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OPTIMIZING PRINCIPAL MANAGEMENT FOR DEEP LEARNING CURRICULUM IMPLEMENTATION IN VOCATIONAL HIGH SCHOOLS

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Abstract

The present study aims to analyze the strengths, weaknesses, opportunities, and threats of school principals' management in implementing the deep learning curriculum in vocational schools and to formulate strategic recommendations through a SWOT analysis. The current research employs a qualitative approach with a multisite case study design involving Vocational High Schools (SMK) in Central Java Province. The study population consisted of approximately 1,547 SMK principals across the province, while the research sample comprised 45 principals representing both public and private schools. Data were collected through in-depth interviews with school principals as the main informants. The analysis was conducted with thematic coding to classify the data into strengths, weaknesses, opportunities, and threats, then synthesized in an operational SWOT matrix to formulate strategic recommendations. The results suggest that the principal has strategic leadership, builds a school culture that is open to innovation, and utilizes available facilities to support the implementation of deep learning. However, internal weaknesses were found in a dense, rigid curriculum, sporadic teacher training, limited technological infrastructure, and traditional assessment practices. The external side, government policies, partnership opportunities with industry and universities, and the demands of 21st-century competencies are important opportunities. Meanwhile, students' socio-economic disparities, uneven technological readiness, and fluctuating external support are real threats. The results confirm that strategic planning based on SWOT analysis can help principals maximize strengths and opportunities, while systematically addressing weaknesses and threats. The research findings are expected to be a reference for school principals, teachers, and policymakers.

Keywords

Deep learning curriculum; learning management; school leadership; SWOT analysis; vocational education.

INTRODUCTION

Efforts to enhance the quality of vocational education and implement a deep learning curriculum in Vocational High Schools (SMK) are urgently needed. The deep learning curriculum emphasizes developing higher-order thinking skills, creativity, and contextual problem-solving abilities per the demands of the 21st-century workforce (Meirani & Intania, 2023; Utami et al., 2022). However, the successful implementation of the deep learning curriculum is not only determined by the readiness of teachers and students (Meinokat & Wagner, 2025; Pambudi et al., 2024) but is also strongly influenced by the management role of school principals as leaders and managers of educational institutions (Hafis et al., 2023; Kanyakan et al., 2024). Principals are required to optimize all school resources, build partnerships with external parties, and formulate managerial strategies that are adaptive to change (Beattie et al., 1997; Haggis, 2003; Smith & Colby, 2007). Therefore, SWOT analysis is a relevant approach to assess the strengths, weaknesses, opportunities, and threats in implementing a deep learning curriculum in SMK, especially in Central Java.

Furthermore, if analyzed using the SWOT framework, in the context of vocational schools in Central Java, several principal management strengths that support implementing the deep learning curriculum can be identified (Jiang, 2022; Khurniawan et al., 2021). The strengths lie in clear instructional leadership, relatively high collaboration with business/industry (DU/DI) in many vocational schools, and school autonomy to adapt learning practices to local needs (Kovač et al., 2025; Liang et al., 2025). Visionary principals can encourage collaboration among teachers, support practice-based learning projects, and facilitate access to relevant industry internships of which accelerate the adoption of deep learning principles (Weng et al., 2023). However, there are significant internal weaknesses: not all principals have specific managerial competencies for deep learning-based curriculum transitions (McPhail, 2020; Yanhua et al., 2025), the availability of technical resources and infrastructure is often inadequate, and teachers' professional development capacity is limited (Haggis, 2003; Srichai & Wongsaphan, 2022). Moreover, administrative burdens and resistance to pedagogical change among teachers can slow down implementation, while data-based monitoring and evaluation mechanisms to assess the effectiveness of deep learning are not well-systematized (Moulida et al., 2022; Shoho & Barnett, 2010; Thongrasamee et al., 2025).

The internal strengths and weaknesses aside, external factors also have an important role in determining implementation success. Opportunities that principals can take advantage of include national or regional education policies that support curriculum innovation and vocational

strengthening, labor market demands that increasingly value higher-order thinking and practical skills, and the availability of training/mentoring programs from education offices, universities, or industry partners (Deschaine & Jankens, 2017; Setiawan et al., 2024). Community support, funding opportunities, and developments in educational technology also provide opportunities to enrich learning practices (Baiyang et al., 2025; Smith et al., 2021). Meanwhile, external threats include the unequal distribution of resources among schools, leading to implementation gaps, rapid and inconsistent policy changes, and the dynamics of rapidly changing industry needs that can quickly change school curricula (Cattaneo et al., 2025; Levin, 2024). Socio-economic factors (e.g., family access to technology) and inter-school competition for resources or students can also pressure principals' capacity to implement deep learning models optimally.

According to the mapping of internal and external factors, principals can formulate an integrated management strategy that focuses on: (a) strengthening human resource capacity through continuous professional development programs, instructional coaching, and the establishment of learning communities for teachers (Duan et al., 2024; Ma et al., 2024); (b) Utilization of strategic partnerships with industry, universities, and local governments for access to internships, financing of learning projects, and alignment of curriculum with field needs (Tao, 2025); (c) Crioritized resource management-allocating budget for essential learning infrastructure and using blended/low-tech solutions if infrastructure is limited (Li, 2024); (d) Implementation of a monitoring-evaluation system based on deep learning performance indicators (KPIs) for data-driven decision-making (Puyt et al., 2023); and (e) prioritized resource management-allocating budget for essential learning infrastructure and using blended/low-tech solutions if infrastructure is limited (Li, 2023); and (e) implementation of distributed leadership by delegating curriculum leadership roles to teacher leaders to make innovations more durable (Lertlam et al., 2024; Weng et al., 2025). The strategies are designed to turn weaknesses into strengths (e.g., making teachers agents of change) and catalyze external opportunities (e.g., leveraging grant programs or DU/DI support) while preparing to mitigate threats such as policy changes or budget constraints (Gkoltsiou & Paraskevopoulou, 2021; Nilashi et al., 2024).

