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Principals' Instructional Leadership in Implementing Deep Learning in Public Senior High Schools

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Abstract

However, even now, learning in public senior high schools is still facing various obstacles such as the domination of memorization teaching strategy, low level of students' involvement in learning, and inadequate development of higher order thinking skills. Thus, the significance of instructional leadership by school principals in transforming learning through deep learning paradigm becomes very apparent. At present, despite growing interest of many countries around the globe toward deep learning as a pedagogic framework, the role of instructional leadership in its implementation process at the secondary education level still remains largely unexplored especially in Indonesia. The current study aimed to investigate the implementation of instructional leadership in deep learning implementation, the strategies used by school principals, and the factors affecting its success or failure. This study used a literature review. Information for analysis was gathered from both national and international peer reviewed journals, books, and scientific publications in Google Scholar, Scopus, and ERIC databases. Content analysis of the collected data has been performed based on Miles et al. (2014) framework. The results of analysis demonstrate that instructional leadership of school principals is an important factor in supporting deep learning through the following aspects: (1) establishing vision of learning; (2) conducting efficient instructional leadership strategies like professional learning community and clinical supervision; (3) incorporating digital technology into the learning process appropriately; (4) developing continuous professional development of teachers; (5) management of supporting and inhibiting factors. Deep learning implementation thus depends largely on the ability of principals to create new quality oriented learning environment. The research will contribute to improvement of educational leadership practice aimed at achievement of Sustainable Development Goal (SDG) 4 regarding provision of quality education for all.

Keywords: Instructional Leadership, School Principal, Deep Learning, Teacher Professional Development, Quality Education.

INTRODUCTION

Learning in senior high schools is usually characterized by rote learning without any engagement that would help in acquiring deep concepts. According to Nelson Laird et al. (2008), educational techniques that emphasize knowledge transmission over engaging students prevent the formation of deep learning approaches, thus hindering the learners' skills in solving problems and critical thinking. Limited use of technology and lack of teacher preparedness for using new learning methods have continued to hinder meaningful learning. Perach & Alexandron (2022) found out that teachers' readiness to employ technology in the learning process – which is a vital element of deep learning – highly depends on the kind of guidance provided by school administration. These conditions contribute to declining student motivation, particularly in STEM-related fields, and suboptimal academic achievement, a finding consistent with Santana et al. (2020), who showed that deep learning approaches

integrating technology and project-based activities significantly enhance student engagement in STEM disciplines.

Several previous studies have explored the implementation of deep learning in secondary education from various perspectives. Alfiah et al. (2026) identified a high level of teacher demand for collaborative project-based learning models designed to strengthen deep learning, highlighting the importance of institutional support from school leaders. Similarly, Talib et al. (2026) found that Android-based modules incorporating deep learning significantly enhanced students' mathematical literacy and intrapersonal intelligence. Bruckhaus et al. (2024) examined students' digital literacy through immersive school–university collaboration and reported substantial improvements in competencies associated with deep learning development. Meanwhile, Acquah et al. (2024) investigated the cultural relevance of data-mining practices in high schools and demonstrated that contextually grounded instruction improves students' conceptual understanding. At the school level, Ayasrah et al. (2025) revealed that digital leadership and digital innovation positively contributed to students' academic performance. Furthermore, Lin et al. (2022) found that instructional leadership practices, particularly curriculum alignment and teacher coaching, had a statistically significant effect on student learning outcomes. Consistent with these findings, Heck and Hallinger (2009) established through a meta-analytic review that principals' instructional leadership has a mediated yet significant influence on student achievement.

Outside of Indonesia, the increasing number of research studies internationally have highlighted the complex connection between leadership styles and the pedagogy of deep learning. Recent international research highlights that the success of the curriculum implementation depends significantly on the principal's ability to share leadership responsibilities with experienced teachers and subject department heads (Okiri & Hercz, 2023). Within the frameworks of secondary education in Europe and East Asia, instructional leadership is no longer regarded as a directive approach from the principal to teachers but is conceptualized as a network which creates collective teacher efficacy (Limon & Dilekci, 2025; Fan & Chu, 2025). Besides, the current state of research in the field of digital education emphasizes that despite the significance of the infrastructure readiness, it is still secondary to the pedagogical vision of the principal. In the absence of a clear connection between the objectives of the institution and competencies of deep learning, including critical thinking and collaboration, technological innovations continue to be used only for the purpose of conventional teaching (Pangestika et al., 2026; Trimiltin et al., 2025).

