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Implementing Deep Learning-Oriented Academic Supervision in Vocational Schools

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ABSTRACT

The declining quality of learning in Vocational High Schools, reflected in the 2025 Education Report, highlights the need for more effective strategies to strengthen instructional practices. This study aims to examine the implementation of deep learning-based academic supervision and to identify the factors influencing its effectiveness at SMKS Jayanegara Lawang, Malang Regency. A qualitative case study design was applied, involving school leaders and teachers as key informants. Data were collected through interviews, observations, and documentation, and analyzed using the interactive model of Miles, Huberman, and Saldana. The findings indicate that academic supervision follows a structured, continuous cycle comprising planning, classroom implementation, evaluation, reflective feedback, and systematic follow-up. This process forms a supervision model that promotes student-centered learning, characterized by meaningful engagement, reflective thinking, and contextual application aligned with workplace demands. Its effectiveness is supported by teacher commitment, collaborative culture, digital readiness, and institutional support, while constraints arise from resistance to pedagogical change, limited infrastructure, time allocation issues, and learner diversity. The study contributes by proposing a practical supervision framework that integrates deep learning principles into professional development processes. It also implies that policymakers and school leaders should strengthen capacity-building programs, improve infrastructure, and institutionalize reflective supervision practices to enhance learning quality in vocational education.

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1. INTRODUCTION

Education plays a central role in shaping adaptive and competitive human resources, particularly within vocational systems that are directly linked to labor market demands. Vocational High Schools (SMK) are expected to produce graduates who possess both academic competence and industry-relevant skills. However, recent data from the

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Indonesian Education Report (2025) indicate that learning quality at the SMK level remains moderate (60.18%) and has declined compared to the previous year, signaling a structural issue that requires immediate intervention [1]. This condition reflects not only limitations in instructional practices but also the need for more effective professional support systems to enhance teaching quality and student learning outcomes [2].

One strategic effort to address this issue lies in strengthening academic supervision as a mechanism for continuous teacher development. Academic supervision has been widely recognized as a professional support system that improves teacher performance, pedagogical competence, and instructional quality [3]. Studies show that supervision contributes significantly to teacher effectiveness, both directly and through mediating variables such as leadership, school culture, and motivation [4]. Various models, such as clinical, collaborative, and reflective supervision, have been implemented to enhance teaching practices through observation, feedback, and professional dialogue [5]. Despite these developments, the application of supervision in vocational contexts often remains procedural and has not fully integrated innovative pedagogical approaches that respond to current educational challenges.

In parallel, the deep learning approach has emerged as a relevant framework for improving learning quality by emphasizing conceptual understanding, critical thinking, and the real-world application of knowledge. This approach, supported by Ministerial Regulation No. 18 of 2025, promotes student-centered learning characterized by meaningful, mindful, and joyful engagement. Empirical studies demonstrate that deep learning enhances higher-order thinking skills, engagement, and learning outcomes [6]. However, existing research tends to examine deep learning and academic supervision separately. Limited studies explore how academic supervision can be systematically designed to support the implementation of deep learning in vocational education settings. **This gap indicates the need for integrative research that** connects supervision practices with deep learning principles to improve instructional quality. Based on this context, the present study seeks to analyze how deep learning-based academic supervision is implemented in a vocational school and how it contributes to improving learning quality. The study also examines the factors that support and hinder its implementation [7]. Implicitly, this research addresses key questions regarding how supervision practices can be aligned with deep learning principles and how such integration affects teaching and learning processes [8].

Theoretically, this study is grounded in the concepts of academic supervision as a continuous professional development process and deep learning as a pedagogical approach that fosters meaningful, reflective learning. Academic supervision involves systematic activities such as planning, observation, feedback, and follow-up to improve instructional practices, while deep learning emphasizes the development of higher-order cognitive skills and contextual understanding [9]. Integrating these two frameworks provides a comprehensive approach to improving both teacher competence and student learning experiences. **This research is expected to contribute both theoretically and practically.** Theoretically, it offers a conceptual integration between academic supervision and deep learning, addressing the gap in previous studies. In practice, it provides a structured model of supervision that school leaders can apply to enhance instructional quality **in vocational**

education. The findings are also expected to inform policymakers in designing more effective supervision systems and professional development programs [10]. Ultimately, this study aims to improve learning quality in SMKs, ensuring that graduates are better prepared to meet the demands of an evolving industrial landscape.