However, despite this strategy's opportunities, academic problems and empirical gaps still need to be explored further. Although the principles and needs of deep learning curriculum are increasingly recognized, it is not yet clear how the combination of internal principal managerial factors (instructional leadership, resource management, professional development capacity,

monitoring system) and external factors (policy support, industry partnerships, socio-economic conditions) simultaneously affect the success of implementation in SMK, especially in Central Java. Practically, inter-SMK implementation variability has not been systematically mapped; theoretically, no contextual managerial model that formulates priority strategies based on a comprehensive SWOT analysis.

Several previous studies have attempted to address some of these issues and emphasized the importance of principal management in implementing a deep learning-based curriculum. Sirk (2024) found that principal leadership had a significant effect on teachers' role in the adoption of an innovative AI-based curriculum, while Wang et al. (2024) discovered that principals' instructional leadership increased teachers' self-efficacy and performance in implementing the Merdeka curriculum. Cechovsky (2025) added that principal leadership, digital platform utilization, and learning communities contribute to teachers' pedagogical competence in vocational schools. Amrullah et al. (2025) also emphasized the role of proactive principal leadership in improving learning quality, while Kumpliw et al. (2025) highlighted teachers' perceptions of the benefits and constraints of deep learning. However, the five studies still tend to highlight leadership aspects or teacher perceptions partially without mapping the interaction of internal factors of principal management with external factors such as industry support, regional policies, and students' socio-economic conditions contextually. Therefore, the novelty of the present study lies in the application of SWOT analysis that brings together the internal strengths and weaknesses of school principals' managerial skills with external opportunities and threats in the implementation of deep learning curriculum in Central Java vocational schools, while formulating management strategies that are tactical, measurable, and relevant to the needs of vocational education.

Besides the academic review, the national policy context provides an important foundation for implementing the deep learning curriculum. The Ministry of Primary and Secondary Education (Kemendikdasmen), in line with national education reform efforts, has pursued several important policies to introduce deep learning as the main learning approach. Through Permendikdasmen No. 13 of 2025, the government did not completely change the curriculum, but rather adjusted the content to support the deep learning approach by reducing the material load but emphasizing essential material that is contextually integrated and interdisciplinary. The policy emphasizes "mindful, meaningful and joyful" learning - focusing on deep understanding and real-life relevance, rather than simply adding content. Theoretically, this approach aligns with modern curriculum

management principles that emphasize adaptation to contextual needs and the constructivist paradigm: the curriculum is structured flexibly, considers the local context, and equips students with 21st-century skills such as critical thinking and problem solving. The principal, from a managerial perspective, acts as a change agent who must be able to manage the implementation of this approach - from the development of an adaptive curriculum plan, allocation of resources and digital infrastructure, to partnerships with industry and local policy makers - while facilitating teachers' professional development to design and implement effective deep learning practices.

The present study aims to: (1) identify the internal strengths and weaknesses of school principals' management in implementing the deep learning curriculum in vocational schools; (2) examine the external opportunities and threats that influence its implementation; and (3) formulate strategic recommendations based on a SWOT analysis. Theoretically, this research contributes to the development of educational management studies by providing a contextualized understanding of how internal managerial capacities interact with external factors in shaping the effectiveness of curriculum innovation, particularly within the framework of deep learning. Pragmatically, the study offers evidence-based recommendations for school principals and policymakers to design managerial strategies that optimize resources, strengthen partnerships with industry, and ensure the sustainable implementation of the deep learning curriculum in vocational schools, especially within the context of Central Java.

METHOD

Research Design

The qualitative study employed a multisite case study approach involving Vocational High Schools (SMK) in Central Java. The study population consisted of all principals of SMK in Central Java, totaling approximately 547, while the research sample comprised 45 principals representing both public and private SMKs. This design was selected to explore principals' management practices in implementing the deep learning curriculum, analyzed through a SWOT framework.

Data and Data Sources

The research data were primary and secondary data. The research data consisted of principals' management behavior in implementing the deep learning curriculum in Vocational High Schools (SMK) in Central Java. Data were collected through observation, in-depth interviews, and focus group discussions (FGDs). The main source of data was the SMK principal, while vice

principals and teachers served as supporting informants. Secondary data were obtained from school documents, including work programs, supervision reports, and curriculum policies.

Data Collection Technique

Data collection in this study was conducted through observation, in-depth interviews, and documentation. Observation was conducted from February to April 2025 to observe the principal's management practices in planning, implementing, and evaluating *deep learning-based learning* in SMK. The in-depth interviews were conducted with the principal as the main respondent, the vice principal for curriculum, and several teachers as supporting informants, focusing on exploring the strengths, weaknesses, opportunities, and threats in implementing the *deep learning* curriculum. Moreover, documentation was conducted by reviewing school work program documents, learning supervision reports, and teacher training archives to complement and strengthen the data from observations and interviews.

Data Analysis

Data analysis was conducted qualitatively using an interactive model including data reduction, presentation, critical analysis, and verification. In the data reduction stage, researchers filtered and grouped information from observations, interviews, and documentation into SWOT categories (strengths, weaknesses, opportunities, and threats). The reduced data were then presented as matrices and thematic narratives to provide a comprehensive picture of the principals' management practices. Furthermore, the researcher conducted a critical analysis by linking the field findings to educational management theory and the concept of deep learning curriculum, and comparing it with previous studies' results to strengthen academic validity. The verification process was conducted through member check, peer debriefing, and audit trail to ensure the credibility and validity of the research data.

FINDINGS AND DISCUSSION

Findings

The results of this study present a mapping of internal and external factors that influence the optimization of school principals' management in implementing the *deep learning* curriculum in Vocational High Schools (SMK) in Central Java. The mapping is done through a SWOT analysis that describes the strengths and weaknesses from the internal side of the school, as well as opportunities and threats from external factors. Identifying these four aspects is important to provide a

comprehensive picture of the actual condition of the school in facing the challenges of implementing the *deep learning* curriculum, as well as finding the right strategy to strengthen the role of the school principal. A summary of the SWOT analysis results is presented in Table 1.

