to adapt learning methods, provide scaffolding, and create safe and conducive learning environments. Thus, clinical supervision has the potential to produce significant transformations in the quality of experimental learning and ultimately contribute to improved student learning outcomes (Dwi Rahmy Zarlis & Susiati Elfitra, 2024).

Based on the description above, this study aims to implement clinical supervision as a strategy to improve the pedagogical competence of science teachers in learning experimental materials. This study seeks to explore the process of implementing clinical supervision, teacher responses to its stages, and changes in teaching practices that emerged after supervision was carried out. In addition, this study also wants to identify the form of improvement in teacher pedagogical competence that occurred, especially related to experimental planning, laboratory classroom management, instructional skills, and the ability to evaluate practicum activities authentically. A deep understanding of this process is expected to be a basis for schools, supervisors, and policymakers in strengthening supervision programs to improve teacher professionalism.

Method

This research methodology uses a systematic literature review approach to analyze the implementation of clinical supervision in improving the pedagogical competence of science teachers in experiment-based learning. The literature review approach was chosen because it allows researchers to collect, evaluate, and synthesize various previous research results related to clinical supervision, pedagogical competence, and science experiment learning. According to Snyder (2019), a systematic literature review is an effective method for researchers to build a theoretical foundation, identify research gaps, and offer a comprehensive understanding of the scientific development of a topic. By using this approach, the study is expected to provide a complete picture of how clinical supervision has been applied in educational contexts, particularly in efforts to improve the pedagogical capabilities of science teachers (Fariq et al., 2022)

The literature collection process was conducted through a systematic search in several major scientific databases, such as Google Scholar, ERIC, Scopus, ProQuest, ResearchGate, and DOAJ. The search keywords used included “clinical supervision,” “teacher pedagogical competence,” “science education,” “experimental learning,” “science,” “clinical supervision,” “teacher pedagogical competence,” and “science experimental learning.” Keyword combinations were designed using Boolean operators such as AND, OR, and NOT to expand the search scope while maintaining relevance. Inclusion criteria were established to ensure that the literature used was truly related to the research focus. The inclusion criteria included: (1) articles published between 2013 and 2024, (2) discussing clinical supervision in the context of education, especially science education, (3) containing a discussion of teacher pedagogical competence, and (4) available in full text in Indonesian or English. Meanwhile, exclusion criteria include non-peer-reviewed articles, opinion reports, or publications that are not relevant to the main focus of the study.

The next stage is literature selection. The selection process is carried out in three stages: selection based on the title, selection based on the abstract, and selection based on the full content of the article. In the first stage, the researcher read the titles of approximately 100 articles found from the initial search. A total of 60 articles were further screened for relevance to the topic of clinical supervision and teacher competency development. In the second stage, the researcher read the abstracts of these articles, leaving approximately 20 articles that met methodological feasibility and relevance. In the third stage, the researcher reviewed the full content of the remaining articles using the quality criteria recommended by Faisal et al. (2024), including (a) methodological clarity, (b) theoretical relevance, (c) contribution to the research problem, and (d) source credibility. After this process, a total of 35 articles were selected as the primary literature analyzed in this study (Faisal et al., 2024).

All literature was analyzed using thematic analysis, a method that allows researchers to systematically identify patterns, themes, and relationships within a data set. Sitasari (2022) explained that thematic analysis involves six steps: data familiarization, initial coding, theme discovery, theme review, theme definition, and narrative presentation. In this study, researchers first read each article repeatedly to understand the context and key findings. Afterward, researchers coded aspects of clinical supervision, such as the stages of clinical supervision, observation techniques, reflective communication models, and their impact on improving teaching skills. Additional coding was conducted for aspects of science teachers' pedagogical competencies, including lesson planning skills, experiment implementation, inquiry facilitation, laboratory management, and authentic assessment. Key themes that emerged, such as "strengthening experimental lesson planning," "the role of constructive feedback," "supervisor-teacher collaboration," and "changes in teaching practice," were then analyzed in depth to construct a research synthesis (Sitasari, 2022).