2. METHOD

Type and Research Approach

This study adopts a qualitative approach grounded in a post-positivist paradigm, in which the researcher functions as the primary instrument and data are generated through triangulated techniques and analyzed inductively [11]. The approach is intended to capture the complexity of educational practices in their natural context rather than to produce generalizable findings. A case study design is employed to allow an in-depth exploration of the implementation of deep learning-based academic supervision at SMKS Jayanegara Lawang, enabling a holistic understanding of processes, interactions, and contextual dynamics.

Research Subjects and Informants

The study involves five key informants: the principal, the vice principal for curriculum affairs, productive teachers, and normative-adaptive teachers. Informants were selected through purposive sampling based on their direct involvement and strategic roles in academic supervision practices. The selection of five informants is considered adequate in qualitative research, given the emphasis on depth rather than breadth. Each informant offers a critical perspective within the supervision system, yielding rich, information-dense data. Data saturation was achieved when no new themes or insights emerged from additional data collection, indicating sufficient coverage of the research phenomenon.

Data Sources

The research utilizes both primary and secondary data sources. Primary data are derived from interviews and direct observations, providing firsthand insights into supervision practices. Secondary data includes institutional documents such as supervision plans, evaluation reports, and deep learning lesson plans, which support data validation and contextual interpretation.

Research Location and Time

The study was conducted at SMKS Jayanegara Lawang, Malang Regency, a vocational school actively implementing deep learning initiatives and designated as a training target by the Directorate General of Teachers and Education Personnel (Ditjen GTK PG). The research took place over four months, from December 2025 to March 2026, allowing sufficient time for iterative data collection and analysis.

Data Collection Methods

Data were collected through semi-structured interviews, observations, and documentation. Semi-structured interviews enabled flexibility in exploring participants'

experiences while maintaining alignment with research objectives. Observations were conducted to examine real classroom practices and supervision activities. Documentation analysis was used to complement and verify findings from interviews and observations.

Data Analysis and Coding Process

Data analysis follows the interactive model of Miles, Huberman, and Saldana, involving data condensation, data display, and conclusion drawing. The coding process was conducted systematically through three stages: open coding to identify initial concepts, axial coding to group related categories, and selective coding to develop overarching themes. This process enabled the identification of key patterns, including supervision stages, implementation strategies, and influencing factors.

Trustworthiness and Academic Rigor

To ensure the rigor of the study, several strategies to enhance trustworthiness were applied. Credibility was strengthened through methodological triangulation by comparing data from interviews, observations, and documents. Member checking was conducted by validating findings with informants to ensure the accuracy of interpretations. Dependability was maintained through a clear audit trail documenting data collection and analysis procedures. Confirmability was ensured by minimizing researcher bias through reflective practices and systematic data verification. These strategies collectively enhance the reliability and validity of the findings, ensuring that the study provides a robust and trustworthy account of the phenomenon under investigation.

3. RESULTS AND DISCUSSION

3.1. Results

a. Implementation of Deep Learning Based Academic Supervision at SMKS Jayanegara Lawang

Based on the results of data analysis conducted through interviews, observations, and documentation, the implementation of deep learning-based academic supervision at SMKS Jayanegara Lawang follows systematic stages. These include planning, implementation, evaluation, analysis, feedback, and follow-up actions. These stages indicate that the implementation is well planned, systematic, and oriented toward improving the quality of learning in schools.

1. Planning Stage of Deep Learning Based Academic Supervision

Academic supervision planning refers to structured preparatory activities before implementation, including preparing supervision programs, scheduling, providing observation instruments, and determining the deep learning indicators to be observed. Based on the interview results, the principal emphasized that supervision begins with systematic planning.

Planning is carried out through coordination meetings, mapping learning outcomes, structured scheduling, and determining deep learning indicators to be observed in classroom activities. It also includes preparing RPM (Deep Learning Lesson Plans)

and observation instruments aligned with deep learning principles, ensuring clear direction, indicators, and assessment standards.

2. Implementation Stage of Deep Learning Based Academic Supervision

The implementation is carried out through classroom observations, review of teaching documents, and professional interaction between the principal and teachers to ensure the application of deep learning principles.