Table 1. Optimizing Principal Management in Implementing the Deep Learning Curriculum: A SWOT Study of Vocational High Schools in Central Java

No	Strength	Weaknesses	Opportunities	Threats
1	Strategic Leadership & Adaptive Vision	Curriculum Planning & Design	Policies and Regulations that Support the Implementation of Innovative Learning	External Resource Limitations
2	Human Resource Development (Teachers & Students)	Teacher Professional Development	Strategic Partnerships with DUDI, Universities, and External Institutions	Policy Challenges & Government Support
3	Technology Infrastructure & Facilities	Infrastructure, Budget & Infrastructure	Workplace Demands and 21st Century Competencies as Opportunities for School Transformation	Socio-Economic Influences & Digital Literacy
4	School Culture that Supports Innovation & DL	External Support & Partnerships	The Role of Teachers and School Autonomy in Optimizing the Implementation	Stakeholder Response & Expectation
5	New Approach Openness & External Partnerships	Evaluation & Assessment System	Character-Building Learning, Emotional Maturity, and Future Readiness	Adaptive Efforts & Internal School Strategies
6	-	School Culture & Environment	-	-
7	-	Social Context & External Gaps	-	-

Source: Authors' Analysis Based on Field Data (2025)

According to the qualitative data analysis results through in-depth interviews with principals, teachers, and related stakeholders, several main themes were obtained that represent the strengths in the principals' managerial strategies in implementing the deep learning curriculum in vocational schools. The results of the qualitative coding analysis on strengths are presented in Table 1. Qualitative coding analysis revealed five main strengths in implementing *a deep learning* curriculum in schools. First, strategic leadership and adaptive vision are reflected in a clear vision, SMART policies, and a proactive principal (*"change is inevitable"*). Second, human resource development for teachers and students is realized through training, pilot projects, and strengthening 21st-century competencies such as critical thinking and independence. Third, infrastructure and technological infrastructure support the implementation of the deep learning curriculum, including multimedia rooms, stable internet, and LMS platforms (*"infrastructure that supports deep learning"*).

Fourth is a school culture that supports innovation, collaboration, regular reflection, and an inclusive learning atmosphere (*"collaborating with each other, communicating"*). Lastly, openness to new approaches and external partnerships is evident in accepting community input and curriculum adjustments to industry needs. These five aspects form a school ecosystem conducive to the sustainable implementation of the deep learning curriculum.

The analysis revealed several main themes that reflect internal barriers and structural weaknesses that need serious attention. The results of the qualitative coding analysis in the weaknesses category are presented in Table 1. The results of the qualitative coding analysis identified seven main weaknesses in implementing the *deep learning* curriculum. First, the curriculum planning and design were considered too dense, less flexible, lacking authentic assessment, not collaborative, and not contextualized, as stated: *"The curriculum is too dense with a lot of material... teachers have difficulty providing space for deep exploration."* Secondly, teachers' professional development is still weak due to low understanding, many misconceptions, sporadic training, and the demands of a new paradigm that not all teachers are ready to accept (*"Teachers' basic knowledge affects implementation... training is only sporadic"*). Thirdly, infrastructure, budget, and facilities and infrastructure are limited, especially for ICT and practice, with an inadequate budget burden (*"Technology infrastructure gap... very limited"*). Fourth, external support and partnerships with committees, business and industry and universities, and government are not optimal, hampering curriculum synchronization with external needs (*"Requires external support (committees, DUDI, stakeholders)"*). Fifth, the evaluation and assessment system is traditional and not integrated with deep learning principles, without clear, authentic assessment guidelines. Sixth, the school culture and environment show resistance to change, a diverse understanding of the school community, and a lack of socialization and mentoring (*"Not all teachers want to understand deep learning..."*). The social context and external disparities, such as low socio-economic conditions in rural areas and disparities between schools, pose challenges to equitable implementation. The findings confirm that the success of deep learning is highly dependent on adaptive curriculum design, enhancing teachers' competencies, infrastructure support, and synergy with the external ecosystem.

The results of identifying various opportunities were obtained through thematic analysis of qualitative data from in-depth interviews with various key informants. The identification findings are presented in Table 1. The thematic analysis results revealed five strategic opportunities that schools can take advantage of in implementing a *deep learning-based* curriculum. First, policy and

regulatory support at the national and local levels provides an important foundation through training programs, education regulations, and policy synchronization between institutions. This is reflected in the quote: *"Policies, regulations, and programs from the government or other institutions are very supportive of the implementation of deep learning-based learning in schools.*" However, some respondents also noted that these policies have not fully addressed the root of the problem at the education unit level. Secondly, strategic partnerships with business and industry, universities, and external institutions open up real opportunities for collaboration through contextual projects, provision of professional mentors, and multi-stakeholder synergies, as asserted: *"The potential for partnerships with DUDI, universities, and external institutions is enormous ... can be utilized in project-based learning or other collaborative forms.*" Third, the demands of the world of work and 21st-century competencies are important transformation drivers for schools to focus on developing 4C skills relevant to the needs of the dynamic world of work. Fourth, the role of teachers and school autonomy provides room for creativity in local curriculum development and learning innovation, as reflected in the quote: *"The potential is very large, it is just the activeness of the teachers and the committees in the school.*" The research findings confirm that the policy ecosystem, external partnerships, future competency demands, and innovation space at the school level can be significant accelerators in optimizing the implementation of the deep learning curriculum.

Table 1 presents the results of the qualitative coding analysis in the threats category. The qualitative analysis of the *threats* indicates that five main challenges potentially hinder optimizing *deep* learning implementation in schools. First, limited external resources, including inadequate infrastructure, technology, budget, and facilities, are the fundamental obstacles as stated: *"The lack of facilities makes deep learning difficult to implement*" and *"Industry uses sophisticated tools, in schools, the nature is different specs, as a result, the effort to become a problem solver is not maximized."* Second, there are policy challenges and government support, including overly prescriptive curriculum policies, limited budget allocations, slow bureaucracy, and the political situation of leadership transitions that affect the sustainability of programs and teacher training (*"The government is facing a leadership transition period, so policies, budgets, and training are not widely available"*). Third, socio-economic influences and digital literacy also pose a threat, as students' low economic status creates a double burden outside of school, and teachers' and students' readiness to deal with technology is still limited. Fourth, there are dynamics in stakeholder responses and expectations, with society and industry generally providing positive support. Finally, despite external pressures, there are adaptive

efforts and internal strategies, such as teacher creativity, effective socialization, and the ability of education units to turn pressure into motivation to innovate (*"With the right strategy, schools can turn external pressure into motivation to keep innovating"*). The findings highlight that the successful implementation of deep learning requires risk mitigation through strengthening resources, responsive policies, and supporting a more inclusive socio-economic ecosystem.