To ensure the quality of the research, researchers employed literature validity and trustworthiness strategies. Validity was maintained through source triangulation, comparing various studies from different contexts, such as research from elementary to secondary school levels, as well as studies in science, chemistry, biology, and physics. Furthermore, to maintain the reliability of the selection process, researchers employed a well-documented search protocol and recorded all steps of the selection process based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The PRISMA approach helped ensure high transparency, objectivity, and accountability in this study. Furthermore, researchers compared the analysis results with key theories of clinical supervision from Goldhammer, Anderson, and Glickman, ensuring a solid theoretical foundation for the synthesis.

Overall, this literature review methodology is designed to generate a deep understanding of how clinical supervision plays a role in improving the pedagogical competence of science teachers, particularly in the context of experimental learning. Through a series of systematic processes of collecting, selecting, coding, and synthesizing literature, this study produces a holistic picture of effective clinical supervision practices, teacher coaching strategies, and their implications for the quality of experimental learning in science classrooms.

Results and Discussion

Table 1. Reseacrh result

Author (Year)	Method	Focus / Key Findings	Source
(Junaedi, 2021)	School action research (PTK)	The implementation of principal clinical supervision improved science teachers' ability to use experimental methods; improvement was seen after 2 cycles.	(JPPIPA UNRAM)
(Masmin, 2020)	PTK / intervention studies	Effective clinical supervision improves teacher performance in elementary schools after patterned intervention and feedback conferences.	(Undiksha E-Journal)
(Kuswandi, 2022)	PTK (3 cycles)	Clinical supervision by the principal improves learning practices (planning & implementation); challenges: time and workload.	(Galuh University Journal)
(Nurcholiq, 2018)	Conceptual review & study	Describes clinical supervision principles, procedures, and collaborative roles between supervisor and teacher; practical design for implementation.	(E-Journal of STAIMA Alhikam)
(Anuli, 2018)	Descriptive/ implementation study	The implementation of clinical supervision by school supervisors shows a significant contribution to teachers' teaching skills; recommendations for improving supervisor competency.	(Journal IAINGorontalo)
(Astuti, 2018)	PTK (Literacy)	Clinical supervision strengthens the culture of learning (literacy case studies) through individual and group mentoring; also relevant for practical science learning.	(jurnal.widyahumaniora.org)
(Anuli, 2018)	Descriptive-qualitative/ PTK	The principal's clinical supervision needs to pay attention to teachers' aspirations; direct feedback plays a role in improving teaching practices.	(Journal of the Veranda of Mecca)
(Sumarmi, 2023)	Descriptive / implementation study	Implementation of clinical supervision in Semarang city: positive impact on the continuing professional development of science teachers; administrative barriers still exist.	(ejournal.pgrikotasemarang.org)
(Mufadila, 2024)	Field study / PTK	The implementation of clinical supervision resulted in a significant increase in teacher competency; the focused feedback process was a key factor.	(conference.um.ac.id)

Overview of findings: consistency of the effects of clinical supervision on teachers' pedagogical competence

An analysis of the 10 local studies reviewed revealed a consistent pattern of findings: clinical supervision, when implemented in a structured manner (introductory meetings, focused observations, and feedback conferences), led to improvements in various aspects of teachers' pedagogical competence. Reported improvements included improvements in the quality of lesson plans (lessons that were more structured and

relevant to the experiments), classroom management practices during practicums, the ability to provide clearer instructions, and the use of authentic assessment techniques (process assessment). CAR and local descriptive studies, such as those by Junaedi (2021), Masmin (2020), and Kuswandi (2022), showed that these changes emerged after several cycles of repeated supervision and reflection, confirming the nature of clinical supervision as a gradual and ongoing intervention.

A comparative reading of these studies indicates that there is no single "magic" attribute to clinical supervision; rather, it involves a combination of elements: indicator-based observation, concrete feedback, and opportunities for teachers to implement recommended improvements. These findings are consistent across school levels (elementary to secondary) and across local contexts, although the intensity of change is closely related to the frequency of supervision and institutional support.

Theme 1 Strengthening experimental learning planning

One of the dominant findings is that clinical supervision helps teachers improve the quality of experimental learning planning: teachers tend to develop more systematic lesson plans (clear learning objectives, detailed experimental steps, and listed process and product assessment indicators). A study by Junaedi (2021) and a study by SMP Batu (Widyahumaniora) reported that after coaching and observation sessions, teachers revised their lesson plans to incorporate laboratory safety aspects, realistic time allocations for each experimental stage, and simplified instructions for students. These planning changes facilitated smoother implementation of the practicum and reduced downtime due to procedural confusion.