Based on interviews, the principal explained that supervision is conducted systematically through classroom observation. In the post-observation stage, professional interaction occurs through reflection and feedback.

This process includes the use of instruments to assess deep learning indicators and reflective dialogue between supervisors and teachers. The vice principal for curriculum stated that supervision also involves verifying lesson plans (RPMs), observing teaching practices, and conducting evaluative discussions to ensure meaningful, mindful, and joyful learning.

Based on the feedback instrument analysis, Informatics obtained an average score of 3.40, while Mathematics, Islamic Education (PAI), and Productive subjects scored 3.33. Overall, the scores fall into the “Good” category, indicating that lesson planning meets most assessment indicators.

Strengths include the development of essential competencies such as digital literacy, independent learning, logical thinking, and professional character. Learning plans are systematic, contextual, and relevant to students’ needs.

However, improvements are needed in structured reflection, integration of real-world work contexts, partnerships with industry (DU/DI), and optimization of interactive technology. Recommendations include project-based learning, structured reflection activities, interdisciplinary collaboration, and the use of interactive digital media.

3. Evaluation and Analysis Stage of Academic Supervision Results

Evaluation and analysis involve processing supervision findings to identify strengths, weaknesses, and the achievement of learning objectives. The principal stated that the evaluation compares teaching practices before and after the implementation of deep learning.

Evaluation is conducted through observation, comparison, and analysis to measure meaningful and active learning outcomes. The vice principal emphasized that evaluation involves reflective dialogue and alignment analysis between implementation and lesson plans (RPM).

Analysis of observation instruments across Informatics, Pharmacy, Mathematics, and Islamic Education shows that most indicators have been met. Learning activities are systematically structured into introduction, core, and closing stages, supporting understanding, application, and reflection.

Teachers have implemented interactive and collaborative learning, including discussions, problem-based learning, and practical activities. Digital technology has been integrated but remains basic and not fully interactive.

Students demonstrate the ability to understand and apply concepts in real contexts. However, reflection activities remain limited and are not systematically documented. In assessment, teachers evaluate knowledge, skills, and attitudes and provide direct feedback. However, written assessment documentation and detailed rubrics still need improvement to enhance accountability and validity.

4. Feedback Stage of Deep Learning Based Academic Supervision

Academic supervision feedback is a form of professional guidance provided to teachers through a dialogic, reflective process following classroom observation. Based on interview results, the principal explained that feedback is delivered through joint reflection between the supervisor and the teacher.

In this stage, teachers receive supervision notes as a basis for improving their teaching. Feedback is not given as a one-sided evaluation but through a constructive, reflective process, enabling teachers **to understand the strengths and weaknesses of their teaching practices** as part of continuous professional development.

The vice principal for curriculum emphasized that feedback is provided through a dedicated meeting between the supervisor and the teacher after classroom observation. This feedback process involves two-way, reflective communication aimed at guiding teachers in improving learning quality in line with deep learning principles.

Based on analyses of observation instruments and reflection data across four subjects, it was found that the implemented learning positively impacts students' competencies in knowledge, skills, and attitudes. However, several challenges remain, including time constraints, differences in student abilities, and limited integration of real-world work contexts and partnerships with business and industry (DU/DI). Therefore, recommended follow-up actions include strengthening project-based and case-based learning, enhancing structured reflection activities, developing differentiated instruction, and optimizing the use of digital technology.

5. Follow-Up Plan Stage of Deep Learning Based Academic Supervision

The follow-up plan is developed based on evaluation results to improve learning quality continuously. According to the principal, follow-up actions are formulated after the evaluation and feedback stages.

Follow-up actions go beyond providing evaluation notes and are implemented through individual mentoring, collaborative activities, and internal training as systematic efforts to address weaknesses and sustainably improve learning quality.

The vice principal for curriculum explained that follow-up plans are carried out through continuous guidance and monitoring of improvements in teaching practices. This indicates that follow-up actions are based on supervision results and implemented through individual mentoring and ongoing monitoring, ensuring systematic, continuous quality improvement aligned with deep learning principles.

The follow-up stage is also implemented through in-house training, with trained teachers serving as resource persons to share best practices. These activities focus on strengthening teachers' understanding and skills in applying deep learning principles.