Table 2. Managerial Strategy Based on SWOT Analysis Results

No		Opportunities (O)	Threats (T)
1	Strengths (S)	- Utilize leadership & school culture to establish partnerships with DUDI/PTs - Optimizing facilities and infrastructure & LMS to welcome 21st century competency demands - Maximizing teacher autonomy & creativity in contextual DL projects	- Using adaptive leadership & collaborative culture to maintain program stability during policy transitions - Utilizing public communication to educate the public to move beyond traditional test score orientation - Using a joyful learning approach to maintain the interest of students from low socioeconomic families
2	Weaknesses (W)	- Utilize external training programs to overcome low teacher understanding - Submit grant/CSR proposals to cover budget & ICT limitations - Adapting school autonomy to simplify a condensed curriculum to focus on 21st-century competencies	- Develop intensive mentoring/internal coaching to overcome teacher resistance & improve the evaluation system - Establish a quality team to monitor DL practices & authentic assessment - Strengthen communication with stakeholders to help limited students via scholarship/internship programs

Source: Authors' Analysis Based on Field Data (2025)

The SO strategy leverages strengths such as visionary leadership and a collaborative culture to build partnerships with industries and universities, while optimizing infrastructure and LMS to support project-based deep learning and teacher-driven curriculum innovation. The WO strategy addresses weaknesses by utilizing opportunities through training, grant funding, and curriculum simplification. ST strategies mitigate threats by strengthening leadership roles, sustaining DL programs, enhancing parental communication, and promoting joyful learning. WT strategies anticipate challenges through internal coaching, quality teams, and stakeholder engagement. These strategies form the basis of a conceptual framework for principal management in implementing the deep learning curriculum (Figure 1).

The SWOT analysis conceptual framework maps internal factors in the form of Strengths (S) and Weaknesses (W), and external factors in the form of Opportunities (O) and Threats (T). The combination of factors gives rise to four main strategies: SO Strategy, which leverages internal strengths to capture external opportunities; WO Strategy, which leverages opportunities to

overcome weaknesses; ST Strategy, which uses strengths to anticipate threats; and WT Strategy, which minimizes weaknesses from being exacerbated by threats. The four strategies are directly geared towards achieving operational outputs, which are: 1: DL curriculum is implemented thoroughly in schools, External partnerships are formed through cooperation with DUDI, universities, and related institutions, Students' 21st century competencies increase, especially in critical, creative, collaborative, and communicative thinking, Infrastructure & ICT are strengthened so that they can support the continuous DL learning process. The conceptual framework thus provides an integrative and systematic relationship from condition identification to strategy formulation, then to outcome targets, as a basis for school management planning and decision-making in implementing learning innovations.