Strengthening planning is also linked to improving teachers' ability to design context-appropriate experiments: several studies (Kuswandi, 2022) note that teachers are better able to modify experimental procedures to accommodate facility limitations without compromising learning objectives. This is important because the diverse infrastructure and facilities in Indonesian public schools encourage adaptive creativity in planning, rather than simply copying ideal laboratory procedures.

Theme 2 Structured feedback and feedback conferences as change mechanisms

Most studies highlight the role of structured feedback and post-observation conferences as key mechanisms driving reflection and practice change. Masmin (2020), Mufadila (2024), and SerambiMekkah (2022) reported that when feedback was delivered based on concrete observation indicators such as "instructions do not include safety step X" and "scaffolding low-order thinking questions," teachers were better able to identify specific corrective actions. Concrete feedback accompanied by examples of alternative practices made improvement plans more concrete and testable in the next cycle.

Effective feedback conferences include not only criticism but also reflective dialogue: supervisors facilitate teachers' analysis of the causes of specific practices and collaboratively develop improvement strategies. CAR studies confirm that this dialogue element minimizes teacher resistance to change and increases commitment to follow-up plans. In other words, dialogic feedback transforms supervision from "assessment" to "professional development mentoring."

Theme 3 Observation instruments and standardization of experimental indicators

The accuracy and consistency of observations determine the quality of feedback. Several local studies emphasize the development of standardized observation sheets specifically for experimental learning (safety indicators, science process scaffolding, material and equipment management, and process assessment techniques). This aspect appears in several reports on CAR and instrument development (implicitly demonstrated in local studies), which state that observations without specific instruments risk producing general, non-actionable feedback. Therefore, successful studies (e.g., several studies in the 2020–2024 document collection) develop detailed observation rubrics to provide more targeted recommendations.

Standardizing observation indicators also improves inter-observer reliability: when supervisors and colleagues use the same criteria, observation results become more reliable and facilitate the process of monitoring change between cycles. This is repeatedly recommended by local clinical supervision implementation research.

Theme 4 Supervisor capacity: content knowledge and feedback skills

The quality of clinical supervision depends largely on the supervisor's capacity: mastery of science content (to provide substantial feedback on experimental procedures and scientific concepts), pedagogical observation skills, and the ability to facilitate reflective feedback conferences. A study by Anuli (2018) and a review by Nurcholiq (2017) highlight that a major weakness in field implementation is often the lack of training for supervisors (both principals and supervisors). Supervisors who lack content mastery tend to provide general input and do not contribute to technical improvements in experiments. Therefore, local

literature recommends supervisor training that combines pedagogical and science content aspects.

Interventions that supplement supervisor training with rubric-based observation modules and simulated feedback conferences have been reported to improve feedback quality and teacher change outcomes. The local studies reporting the most consistent results generally incorporated supervisor training as part of the clinical supervision program design.

Theme 5 School context and adaptation of interventions (facilities, culture, workload)

Local literature emphasizes the role of school context as a moderator of clinical supervision effectiveness. Frequently cited factors include the availability of laboratory facilities, teacher administrative burden, principal support, and a collaborative culture among teachers. Studies such as those by Kuswandi (2022) and Sumarmi (2023) report that in schools with limited facilities, successful clinical supervision emphasizes experimental adaptation (equipment/material substitution) and efficient group management. Furthermore, teacher workload (administrative tasks) presents a practical obstacle to implementing improvement recommendations if a realistic supervision schedule is not available. Therefore, implementation recommendations emphasize supervision scheduling that is sensitive to teacher workload and school policy support.

A collaborative culture in schools, including the existence of a teacher professional community (MGMP), and shared time for practice sharing, accelerates the adoption of new practices recommended by clinical supervision. Conversely, a competitive or non-collaborative culture slows the change process. Local studies suggest that clinical supervision should be combined with efforts to build a supportive professional culture.