Training sessions are conducted interactively, including discussions, Q&A sessions, and practice in developing relevant follow-up plans.

This training demonstrates a systematic effort to integrate supervision results into improved teaching practices. Teachers are encouraged to identify prior findings and formulate concrete improvement strategies, such as strengthening project-based learning, enhancing student reflection, and optimizing technology use. Additionally, this process facilitates collaboration among teachers in developing more contextually relevant and applicable follow-up plans.

Thus, the follow-up stage is not merely administrative but has evolved into a continuous professional development process. It serves as a medium for collective reflection and the strengthening of pedagogical competencies, ultimately improving the effectiveness and systematic implementation of deep learning in schools.

b. Supporting and Inhibiting Factors of In-Depth Learning-Based Academic Supervision at SMKS Jayanegara Lawang

The implementation of academic supervision based on deep learning at SMKS Jayanegara Lawang, in practice, cannot be separated from various factors that influence the effectiveness of its implementation. Based on the study's results from interviews, observations, and documentation, it was found that there are factors that act as both supporting and inhibiting elements at each stage of academic supervision, from planning to follow-up actions. Identifying these factors is important to comprehensively understand the dynamics of supervision implementation and the extent to which the deep learning approach can be optimally applied in the school environment.

1. Supporting factors of deep learning-based academic supervision

Based on interviews with the principal, the supporting factors of deep learning-based academic supervision are reflected in teachers' commitment to continuous development and the emergence of a collaborative culture within the school. In addition, the principal emphasized that teachers have begun to show openness to feedback and reflection on their teaching practices. Changes in mindset and openness to reflective processes are key factors supporting the successful implementation of deep learning-based academic supervision.

The vice principal for curriculum highlighted that supporting factors also stem from the readiness of teacher resources and the solidity of school management. Teachers' digital competence and effective managerial coordination are important factors in supporting the implementation of deep learning-based academic supervision.

From the perspective of the pharmaceutical vocational teacher, supporting factors are related to experience in participating in deep learning training and the support of digitalization in the learning process. Professional training and partnerships with industry and the business sector strengthen the quality of academic supervision and improve the quality of the learning process.

The mathematics teacher also stated that academic supervision serves as a supporting factor in improving the quality of learning, as evaluations help teachers refine their

teaching practices. Alignment between lesson planning (RPM) and classroom practice, as well as reflective evaluation, is a supporting factor in the implementation of deep learning-based academic supervision.

From the perspective of the religious education teacher, supporting factors lie in the availability of learning media and the application of more meaningful and enjoyable learning principles. Support for learning facilities and an understanding of meaningful and engaging learning principles are the main supporting factors in the success of deep learning-based academic supervision.

2. Inhibiting factors of deep learning-based academic supervision

Based on interviews with the principal, the inhibiting factors are mainly related to resistance to changes in teachers' mindsets and limitations in learning facilities and infrastructure. Challenges in shifting mindsets and limited digital facilities become obstacles in optimizing the implementation of deep learning-based academic supervision.

The vice principal for curriculum stated that inhibiting factors also arise from time constraints in conducting supervision and limitations in supporting learning facilities. Limited time allocation and inadequate facilities hinder the optimal implementation of supervision activities as planned.

From the perspective of the pharmaceutical vocational teacher, inhibiting factors relate to limited digital infrastructure and challenges in classroom management. Limited digital facilities and the diverse characteristics of students pose challenges in implementing deep learning-based academic supervision.

The mathematics teacher also pointed out obstacles in managing instructional time and differences in student characteristics. Time management in learning, as well as differences in students' abilities and learning styles, inhibit the implementation of supervised deep learning.

Meanwhile, the religious education teacher stated that inhibiting factors also arise from students' responses during the learning process. This indicates that classroom conditions and students' readiness to engage in active learning become challenges in ensuring the implementation of meaningful and enjoyable learning principles as expected in deep learning-based academic supervision.

3.2. Discussion

Implementation of Deep Learning-Based Academic Supervision at SMKS Jayanegara Lawang

The implementation of deep learning-based academic supervision at SMKS Jayanegara Lawang demonstrates a systematic, continuous process that includes planning, implementation, evaluation, and analysis of supervision results, feedback provision, and the preparation of follow-up plans [12]. The findings of this study are in line with the concept of academic supervision, which states that supervision is a professional development process carried out in a planned, systematic manner and oriented toward improving the quality of learning [13]. In the context of deep learning, supervision not only assesses administrative

aspects of teaching but also focuses on the quality of the learning process that can develop critical and creative thinking skills, as well as active student engagement in learning [14].