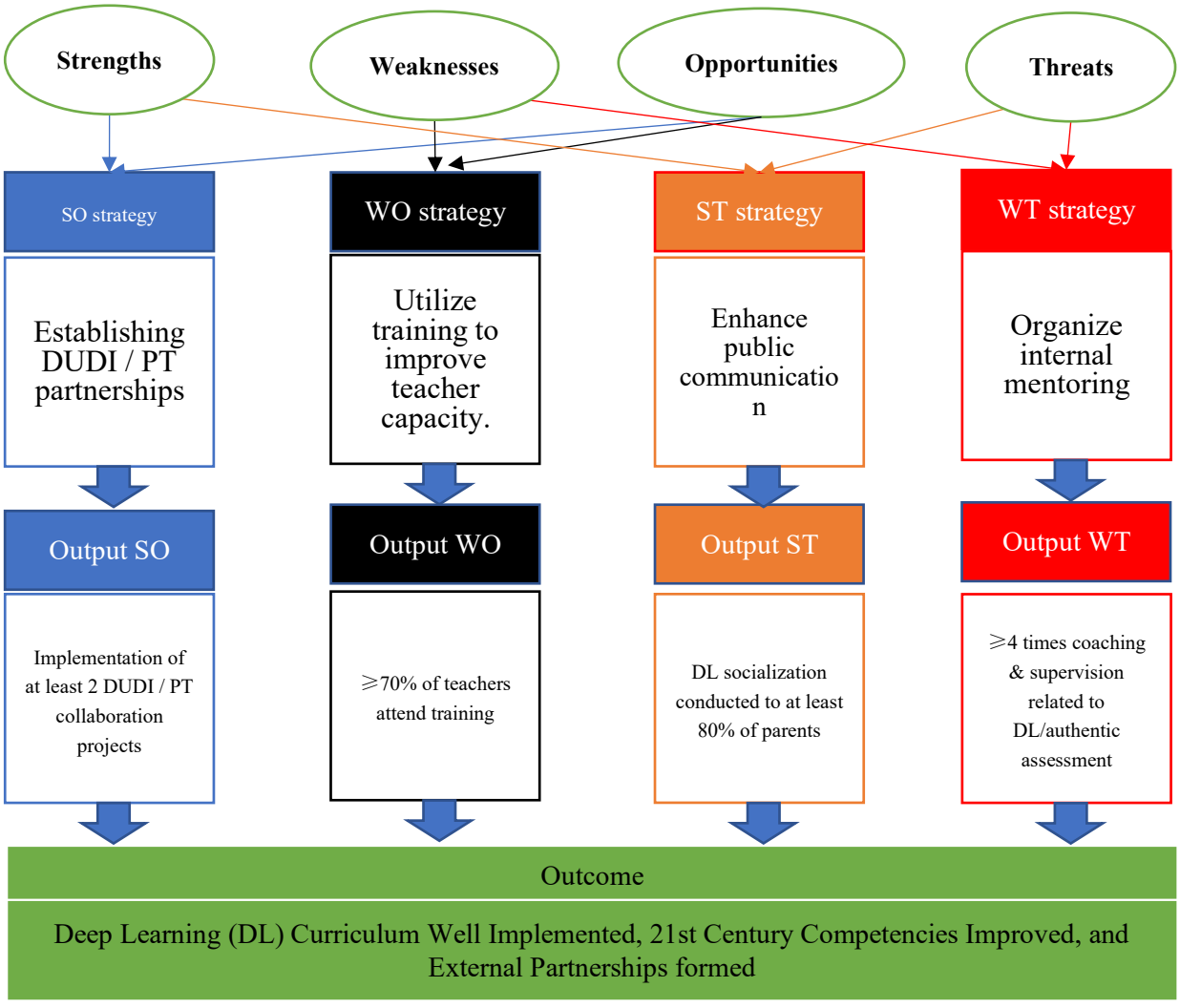

Figure 1. Conceptual Framework of Principal's Managerial Strategy

Discussion

Strengths and Weaknesses in Implementing the Deep Learning Curriculum

The strengths of principals' management in implementing the deep learning curriculum in vocational schools lie in adaptive leadership, strategic vision, human resource development, adequate infrastructure, and an innovation-friendly school culture. Supportive infrastructure and openness to industry and community engagement further enhance implementation. These findings align with Tsai et al. (2022) and Deschaine & Jankens (2017), underscoring the importance of visionary leadership and cultural renewal. Nonetheless, sustained external support remains essential to optimize these strengths.

Key weaknesses in principals' management of deep learning implementation in vocational schools include rigid and non-contextual curriculum planning, limited teacher competence, inadequate infrastructure, weak external partnerships, and ineffective evaluation systems. The curriculum is often overly dense and lacks space for critical thinking and creativity. Poor collaboration with industry and unclear assessment guidelines further hinder progress. Echoing Setiawan et al. (2024), Moulida et al. (2022), and Shoho & Barnett (2010), these structural and cultural barriers can be mitigated through enhanced professional development, stronger external collaboration, and the development of evaluation systems aligned with deep learning principles.

Principals' strengths in strategic, adaptive leadership, fostering an innovation-oriented culture, and supporting human and infrastructure development play a crucial role in addressing internal challenges in implementing the deep learning curriculum in vocational schools. Empirical evidence shows that principals provide a clear vision, promote collaboration, facilitate teacher training, and ensure access to ICT facilities such as multimedia rooms and LMS (Cattaneo et al., 2025; Smith et al., 2021). While these strengths are significant, broader success depends on systemic support and policy interventions to address resource gaps beyond the school's capacity (Levin, 2024).

Opportunities and Threats in Implementing Deep Learning Curriculum

Several external factors present strategic opportunities for implementing the deep learning curriculum in vocational schools, including progressive education policies, partnerships with industry and universities, labor market demands for 21st-century skills, school autonomy, and character-focused learning orientations. Although current policies and training initiatives support teacher development, they often fall short of addressing core issues. Nonetheless, collaboration with

external stakeholders enables project-based learning and multi-party engagement, while workforce demands for 4C competencies push schools toward more critical and creative pedagogies. Curriculum autonomy further allows contextual and character-driven learning design. The findings align with Sukardjo & Sugiyanta (2018), McPhail (2020), and Weng et al. (2023), who emphasize the synergistic role of policy, autonomy, and industry collaboration in driving educational transformation.

There are several external threats to principals' management in implementing the deep learning curriculum in vocational schools, include limited resources, inconsistent government policies, socio-economic constraints, low digital literacy, and stakeholder expectations misaligned with 21st-century learning goals. Interviews highlight inadequate infrastructure, rigid policies, bureaucratic delays, and minimal training access as major barriers. Socio-economic hardships affect students' focus, while both teachers and students often lack digital competence. Additionally, societal pressure favoring traditional academic metrics and inter-school competition further hinders innovation. These findings support the views of Haryani et al. (2021), Sutikno et al. (2019), and Moulida et al. (2022), who emphasize policy rigidity, funding limitations, and cultural constraints as obstacles to educational innovation. Nevertheless, some principals navigate these challenges through adaptive leadership, resource optimization, and strategic stakeholder engagement.

Opportunities and threats in implementing the deep learning curriculum in vocational schools are closely tied to the dynamics of national and regional education policies. While current policies offer potential through teacher development programs, curriculum autonomy, and innovation training, they remain inconsistent and often fail to address fundamental issues such as budget limitations, bureaucratic delays, and regional disparities in infrastructure. Leadership transitions and prescriptive national curricula further limit schools' flexibility. These findings underscore that education policy serves as both an enabler and a constraint, shaping the space and resources for curriculum innovation. This aligns with McPhail (2020), Tsai et al. (2022), and Haggis (2003), who emphasize that policy coherence, funding adequacy, and technical support are essential for equitable and sustainable reform. Ultimately, the effectiveness of these policies hinges on their alignment across governance levels and the capacity of principals to leverage them through visionary leadership and multi-stakeholder engagement.

Local dynamics and school-specific contexts significantly shape the opportunities and threats in implementing the deep learning curriculum in vocational schools. Urban schools benefit from stronger partnerships, better ICT access, and higher digital literacy, while rural and private schools often face limited resources, low socio-economic conditions, and restricted training access. These disparities highlight how geographic location, school type, and socio-economic background influence a school's capacity to respond to external pressures. This aligns with Duan et al. (2024), Ma et al. (2024), and Tao (2025), who emphasize that micro-level factors (such as infrastructure, organizational culture, and resource availability) are critical to educational innovation. Thus, the ability of school principals to strategically navigate and leverage their local context plays a decisive role in the successful implementation of deep learning.