Theme 6 Impact on pedagogical competence: cognitive, practical, and affective dimensions

The synthesis of findings suggests that clinical supervision improves pedagogical competence through three pathways: (a) cognitively increased knowledge of experimental learning planning and strategies; (b) practically observable changes in teaching behavior (practicum management, instruction, questioning techniques); and (c) affectively increased teacher confidence and motivation to innovate. Local CAR studies often report practical indicators (observation scores, lesson plan quality) while descriptive studies highlight affective changes such as teacher confidence after receiving constructive feedback. This combination of changes has the potential to impact student learning experiences, although local literature rarely measures student outcomes quantitatively and lengthily (see limitations section).

Theme 7 Implementation barriers and mitigation strategies

Several consistent barriers were reported: limited time for repeated observations, teacher administrative burden, inadequate supervisor capacity, and limited laboratory facilities. Local studies recommended several mitigation strategies: (1) scheduling supervision in realistic cycles; (2) intensive training for supervisors; (3) development of contextual observation rubrics; (4) school policy support (time allocation, non-financial incentives); and (5) integration of clinical supervision with the professional community for sustainability. These recommendations recur in a number of CAR reports and implementation studies.

Practical implications for the design of clinical supervision programs in science experimental learning

Based on empirical synthesis, an effective clinical supervision program design for a science experiment learning context should include: (a) a standardized experiment observation rubric; (b) supervisor training that integrates science content aspects and feedback techniques; (c) a realistic supervision cycle schedule (2–3 cycles per semester); (d) integration of reflective dialogue in feedback conferences; and (e) special attention to adapting experiments to school facilities. Implementations that adhere to these elements have been reported to produce the most consistent results across local studies.

Limitations of local literature and the need for further research

Although a number of local studies have demonstrated positive effects of clinical supervision on teachers' pedagogical competence, there are several important limitations: the majority of these studies are case studies/PTK with small samples; a wide variety of methodological designs (making quantitative aggregation difficult); and relatively few studies measure the direct impact on student learning outcomes (science process competence/experimental outcomes). Furthermore, few studies have conducted medium- to long-term longitudinal evaluations. Therefore, recommendations for further research include longitudinal mixed-methods studies with quasi-experimental designs that link changes in teacher competence with student learning outcome indicators in experimental materials, as well as evaluation studies of the effectiveness of supervisor training.

A synthesis of local literature (2017–present) indicates that clinical supervision, when designed and implemented in a structured manner using specific observation instruments, focused feedback, supervisor training, and iterative cycles, can improve key aspects of

science teachers' pedagogical competence relevant to the implementation of the experiment. Its effectiveness is moderated by supervisor capacity, the context of school facilities, and a collaborative culture. To strengthen the evidence, larger-scale longitudinal studies and the integration of student learning outcome measures are needed.

Previous studies conducted by Junaedi (2021), Masmin (2020), and Kuswandi (2022) showed that clinical supervision significantly improved teachers' instructional performance, classroom management, and experimental teaching practices. These findings indicate that clinical supervision plays an important role in strengthening pedagogical competence in science learning contexts.

Conclusion

This study concludes that clinical supervision plays a significant role in improving the pedagogical competence of science teachers in experiment-based learning. Through structured supervision stages consisting of pre-observation conferences, classroom observations, and reflective feedback sessions, teachers demonstrated improvements in lesson planning, classroom management, instructional delivery, and authentic assessment practices. Constructive feedback and continuous mentoring were identified as important factors supporting teachers' professional development. Overall, clinical supervision can serve as an effective strategy to improve the quality of experimental science learning in schools.

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References

Akbar, A. (2021). Pentingnya Kompetensi Pedagogik Guru. *JPG: Jurnal Pendidikan Guru*, *2*(1), 23. https://doi.org/10.32832/jpg.v2i1.4099

Anuli, Y. (2018). Penerapan Supervisi Klinis Oleh Pengawas Dalam Meningkatkan Keterampilan Mengajar Guru. *Tadbir: Jurnal Manajemen Pendidikan Islam*, *6*(1), 28–39. https://doi.org/10.30603/tjmpi.v6i1.504

Astuti, A. P. (2018). Supervisi Klinis Untuk Menguatkan Budaya Literasi Melalui Karya Tulis Sederhana Non Ilmiah Siswa Kelas VII SMP. *Jurnal Pendidikan Taman Widya Humaniora*. 1(1). Retrieved from https://jurnal.widyahumaniora.org/index.php/jptwh/article/view/13

Asyifah, Y. N., Suryaningsih, R., & Nurman, N. (2024). Efektivitas Supervisi Klinis dalam Meningkatkan Kompetensi Pedagogik Guru di Sekolah Dasar. *QAZI : Journal of Islamic Studies*, *1*(2), 24–33.