At the planning stage, academic supervision at SMKS Jayanegara Lawang is conducted through coordination meetings involving the principal, vice principal for curriculum, and teachers [15]. These activities include preparing the supervision program, mapping learning outcomes, scheduling supervision activities, and determining deep learning indicators to be observed. These findings indicate that supervision planning is carried out systematically, taking into account teachers' needs and classroom conditions. This is consistent with the view that the planning stage is a crucial initial process that determines the success of supervision, as it involves setting objectives, strategies, and supervisory approaches [16].

Furthermore, the use of the Deep Learning Lesson Plan (RPM) as the basis for instructional planning indicates that academic supervision in this school has integrated the deep learning approach into teaching practices. Deep learning emphasizes conscious, meaningful, and enjoyable learning processes, enabling students not only to understand concepts but also to apply knowledge in real-life contexts [17]. Therefore, verifying the RPM during the planning stage becomes an essential step to ensure that learning processes are designed in accordance with deep learning principles.

At the implementation stage, academic supervision is carried out through pre-observation, classroom observation, and post-observation activities [18]. Observations are conducted using supervision instruments designed to assess the implementation of deep learning indicators, including student engagement, active learning methods, and the integration of technology in teaching. These findings indicate that academic supervision evaluates not only administrative aspects but also the quality of classroom interactions. This aligns with the concept of deep learning-based academic supervision, which emphasizes observing teachers' pedagogical practices in creating meaningful learning experiences [19].

The evaluation and analysis stage shows that supervisors review changes in teachers' instructional practices before and after implementing deep learning. The results indicate a shift from teacher-centered to student-centered learning approaches. This shift is reflected in the use of project-based learning, discussions, collaboration, and the integration of digital technology [20]. These findings are consistent with the characteristics of deep learning, which emphasize the development of critical thinking, collaboration, creativity, and communication skills as essential student competencies [21].

Furthermore, in the feedback stage, academic supervision is conducted through reflective dialogue between the supervisor and teachers. Feedback is delivered constructively through dedicated meetings after classroom observations [22]. This process allows teachers to reflect on their teaching practices and receive recommendations for improvement. These findings support the view that feedback in academic supervision should be dialogic and collaborative to encourage teachers' professional growth [23].

The final stage in academic supervision is preparing follow-up plans. Based on the findings, follow-up actions at SMKS Jayanegara Lawang include individual mentoring, lesson study activities, and in-house training to strengthen deep learning strategies and authentic assessment. This indicates that academic supervision does not end with evaluation

but continues through ongoing professional development efforts. These activities aim to enhance the implementation of deep learning by improving teachers' pedagogical competencies. This aligns with the modern concept of academic supervision as a continuous professional development process, supported by the idea that teacher empowerment through training and professional development is integral to deep learning-based supervision [24].

Thus, the implementation of deep learning-based academic supervision at SMKS Jayanegara Lawang can be considered systematic and oriented toward improving learning quality. Through the stages of planning, implementation, evaluation, feedback, and follow-up planning, academic supervision functions not only as a monitoring mechanism but also as a professional development tool that encourages teachers to develop more meaningful, active, and contextual learning practices for students [25].

Supporting and Inhibiting Factors of Deep Learning Based Academic Supervision at SMKS Jayanegara Lawang

The implementation of deep learning-based academic supervision at SMKS Jayanegara Lawang is influenced by various factors that serve as both enablers and barriers. Based on the research findings, these factors relate to human resources, school organizational culture, facilities and infrastructure, and classroom learning conditions. Identifying these factors is essential to understanding the dynamics of academic supervision and determining appropriate strategies to enhance the effectiveness of deep learning implementation in schools.

One of the main supporting factors is teachers' commitment to continuously developing their professional competencies. The findings show that teachers are open to feedback and reflective about their teaching practices. The shift from a fixed mindset to a growth mindset is a crucial factor supporting successful implementation. This aligns with the view that effective academic supervision requires active teacher involvement as partners in reflection and instructional development [26].