However, there is a significant limitation of the existing literature since the majority of previous researches tend to study deep learning or instructional leadership separately, but not in combination and in accordance with the context of Indonesia (Nurhasanah et al., 2025). Additionally, there is a lack of systematic reviews on the role of instructional leadership of principals in promoting the implementation of multiple dimensions of deep learning, such as technology usage, professional development, and school culture (Ambrita et al., 2025; Pramudya et al., 2025). Hence, the present research attempts to fill that research gap by performing a comprehensive literature review on the role of instructional leadership in deep learning implementation in Indonesian senior high schools.

The uniqueness of this research is defined by the integration of the analysis of instructional leadership as a multidimensional pedagogical phenomenon which creates the atmosphere of deep learning. This research will be distinguished from the existing ones by a comprehensive analysis of international and national literature on the behaviors and strategies of instructional leadership which foster deep learning implementation at senior high school. There are three main research questions which have been formulated for this study: (1) What is the role of school principals as instructional leaders in deep learning implementation in senior high schools? (2) What instructional leadership strategies contribute to deep learning implementation? (3) What fosters or obstructs the process of effective instructional leadership in deep learning implementation?

DISCUSSION

The Role of School Principals as Instructional Leaders in Deep Learning Implementation

From the literature review, it is evident that school principals occupy a vital position in the process of implementing deep learning in public senior high schools as instructional leaders. Instructional leadership can be defined as the ability of the principal to influence learning processes through visioning, curriculum planning, mentoring of teachers, and providing a conducive learning environment (Hallinger, 2005). In the case of implementing deep learning, the principal is not expected to operate solely as an administrator, but to act as a pedagogical change agent in transforming instructional practices within the school.

From the literature review, it is clear that instructional leadership by principals in the process of implementing deep learning has the following three core components: (1) developing and communicating a learning vision focusing on deep understanding; (2) management of professional development activities for teachers; and (3) monitoring and evaluation of learning quality. These three components are related to each other and form a

leadership ecology to facilitate the systematic implementation of deep learning. This aligns with the assertion that the effectiveness of instructional leadership depends on the integration of different managerial skills and learning quality improvement efforts (Nelson Laird et al., 2008; Hallinger & Heck, 2010).

Principals who function as effective instructional leaders actively monitor curriculum implementation, observe classroom practices, and provide evidence-based feedback to teachers. Karadag & Sertel (2025) found that instructional leadership behaviors including setting high academic expectations, coordinating curriculum alignment, and providing instructional support significantly predicted student learning outcomes in secondary schools. Similarly, Leithwood et al. (2020) demonstrated through large-scale analysis that principal instructional leadership is among the most influential school-level factors shaping teacher effectiveness and, by extension, student achievement. These findings affirm the strategic importance of instructional leadership as the cornerstone of any effort to institutionalize deep learning in senior high school (SMAN).

Instructional Leadership Strategies Supporting Deep Learning

The literature identifies several instructional leadership strategies that have proven effective in supporting deep learning implementation in public senior high schools. First, the establishment of professional learning communities (PLCs) initiated by the principal creates collaborative spaces for teachers to design, implement, and reflect on deep learning practices. (Alfiah et al., 2026) reinforced this by finding that institutionally facilitated collaborative project-based learning models significantly increased both teache r and student engagement in deep learning processes. Vescio et al. (2008) further demonstrated that PLCs in which teachers collaboratively examine student work and instructional practices consistently produce measurable improvements in student learning, suggesting that principals who prioritize PLCs as a structural strategy are more likely to achieve sustainable deep learning outcomes.

Second, effective instructional leaders implement systematic clinical supervision oriented toward improving instructional quality. Supervision in this context moves beyond administrative compliance to actively guide teachers in designing learning experiences that promote higher-order thinking, authentic problem-solving, and the application of knowledge in real-world contexts. Perach & Alexandron (2022) found that teachers' competence in implementing technology-integrated learning models a key component of deep learning is strongly influenced by the quality of leadership support and mentoring provided. Glickman et al. (2014) similarly argued that developmental supervision, in which principals differentiate

their support based on teacher experience and competency levels, is more effective than uniform inspection-based approaches in fostering instructional innovation.