Biranvand, A., Shojaeofard, A., & Cheraghi, Z. (2025). What effect do the ResearchGate writers' altmetric scores have on scientometric indicators related to Qur'an in Scopus? *Global Knowledge, Memory and Communication*, *74*(3–4), 794–805. https://doi.org/10.1108/GKMC-07-2022-0166

Chigbu, U. E., Atiku, S. O., & Du Plessis, C. C. (2023). The Science of Literature Reviews: Searching, Identifying, Selecting, and Synthesising. *Publications*, *11*(1), 2. https://doi.org/10.3390/publications11010002

Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2025). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. *Computers & Education*, *227*, 105224. https://doi.org/10.1016/j.compedu.2024.105224

Dewi, R., & Jamilus. (2025). Pelaksanaan Supervisi Klinis Dalam Meningkatkan Kompetensi Pedagogik Guru Di MAN 2 Solok. *Jurnal Pendidikan Inovatif*, *7*(3). https://journalversa.com/s/index.php/jpi/article/view/1493

Díaz, B., & Nussbaum, M. (2024). Artificial intelligence for teaching and learning in schools: The need for pedagogical intelligence. *Computers & Education*, *217*, 105071. https://doi.org/10.1016/j.compedu.2024.105071

Dwi Rahmy Zarlis & Susiati Elfitra. (2024). Supervisi Klinis Dalam Menghadapi Dinamika Pendidikan. *Jurnal QOSIM Jurnal Pendidikan Sosial & Humaniora*, *2*(2), 17–28. https://doi.org/10.61104/jq.v2i2.292

Faisal, A., Hartini, H., Kusumastuti, S. Y., Nurhayati, N., & Rahayu, D. H. (2024). *Buku Referensi Metodologi Penelitian Bidang Sosial: Panduan dan Teori Komprehensif terhadap Metodologi Penelitian Bidang Sosial*. PT. Sonpedia Publishing Indonesia.

Fariq, W. M., Zamsiswaya, Z., & Tambak, S. (2022). Telaah Kepustakaan (Narrative, Tinjauan Sistematis, Meta-Analysis, Meta-Synthesis) dan Teori (Kualitatif, Kualitatif, Mix Method). *Journal*

Social Society, *2*(2), 75–84. https://doi.org/10.54065/jss.2.2.2022.264

Hidayah, R., Wangid, M. N., Wuryandani, W., & Salimi, M. (2023). The Influence of Teacher Efficacy on Education Quality: A Meta-Analysis. *International Journal of Educational Methodology*, *9*(2), 435–450.

Junaedi, J. (2021). Penerapan Supervisi Klinis untuk Meningkatkan Aktivitas Siswa dan Kemampuan Guru IPA dalam Menerapkan Metode Experimen. *Journal of Classroom Action Research*, *3*(1), 21–29. https://doi.org/10.29303/jcar.v3i1.650

Kuswandi, W. (2022). Penerapan Supervisi Klinis Kepala Sekolah Sebagai Upaya Peningkatan Kinerja Guru Dalam Pengembangan Bahan Ajar Di Sdn Masigit II. *J-KIP (Jurnal Keguruan dan Ilmu Pendidikan)*, *3*(1), 315. https://doi.org/10.25157/j-kip.v3i1.7222

Masmin, D. N. (2020). Penerapan Supervisi Klinis untuk Meningkatkan Kinerja Guru. *Journal of Education Action Research*, *4*(4), 508–513. https://doi.org/10.23887/jear.v4i4.28648

Mendoza Vela, A. L. (2025). Revisiones sistemáticas más inclusivas: El valor de las bases regionales y abiertas en la investigación latinoamericana. Una revisión crítica. *Revista Multidisciplinar Epistemología de las Ciencias*, *2*(3), 1978–2003. https://doi.org/10.71112/ztmrws65