Additionally, teachers' readiness to utilize digital technology also supports the implementation of deep learning. Teachers at SMKS Jayanegara Lawang have demonstrated their ability to use technology in teaching, including audiovisual media and digital learning resources. This finding is consistent with the concept of deep learning, which positions technology as a key component in creating interactive, collaborative, and contextual learning experiences [27].

Another supporting factor is the school's collaborative culture, reflected in strong managerial coordination among the principal, vice principal, and teachers. This culture creates a conducive environment for academic supervision, as teachers feel supported in developing innovative teaching practices. In deep learning-based supervision, collaboration between supervisors and teachers is essential in building professional learning communities focused on improving learning quality [28].

External support, such as partnerships with the business and industrial sectors (DUDI), also contributes to the successful implementation of deep learning in vocational schools. These partnerships provide students with contextual and relevant learning experiences aligned with workplace demands. Collaboration between schools and industry

partners makes learning more applicable and strengthens the connection between theory and practice in vocational education.

However, the implementation also faces several challenges. One major barrier is the resistance of some teachers to changes in teaching mindsets. Transitioning from conventional teaching approaches to more active, student-centered learning requires adaptation, which is not always easy. This psychological barrier aligns with previous findings that teachers' perceptions of supervision as administrative control can hinder openness to instructional innovation [29].

In addition, limitations in learning facilities and infrastructure, particularly technological tools such as LCD projectors, pose challenges. These limitations require teachers to share resources, preventing optimal use of digital media in all learning activities. In fact, the availability of technological infrastructure is crucial for supporting deep learning, which emphasizes information exploration and contextual problem solving.

Other barriers include time constraints in conducting supervision and the diverse characteristics of students. Supervision schedules are sometimes disrupted by other school activities involving teachers. Moreover, differences in students' abilities and learning styles present challenges in implementing deep learning, which requires active engagement from all learners. This indicates that deep learning implementation requires flexible and adaptive instructional strategies.

In conclusion, the success of deep learning-based academic supervision at SMKS Jayanegara Lawang is influenced by interconnected factors. Supporting factors such as teacher commitment, digital literacy, collaborative culture, and industry partnerships play a significant role in strengthening implementation. However, barriers such as resistance to change, limited facilities, time constraints, and diverse student characteristics must be addressed to improve the effectiveness of deep learning-based academic supervision in schools.

The implementation of deep learning-based academic supervision at SMKS Jayanegara Lawang follows a structured cycle that integrates planning, observation, evaluation, feedback, and follow-up into a continuous professional development process. This pattern emerges largely because the school positions supervision not merely as administrative control but as a developmental mechanism embedded in daily pedagogical practice. The consistency of implementation is driven by leadership commitment and organizational alignment, with supervision activities synchronized with curriculum planning and teacher capacity-building programs. As a result, supervision becomes functionally integrated with instructional improvement, which explains the observed shift toward student-centered learning. This shift is not incidental; it occurs because supervision explicitly incorporates deep learning indicators such as reflection, contextualization, and active engagement into observation instruments and feedback processes, thereby shaping teachers' instructional decisions.

From a theoretical standpoint, these findings resonate with global perspectives that frame academic supervision as a form of instructional leadership and professional learning (e.g., instructional coaching and professional learning communities). However, compared to the broader literature, the model in this study demonstrates a more explicit integration of

supervision and deep learning principles. While international models often emphasize coaching cycles or reflective practice, they do not systematically embed specific pedagogical paradigms, such as meaningful, mindful, and joyful learning, into supervision instruments. This integration represents a distinctive feature, as supervision is used not only to improve teaching quality in general but to operationalize a specific learning philosophy aligned with contemporary educational reforms.

The emergence of supporting factors such as teacher commitment, collaborative culture, and digital readiness can be explained by the school's internal capacity to foster a learning organization environment. Teachers' openness to feedback and reflective practice indicates a shift toward a growth-oriented professional identity, a quality widely recognized in the literature as a prerequisite for successful instructional reform. Similarly, collaboration and industry partnerships strengthen relevance and contextualization, which are central to vocational education globally. These conditions enable the supervision model to function effectively by reducing resistance and fostering shared ownership of change.