Third, principals build a school culture conducive to deep learning by reinforcing values of critical thinking, collaboration, and innovation throughout the school ecosystem. A school culture that supports deep learning is characterized by openness to pedagogical innovation, appreciation for students' critical thinking processes, and collective commitment to instructional quality. Principals who embed these values in daily school policies and practices have been shown to create environments that foster active student engagement, as described by Santana et al. (2020) in the context of technology and project-based deep learning in STEM fields. Just like Mincu (2022), it was argued that cultural transformation led by principals is a necessary precondition for any pedagogical transformation to take place since any training that takes place outside of the culture tends not to result in sustained change.

Finally, the leaders of instruction facilitate the process of interdisciplinarity and cross-curriculum work. Encouraging teachers from various subject areas to cooperate in order to come up with an integrated curriculum leads to the development of deep learning across curricula. Robinson et al. (2008) have proved through a meta-analysis study that the involvement of principals in such processes as curriculum integration and content instruction leads to a better result than mere delegation.

Digital Technology Integration as a Component of Instructional Leadership in Deep Learning

It becomes evident from the literature that instructional leadership of principals in the digital era must incorporate the ability to manage the incorporation of technology into learning processes in a meaningful way. In order to make proper evaluations about the relevance of particular technologies to deep learning goals, principals should have sufficient level of digital literacy, at the same time ensuring systematic development of digital competences among teachers. As demonstrated by Bruckhaus et al. (2024), collaboration between educational institutions in digital literacy enhancement programs resulted in considerable improvement of student competence, thus proving the need for proactive leadership of principals in establishment of such partnerships in order to promote deep learning development.

Talib et al. (2026) proved that incorporation of learning modules on the Android platform with elements of deep learning approaches considerably increased mathematical literacy and intrapersonal intelligence of students, which means that principals should be

proactive regarding development and implementation of such digital learning media in accordance with deep learning principles. Resource allocation, provision of incentives for innovative teaching practices, and development of appropriate policies of the institution are key aspects of instructional leadership in this regard. According to Ayasrah et al. (2025), digital leadership and digital innovation of school principals positively influenced students' academic achievements, thus making digital leadership competency a vital part of instructional leadership.

TPACK (Technological Pedagogical Content Knowledge) framework proposed by Mishra & Koehler (2006) is a helpful tool that can help to understand what principals need to develop in their teachers. Instead of simple technical training, principals who organize professional development programs based on TPACK approach ensure that teachers will be able to employ digital technologies as tools that enable deep learning (Koehler & Mishra, 2009; Voogt et al., 2013).

Teacher Professional Development as an Instructional Leadership Priority

The body of knowledge continuously reiterates that teacher professional development is among the major areas of concern of principals' instructional leadership in the implementation of deep learning. Principals, who do well in their duties, do not only carry out administrative activities for training teachers but make professional development an integral part of their learning environment. Perach & Alexandron (2022) noted that the implementation of a systematic blended learning approach towards the development of teachers' competence to implement the machine learning curriculum in high schools yielded notable capacity increases.

In this context, principals serve simultaneously as facilitators and motivators for professional development oriented toward deep learning. This includes providing time and collaborative space for teachers, supporting pedagogical experimentation, and recognizing teacher innovations. Alfiah et al. (2026) found that teachers' demand for collaborative project-based learning model innovations is high, and meeting this demand requires strong leadership support from principals through responsive and contextually appropriate professional development policies. Darling-Hammond et al. (2017) similarly found that high-quality professional development characterized by coherence, active learning, sustained duration, and collaborative focus produced significant changes in teaching practice and student outcomes.

Furthermore, Guskey (2002) argued that effective professional development must be evaluated at multiple levels including changes in teacher knowledge and attitudes, classroom

practice, organizational learning processes, and ultimately student outcomes and that principals play a decisive role in creating the conditions for each level of change to occur. The implication for instructional leadership is that principals must adopt a systemic perspective on professional development, designing programs that address not only individual teacher competency but also the collaborative structures and accountability mechanisms that translate individual learning into school-wide improvement in deep learning quality.