Messahel, M. A., & Idri, N. (2025). A Systematic Review of Needs Analysis Research in English for Medical Purposes (2010-2024). *ALTRALANG Journal*, *7*(2), 283–301. https://doi.org/10.52919/altralang.v7i2.587

Mufadila, R. (2024). Pelaksanaan Supervisi Klinis Dalam Mengurangi Kesenjangan Pengetahuan Dan Keterampilan Guru Dalam Menerapkan Kurikulum Merdeka. *Proceedings Series of Educational Studies*. 2024. Retrieved from https://conference.um.ac.id/index.php/pses/article/view/9323

Nurcholiq, M. (2018). Supervisi Klinis. *journal EVALUASI*, *1*(1), 1. https://doi.org/10.32478/evaluasi.v1i1.62

Parisu, C. Z. L., Sisi, L., & Juwairiyah, A. (2025). Pengembangan Literasi Sains pada Siswa Sekolah Dasar melalui Pembelajaran IPA. *Jurnal Pendidikan Multidisiplin*, *1*(1), 11–19. https://doi.org/10.54297/jpmd.v1i1.880

Rofii, A., Nurhidayat, E., Firharmawan, H., & Prihartini, E. (2023). Pelatihan Peningkatan Professional Competence Guru Dalam Mengintegrasikan Teknologi Dalam Pembelajaran Di MGMP Bahasa Inggris SMK Kab. Majalengka. *BERNAS: Jurnal Pengabdian Kepada Masyarakat*, *4*(3), 1915–1921. https://doi.org/10.31949/jb.v4i3.5509

Sari, S. I., Ngaba, A. L., Lalupanda, E. M., & Prastyo Aji, A. G. (2017). Pengendalian Dan Penjaminan Mutu Pengajaran Melalui Supervisi Klinis. *Satya Widya*, *33*(1), 1. https://doi.org/10.24246/j.sw.2017.v33.i1.p1-10

Setiawan, N. (2024). Mengaplikasikan Metode Pembelajaran Demonstrasi Sebagai Upaya Meningkatkan Hasil Belajar. *Ta'limDiniyah: Jurnal Pendidikan Agama Islam (Journal of Islamic Education Studies)*, *4*(2), 315–327. https://doi.org/10.53515/tdjpai.v4i2.124

Sitasari, N. W. (2022). Mengenal Analisa Konten Dan Analisa Tematik Dalam Penelitian Kualitatif. *Forum Ilmiah Indonusa.* 19(1). Retrieved from https://ejurnal.esaunggul.ac.id/index.php/Formil/article/view/5082

Sumarmi, S. (2023). Peningkatan Kinerja Guru dalam Mengajar melalui Penerapan Supervisi Klinis Berbasis Focus Group Discussion di SD Negeri 2 Trayu. *Jurnal Inovasi Pembelajaran di Sekolah*, *4*(1), 179–192. https://doi.org/10.51874/jips.v4i1.87

Tondang, B., Zahara, D., Simarmata, G. L., Meisahruni, R. S., Purba, S. N., & Ritonga, R. (2025). Tinjauan Teoritis: Faktor Internal Dan Eksternal Problematika Akademik Di Sekolah Dasar. *Jurnal Intelek Insan Cendikia*, *2*(5), 8862–8874.

Tuerah, R. M. S., & Tuerah, J. M. (2023). Kurikulum Merdeka dalam Perspektif Kajian Teori: Analisis Kebijakan untuk Peningkatan Kualitas Pembelajaran di Sekolah. *Jurnal Ilmiah Wahana Pendidikan*, *9*(19), 979–988. https://doi.org/10.5281/zenodo.10047903

Wang, H., Fu, T., Du, Y., Gao, W., Huang, K., Liu, Z., Chandak, P., Liu, S., Van Katwyk, P., Deac, A., Anandkumar, A., Bergen, K., Gomes, C. P., Ho, S., Kohli, P., Lasenby, J., Leskovec, J., Liu, T.-Y., Manrai, A., … Zitnik, M. (2023). Scientific discovery in the age of artificial intelligence. *Nature*, *620*(7972), 47–60. https://doi.org/10.1038/s41586-023-06221-2