SWOT Analysis-Based Managerial Strategies for Strengthening Deep Learning Implementation

Based on the SWOT analysis, several strategic recommendations are proposed for SMK principals to enhance the implementation of the deep learning curriculum. Key strategies include leveraging instructional leadership to foster an innovation-driven culture, building partnerships with industry and universities, and optimizing infrastructure and LMS for project-based learning. Principals are encouraged to support teacher autonomy in contextual curriculum design, simplify curriculum content, and strengthen teacher capacity through training, grant acquisition, and sustained mentoring. To mitigate external threats, strategies should focus on ensuring program continuity amid policy shifts, enhancing quality management, stakeholder communication, and formalizing external collaborations. These approaches reflect the principal's role in bridging macro policies with school-level realities (Li, 2024), consistent with Sutikno et al. (2019) and Moulida et al. (2022), who stress collaborative leadership and systematic professional development. Ultimately, success depends on resource availability, stakeholder alignment, and adaptive implementation tailored to each school's context.

The SO, WO, ST, and WT strategies derived from the SWOT analysis can be practically applied by SMK principals to strengthen deep learning implementation aligned with 21st-century competencies. These strategies integrate strategic leadership, capacity building, quality management, and external collaboration. For the SO strategy, principals can lead the redesign of local curricula embedding deep learning and 4C skills, alongside initiating at least two collaborative projects with industry or universities annually. WO strategies involve sending ≥70% of teachers to relevant training, securing grants/CSR to procure a minimum of five ICT units, and contextualizing

the curriculum. The ST strategy emphasizes program sustainability during policy transitions through a quality management team and proactive public communication. Meanwhile, the WT strategy focuses on conducting at least four coaching sessions to address teacher resistance and establishing an assessment team to develop standardized deep learning evaluation tools.

The strategy formulation is grounded in educational strategic management principles, which emphasize leveraging internal strengths and external opportunities while addressing weaknesses and threats to drive curriculum innovation. As noted by Prasetya et al. (2025), effective transformation relies on the synergy between principal leadership, teacher collaboration, facility optimization, and multi-stakeholder engagement. This aligns with Hamm & Robertson (2010), who underscore the importance of systematic training, industry partnerships, and leadership in shaping a culture of learning innovation. Ruhalahti et al. (2018) further highlight the role of internal supervision and quality assurance in reducing resistance and ensuring effective project-based learning. However, due to disparities in human resources, budgets, and partnerships, these strategies must be flexibly adapted to fit each school's local context.

Managerial strategies derived from the SWOT analysis can be operationalized through planned, measurable school-level programs involving multiple stakeholders to support effective deep learning implementation. Under the SO strategy, principals and curriculum teams can develop integrated project-based learning through formal collaborations with industry, such as guided internships, industry-led training, or product-based mentorship. The WO strategy can be implemented by utilizing internal MGMP forums to disseminate deep learning training outcomes, ensuring broader teacher capacity building. For the ST strategy, principals may initiate dialogue with school committees and parents to promote understanding of deep learning and maintain clear communication during policy transitions. Meanwhile, the WT strategy involves forming authentic assessment support teams to provide regular coaching for teachers facing challenges in implementing process-based evaluation.

CONCLUSION

The research identified several key strengths of the principal's management in supporting the implementation of the deep learning curriculum in SMK, including visionary and adaptive strategic leadership, human resource development through facilitating teacher training and strengthening 21st century competencies for students, the availability of supporting infrastructure

and technology, a school culture that is open to innovation, and external partnerships that are responsive to new learning approaches. The results of the study found various internal weaknesses that pose challenges, such as a curriculum that is too dense and less flexible, low teacher understanding of the concept of deep learning, limited budget, infrastructure, and ICT, suboptimal external support, and evaluation that tends to be traditional. Opportunities that school principals can utilize include the existence of national and regional policies that support learning innovation, the potential for strategic partnerships with business and industry and universities, the demands of the world of work for competence, and teacher autonomy in learning. The research findings succeeded in formulating managerial strategies that can be applied by school principals, both in the form of aggressive strategies (SO) by maximizing internal advantages to seize external opportunities, diversification strategies (WO) to improve weaknesses by taking advantage of opportunities, stabilization strategies (ST) in anticipating threats with existing strengths, and defensive strategies (WT) to minimize weaknesses so as not to be affected by further threats.

REFERENCES

Amrullah, A., Martono, T., Mafruhah, I., Sabandi, M., Muzakir, M. A. I., & Hermanu, A. I. (2025). Optimizing Vocational Education Management: A Study on Indonesian State Vocational High Schools. *Educational Process: International Journal*, *15*. https://doi.org/10.22521/edupij.2025.15.129

Baiyang, D., Suwancharas, T., Mingmit, N., & Juichamlong, A. (2025). Educational Management Strategies Development for Improving Students' Sustainable Learning Ability in Higher Vocational Colleges in Guangdong Province. *International Journal of Education and Literacy Studies*, *13*(1), 229–241. https://doi.org/10.7575/aiac.ijels.v.13n.1p.229

Beattie, V., Collins, B., & McInnes, B. (1997). Deep and surface learning: A simple or simplistic dichotomy? *Accounting Education*, *6*(1), 1–12. https://doi.org/10.1080/096392897331587

Cattaneo, A., Schmitz, M. L., Gonon, P., Antonietti, C., Consoli, T., & Petko, D. (2025). The Role of Personal and Contextual Factors When Investigating Technology Integration in General and Vocational Education. *Computers in Human Behavior*, *163*, Article 108475. https://doi.org/10.1016/j.chb.2024.108475

Cechovsky, N. (2025). Exploring the Didactic Principles of Vocational Teachers in Financial Education: An Interview Study. *International Journal for Research in Vocational Education and Training*, *12*(3), 360–382. https://doi.org/10.13152/ijrvet.12.3.3

Deschaine, M. E., & Jankens, B. P. (2017). Creating Successful and Sustainable Educational Administrative Internship Experiences. *Higher Education, Skills and Work-Based Learning*, *7*(1), 5–20. https://doi.org/10.1108/HESWBL-02-2016-0008

Duan, Y., Zhou, F., Li, X., Geng, L., & Yue, S. (2024). Is Better Readiness the Key to Deeper Learning in Distance Education? A Cross-Sectional Online Study. *Heliyon*, *10*(9), Article e30602. https://doi.org/10.1016/j.heliyon.2024.e30602