Conversely, the inhibiting factors highlight structural and cultural constraints that explain why implementation is not fully optimal. Resistance to change reflects deeply rooted pedagogical habits and perceptions of supervision as evaluative rather than developmental. Limited infrastructure and time constraints indicate systemic issues that extend beyond individual schools, suggesting that institutional and policy-level support remains uneven. The diversity of student characteristics further complicates implementation, as deep learning requires differentiated and adaptive instruction, which demands higher levels of teacher expertise and preparation. These challenges align with international findings that highlight the difficulty of sustaining student-centered reforms in contexts with limited resources and high variability in learner readiness.

Critically, although the model demonstrates strong internal coherence, it is not without limitations. Its effectiveness depends heavily on leadership capacity and teacher readiness, making it potentially less transferable to schools with weaker organizational cultures or limited professional development systems. In addition, the model emphasizes process quality but provides less measurable evidence of long-term student outcomes, which may limit its evaluative robustness. There is also a risk that the structured supervision cycle becomes procedural if not continuously supported by reflective and critical dialogue.

Despite these limitations, the originality of this study lies in its articulation of a supervision model that explicitly integrates deep learning principles into each stage of academic supervision. Unlike conventional supervision frameworks, this model connects pedagogical philosophy, supervision practice, and professional development into a unified system. It offers a context-sensitive approach to vocational education, where alignment between learning processes and industry relevance is essential. This contribution extends existing literature by demonstrating how supervision can be redesigned as a strategic tool to operationalize deep learning, rather than functioning solely as a mechanism for monitoring instructional compliance.

4. CONCLUSION

Conclusion

This study demonstrates that deep learning-based academic supervision can serve as a structured, continuous professional development model that reorients teaching practices toward more student-centered, reflective, and contextually relevant learning. The core contribution lies in formulating an integrative supervision model that connects supervisory stages to deep learning principles, enabling supervision to move beyond administrative monitoring into a transformative process that strengthens pedagogical quality and instructional coherence.

From a practical perspective, the findings imply that school leaders should institutionalize supervision as an ongoing developmental system supported by mentoring, collaborative learning communities, and targeted training programs. Aligning supervision with deep learning principles can enhance teachers' capacity to design meaningful and industry-relevant learning experiences. At the policy level, the study suggests the need for stronger support in terms of infrastructure, time allocation, and professional development frameworks to ensure the sustainability of such supervision practices in vocational education.

However, this study is limited by its focus on a single institutional context, which may limit the transferability of its findings to other educational settings. The qualitative case study design, while providing in-depth insights, does not allow for broad generalization, and the reliance on a limited number of informants may not fully capture the diversity of perspectives across vocational schools.

Future research is recommended to expand the scope by involving multiple schools and employing mixed-method approaches to validate and refine the proposed supervision model. Further studies could also examine the long-term impact of deep learning-based supervision on student outcomes and workforce readiness. For the broader community, this research provides a conceptual and practical foundation for improving the quality of vocational education, thereby fostering graduates who are more adaptable, skilled, and responsive to the evolving demands of the industrial sector.

Recommendations

Based on the research findings, several recommendations can be proposed to further develop deep learning-based academic supervision at SMKS Jayanegara Lawang:

- a. For the principal as supervisor, it is recommended to continuously strengthen academic supervision by enhancing the quality of professional guidance provided to teachers, particularly in encouraging the application of deep learning-oriented instructional strategies. The principal is also expected to increase support for teacher competency development through training programs, workshops, and teacher learning communities, so that teachers gain a more comprehensive understanding of deep learning implementation.
- b. For teachers, it is recommended to continuously improve their professional competencies and maintain openness to reflection and feedback provided during academic supervision activities. Teachers are also expected to develop more creative, collaborative, and

contextual learning innovations, so that the learning process not only focuses on content delivery but also fosters students' critical, creative, and collaborative thinking skills in line with deep learning principles.

- b. For the school, it is recommended to improve the availability of learning facilities and infrastructure, particularly digital technology that supports the implementation of deep learning. The availability of such facilities is crucial in creating an interactive learning environment and supporting the optimal development of students' competencies.
- c. For future researchers, it is recommended to conduct further studies on deep learning-based academic supervision with a broader scope, covering different levels of education and school contexts, in order to provide a more comprehensive understanding of how academic supervision can enhance the quality of learning.

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