Supporting and Inhibiting Factors in Instructional Leadership for Deep Learning Implementation

The literature also identifies several supporting and inhibiting factors that influence the effectiveness of principals' instructional leadership in deep learning implementation. Among the supporting factors, adequate technology infrastructure, teachers' commitment to innovation, and government education policy support emerge as key enablers. Ayasrah et al. (2025) affirmed that strong digital leadership at the school level, supported by a well-functioning e-learning ecosystem, demonstrably improves students' academic performance. Additionally, the cultural relevance of learning content to students' lived contexts, as emphasized by Acquah et al. (2024), further strengthens the effectiveness of instructionally led deep learning implementation.

Duan (2022) demonstrated that mathematics deep learning teaching approaches, when systematically designed and institutionally supported, produced measurable gains in students' analytical reasoning, suggesting that subject-specific applications of deep learning can be effectively scaled when principals ensure coherent curricular alignment. Lin et al. (2022) similarly found that project-based learning in artificial intelligence and marine disciplines facilitated through cross-institutional collaboration enhanced students' higher-order thinking skills, pointing to the value of principals building external partnerships that extend the school's instructional resources.

Conversely, several inhibiting factors require proactive management by principals. First, teachers' resistance to changing instructional approaches particularly among those accustomed to conventional information-transfer methods is a recurring challenge in deep learning implementation. Secondly, heavy administrative workload faced by the principals may lessen the amount of time spent on developing effective instructional leadership skills. Thirdly, differences in technological capability between teachers working at the same school may complicate consistent application of the deep learning model throughout all classrooms. As Leithwood et al. (2020) pointed out, in case there is no special attention from the school

leaders to the development of collective capability of teachers and overcoming the variability, the process of implementing deep learning programs at schools remains fragmented and dependent on the initiative of individual educators.

In order to overcome the above mentioned problems, the principals need to use the type of adaptive, communicative and data-oriented leadership allowing them to adapt to the needs of their school community and carry out quality transformation towards deep learning. According to Hallinger (2005), the most efficient instructional leaders are the ones who adjust their approaches according to the particular development stage of their school. This approach is especially relevant to the situation in SMAN in Indonesia.

Deeper Analytical Perspectives on Leadership Adaptation

From this synthesis of results, it becomes clear that the movement away from traditional rote-memorization instruction and towards the deep learning approach requires what can be termed 'transformational instructional leadership.' This means there is a need for a radical shift in the perception of school principal's daily operational priorities. For Indonesian SMAN (public senior high schools), this structural paradox lies in the fact that the principal is expected to be a visionary pedagogical leader in the setting of intensive bureaucracy required from him or her. The solution to this problem is the effective delegation of instructional monitoring activities to PLCs and MGMP.

In addition, it should be noted that the resistance to the change in instructional approaches shown by senior teachers is not only a psychological but cultural problem too. Traditional hierarchy in regular classroom usually puts teacher's authority higher than that of students' interest-driven inquiries. Thus, clinical supervision should develop from being a system of administrative evaluation to a non-punitive mentorship process. The application of differentiated development supervision by principals will be an admission of the differences in digital and pedagogical skills in school employees.

CONCLUSION

From the above discussion, it is reasonable to conclude that the role of principals' instructional leadership in successfully implementing deep learning in junior high schools is multi-dimensional and strategic. Principals are learning leaders responsible for defining the educational vision, developing teachers' competence, encouraging the use of digital technology, and establishing the school culture that would support deep learning implementation. As shown from the results, the successful implementation of deep learning in junior high schools requires five interconnected components, which are (1) the role of the principal as an instructional leader; (2) instructional leadership strategies such as professional

learning community, clinical supervision, and culture building; (3) the effective use of digital technology based on TPACK approach; (4) the professional development of teachers in accordance with deep learning goals; and (5) the management of supporting and hindering factors. All these dimensions complement each other and create a learning ecosystem that has the potential to improve the quality of learning experience of students.

The current study adds to the existing theoretical and practical knowledge of instructional leadership in relation to deep learning, especially in the case of secondary school education in developing countries. The proposed integrative framework provides a systematic foundation for educational leaders, policymakers, and researchers to design, evaluate, and improve instructional leadership initiatives aimed at instituting deep learning in organizations. Future research will need to employ more empirical research designs such as survey-based quantitative and mixed methods research to further validate and refine the relationships suggested by this literature review in different SMAN environments in Indonesia and globally. Therefore, instructional leadership is among the most important factors of relevant and meaningful learning in the 21st century.

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