Gkoltsiou, A., & Paraskevopoulou, A. (2021). Landscape Character Assessment, Perception Surveys of Stakeholders, and SWOT Analysis: A Holistic Approach to Historical Public Park

Management. *Journal of Outdoor Recreation and Tourism*, *35*, Article 100418. https://doi.org/10.1016/j.jort.2021.100418

Hafis, M., Syahril, S., Refdinal, R., & Prasetya, F. (2023). Optimizing Learning Engagement and Performance in Technical Education: Harnessing the Power of Video Tutorials for Enhanced Motivation and Skill Development in Shield Metal Arc Welding Subject. *Journal of Engineering Researcher and Lecturer*, *2*(3), 120–128. https://doi.org/10.58712/jerel.v2i3.112

Haggis, T. (2003). Constructing Images of Ourselves? A Critical Investigation Into "Approaches to Learning" Research in Higher Education. *British Educational Research Journal*, *29*(1), 89–104. https://doi.org/10.1080/0141192032000057401

Hamm, S., & Robertson, I. (2010). Preferences for Deep-Surface Learning: Avocational Education Case Study Using a Multimedia Assessment Activity. *Australasian Journal of Educational Technology*, *26*(7), 951–965. https://doi.org/10.14742/ajet.1027

Haryani, E., Cobern, W. W., Pleasants, B. A.-S., & Fetters, M. K. (2021). Analysis of Teachers' Resources for Integrating the Skills of Creativity and Innovation, Critical Thinking and Problem Solving, Collaboration, and Communication in the Science Classroom. *Jurnal Pendidikan IPA Indonesia*, *10*(1), 92–102. https://doi.org/10.15294/jpii.v10i1.27084

Jiang, R. (2022). Understanding, Investigating, and Promoting Deep Learning in language Education: A Survey on Chinese College Students' Deep Learning in the Online EFL Teaching Context. *Frontiers in Psychology*, *13*(7), 1–18. https://doi.org/10.3389/fpsyg.2022.955565

Kanyakan, P., Masena, C., Singhaphan, P., Taochan, S., & Khantharee, N. (2024). Strategies to Manage Vocational Education to Excellence. *Journal of Education and Learning*, *14*(2), 230. https://doi.org/10.5539/jel.v14n2p230

Khurniawan, A. W., Sailah, I., Muljono, P., Indriyanto, B., & Maarif, M. S. (2021). Improving the Effectiveness of School-Based Enterprise: A Structural Equation Modeling in Vocational School management. *International Journal of Evaluation and Research in Education*, *10*(1), 161–173. https://doi.org/10.11591/ijere.v10i1.20953

Kovač, V. B., Nome, D., Jensen, A. R., & Skreland, L. L. (2025). The why, what, and how of deep learning: critical analysis and additional concerns. *Education Inquiry*, *16*(2), 237–253. https://doi.org/10.1080/20004508.2023.2194502

Kumpliw, B., Sirisuthi, C., & Prasertphorn, V. (2025). Model Development for Effective Vocational Education Management of Bachelor's Degree Program in the Institute of Vocational Education in the Northeast. *Higher Education Studies*, *15*(2), 294. https://doi.org/10.5539/hes.v15n2p294

Lertlam, K., Sirisuthi, C., & Prasertporn, V. (2024). Program Development for Enhancing Teachers' Competencies in Teaching Railway Control and Maintenance in Vocational Colleges under the Office of Vocational Education Commission. *International Education Studies*, *17*(4), 16. https://doi.org/10.5539/ies.v17n4p16

Levin, O. (2024). Simulation as a Pedagogical Model for Deep Learning in Teacher Education. *Teaching and Teacher Education*, *143*, Article 104571. https://doi.org/10.1016/j.tate.2024.104571

Li, S. (2024). The Transformation of Vocational Education in the Context of Deep Learning Theory: Actual Dilemma and Practical Path. *Proceedings of the 4th International Conference on New Media Development and Modernized Education (NMDME 2024)*, 193–201. https://doi.org/10.2991/978-94-6463-600-0_23

Liang, H., Bangkheow, P., Sethakhajorn, S., & Bangkheow, P. (2025). Educational Management Strategies to Promote the Sustainable Development of Entrepreneurship of Students in Higher Vocational Colleges. *Higher Education Studies*, *15*(1), 188. https://doi.org/10.5539/hes.v15n1p188

Ma, Z., Ruannakarn, P., & Jansaeng, A. (2024). The Role of Blended Instructional Models Based on Deep Learning Theory in Enhancing Students' Autonomous Learning Ability in Chinese

Higher Vocational Colleges. *Journal of Statistics Applications and Probability*, *13*(3), 947–959. https://doi.org/10.18576/jsap/130309

McPhail, G. (2020). The Search for Deep Learning: A Curriculum Coherence Model. *Journal of Curriculum Studies*, *53*(4), 420–434. https://doi.org/10.1080/00220272.2020.1748231

Meinokat, P., & Wagner, I. (2025). Classroom Disruptions and Classroom Management in Learning Factory Settings at Vocational Schools. *International Journal for Research in Vocational Education and Training*, *12*(2), 266–288. https://doi.org/10.13152/IJRVET.12.2.5

Meirani, R. K., & Intania, N. (2023). Key Elements of Total Quality Management Implementation in Vocational High School. *Proceedings of International Conference on Research in Education and Science*, *9*(1), 424–439.

Moulida, C. W., Yusrizal, & Niswanto. (2022). Principal Management in Improving Teacher Quality at State Vocational High School. *Al-Ishlah: Jurnal Pendidikan*, *14*(1), 679–685. https://doi.org/10.35445/alishlah.v14i1.545

Nilashi, M., Ali Abumalloh, R., Keng-Boon, O., Wei-Han Tan, G., Cham, T. H., & Cheng-Xi Aw, E. (2024). Unlocking Sustainable Resource Management: A Comprehensive SWOT and Thematic Analysis of FinTech with a Focus on Mineral Management. *Resources Policy*, *92*(1), Article 105028. https://doi.org/10.1016/j.resourpol.2024.105028

Pambudi, N. A., Riva Nanda, I., Tahta Alfina, F., & Zulfia Syahrial, A. (2024). Renewable Energy Education and Awareness Among Indonesian Students: Exploring Challenges and Opportunities for a Sustainable Future. *Sustainable Energy Technologies and Assessments*, *63*(February), 103631. https://doi.org/10.1016/j.seta.2024.103631

Prasetya, F., Fortuna, A., Samala, A. D., Latifa, D. K., Andriani, W., Gusti, U. A., Raihan, M., Criollo-C, S., Kaya, D., & Cabanillas García, J. L. (2025). Harnessing Artificial Intelligence to Revolutionize Vocational Education: Emerging Trends, Challenges, and Contributions to SDGs 2030. *Social Sciences and Humanities Open*, *11*, Article 101401. https://doi.org/10.1016/j.ssaho.2025.101401

Puyt, R. W., Lie, F. B., & Wilderom, C. P. M. (2023). The Origins of SWOT Analysis. *Long Range Planning*, *56*(3), 102304. https://doi.org/10.1016/j.lrp.2023.102304

Ruhalahti, S., Aarnio, H., & Ruokamo, H. (2018). Deep Learning Evaluation in Vocational Teacher Education: Conducted on the Principles of Authentic and Dialogical Collaborative Knowledge Construction. *Nordic Journal of Vocational Education and Training*, *8*(2), 22–47. https://doi.org/10.3384/njvet.2242-458x.188222

Setiawan, Z., Sumardjoko, B., Prayitno, H. J., & Muhibbin, A. (2024). Mixing Educational System: Progressive Learning at SMA Muhammadiyah PK Surakarta. *International Journal of Religion*, *5*(4), 374–383. https://doi.org/10.61707/8K25XH50

Shoho, A. R., & Barnett, B. G. (2010). The Realities of New Principals: Challenges, Joys, and Sorrows. *Journal of School Leadership*, *20*(5), 561–596. https://doi.org/10.1177/105268461002000503

Sirk, M. (2024). Professionality Model for Vocational Teachers: Based on the Example of Estonian Vocational Teachers in the Changing VET Context. *Interchange*, *55*(2), 211–240. https://doi.org/10.1007/s10780-024-09519-w

Smith, T. E., Reinke, W. M., Herman, K. C., & Sebastian, J. (2021). Exploring the Link Between Principal Leadership and Family Engagement Across Elementary and Middle School. *Journal of School Psychology*, *84*(December 2020), 49–62. https://doi.org/10.1016/j.jsp.2020.12.006

Smith, T. W., & Colby, S. A. (2007). Teaching for Deep Learning. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *80*(5), 205–210. https://doi.org/10.3200/tchs.80.5.205-210

Srichai, K., & Wongsaphan, M. (2022). Implementation of the Trisikkha Plus Learning Management Model to Enhance the Characteristics of Good Citizenship for Vocational Certificate Students.

Journal of Educational Issues, *8*(2), 359. https://doi.org/10.5296/jei.v8i2.20109

Sukardjo, M., & Sugiyanta, L. (2018). Measurement of Usability for Multimedia Interactive Learning Based on a Website in Mathematics for SMK. *IOP Conference Series: Materials Science and Engineering*, *336*(1). https://doi.org/10.1088/1757-899X/336/1/012032

Sutikno, Baedhowi, Siswandari, & Roemintoyo. (2019). Concept of E-Mon Prakerin Model for Internship Monitoring in Vocational High School. *IOP Conference Series: Earth and Environmental Science*, *243*(1). https://doi.org/10.1088/1755-1315/243/1/012119

Tao, L. (2025). Improving the Quality of Vocational Education in Higher Vocational Colleges Based on Deep Learning Technology: Student Learning Prediction and Personalized Recommendation. *Journal of Advanced Computational Intelligence and Intelligent Informatics*, *29*(2), 407–416. https://doi.org/10.20965/jaciii.2025.p0407

Thongrasamee, P., Sirisuthi, C., & Agsonsua, P. (2025). Program Development for Enhancing Competencies of Vocational College Teachers in Mechatronics and Robotics under the Office of the Vocational Education Commission. *International Education Studies*, *18*(1), 23. https://doi.org/10.5539/ies.v18n1p23

Tsai, C. C., Chung, C. C., Cheng, Y. M., & Lou, S. J. (2022). Deep Learning Course Development and Evaluation of Artificial Intelligence in Vocational Senior High Schools. *Frontiers in Psychology*, *13*, 1–18. https://doi.org/10.3389/fpsyg.2022.965926

Utami, I. S., Rochintaniawati, D., Rusdiana, D., & Suwarma, I. R. (2022). Understanding The Nature of Science (NOS) of In-Service Science Teachers: Instructional Practices and Their Implications on Renewable Energy. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *8*(2), 315–324. https://doi.org/10.21009/1.08213

Wang, M., Zheng, Y., Ma, S., & Lu, J. (2024). Does Higher Vocational Education Matter for Rural Revitalization? Evidence from China. *Humanities and Social Sciences Communications*, *11*(1). https://doi.org/10.1057/s41599-024-03471-x

Weng, C., Chen, C., & Ai, X. (2023). A Pedagogical Study on Promoting Students' Deep Learning Through Design-Based Learning. *International Journal of Technology and Design Education*, *33*(4), 1653–1674. https://doi.org/10.1007/s10798-022-09789-4

Weng, X., Gu, M. M., Xia, Q., & Chiu, T. K. F. (2025). SWOT Analysis of Al Empowered Entrepreneurship Education: Insights from Digital Learners in Higher Education. *Thinking Skills and Creativity*, *56*, Article 101763. https://doi.org/10.1016/j.tsc.2025.101763

Yanhua, Z., Bangkhe, P., Sethakhajorn, S., Bangkheow, P., & Jujia, C. (2025). Research on Strategies for Promoting the Education Management of Higher Vocational College Students' Sustainable Career Planning Based on the SCCT Theory and SWOT Analysis. *International Journal of Education and Literacy Studies*, *13*(1), 205–217. https://doi.org/10.7575/aiac.ijels.v.13n.1p.205