Digital Entrepreneurship Learning (DEL) as an Emerging Trend and Future Directions in Vocational Education: A Systematic Literature Review

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Abstract. Digital entrepreneurship education is crucial in equipping vocational graduates to face global economic transformation. This study aims to analyze the evolution of Digital Entrepreneurship Learning (DEL) in vocational education from 2019 to 2024, identifying trends, strategies, and learning outcomes that are evaluated. This Systematic Literature Review analyzed 26 articles selected from the Scopus, Web of Science, and Google Scholar databases. The research findings show a growing integration of digital technology, an emphasis on developing digital competencies and self-efficacy in entrepreneurship, and the adoption of innovative learning methodologies such as Project-Based Learning and gamification. Psychological and environmental factors also influence students' intentions toward digital entrepreneurship. This study concluded that DEL has developed into a more mature and holistic approach, crucial in shaping vocational graduates as job creators in the digital era.

Keywords: digital entrepreneurship learning; learning outcomes; strategies; trends; vocational education

INTRODUCTION

The development of the digital economy has transformed the global labor market landscape and positioned digital entrepreneurship as a key competency in building economic resilience and future competitiveness (Alzamel, 2024). Entrepreneurship drives economic growth, innovation, and job creation, making it an essential competency that the future workforce must master (Igwe et al., 2021). This fundamental change demands that education systems, including vocational education, adapt and equip learners with relevant entrepreneurial skills and mindsets (Bratianu et al., 2020).

Data show that countries with high levels of entrepreneurial activity have lower unemployment rates and stronger Gross Domestic Product (GDP), underscoring the urgency of fostering an entrepreneurial spirit from an early age.

Despite the recognized importance of entrepreneurship, a significant gap remains between the labor market's need for entrepreneurial talent and the supply from vocational education institutions, especially in developing countries (Orlando et al., 2021). Unemployment rates among young graduates, including vocational education graduates, remain a concern in many countries, showing that the skills being taught may not fully align with the dynamic demands of the job market. Specifically, reports and studies show that graduates often lack 21st-century skills such as digital literacy, critical thinking, and adaptation to technological change, all of which are crucial for entrepreneurial success in the digital age (Mahmud & Wong, 2022). This raises serious questions about the effectiveness of entrepreneurship education programs in equipping students with the competencies needed to become job creators rather than job seekers.

Several factors drive this gap. First, traditional entrepreneurship curricula in vocational education may not yet fully integrate the digital dimension that is now the backbone of modern business models (Zeng et al., 2024). These programs often focus on conventional business aspects, ignoring how technology drives innovation, marketing, and operational management. Second, passive and less interactive teaching methods may not foster an active, creative, and risk-taking entrepreneurial mindset (Iddris, 2024). Third, the lack of digital competence among some teaching staff and adequate facilities for technology-based learning can also be an obstacle. These conditions result in low digital entrepreneurship intent and the readiness of vocational education graduates to enter the increasingly digital business world, as shown by several studies showing that while there is interest, the intent to engage in digital entrepreneurship still needs to be enhanced (Muhazir & Retnawati, 2020).

The challenges faced highlight the urgency of finding effective solutions, optimizing the development of digital entrepreneurship skills and interest among vocational education students (Jardim, 2021). Global economic crises, such as those caused by the COVID-19 pandemic, further emphasize the need for individuals who can adapt and create new opportunities rather than relying solely on formal employment. By studying this phenomenon, we can identify the most effective pedagogical and curricular strategies for developing Digital Entrepreneurship Learning (DEL) that equips students with the skills and confidence needed to succeed in the digital economy. This research is also relevant to government policies that increasingly promote the development of digital-based SMEs as the backbone of the national economy (Aminullah et al., 2022).

One promising solution to address this issue is the implementation of Digital Entrepreneurship Learning (DEL) in vocational education curricula. DEL is a learning approach that explicitly integrates digital skills, entrepreneurial thinking, and digital business practices (Sitaridis & Kitsios, 2023). The importance of this solution lies in its ability to bridge the gap between education and the demands of the digital job market (Karokolis et al., 2022). With DEL, students not only learn entrepreneurial theory but also how to use digital tools and platforms to develop business ideas, market products, manage operations, and adapt to transforming market trends. This approach enables the development of holistic competencies, including digital literacy, entrepreneurial self-efficacy, and innovative entrepreneurial thinking.

Several major theories explain DEL as an independent variable. First, Social Learning Theory provides a framework for understanding how students gain skills and self-efficacy through observation, imitation, and direct experience in a digital entrepreneurship environment (Ozer, 2022). Second, the Theory of Planned Behavior explains attitudes toward behavior, subjective norms, and perceived behavioral control (Bosnjak et al., 2020) influenced how entrepreneurial intentions. DEL can directly influence these three components by fostering positive attitudes toward digital entrepreneurship, demonstrating social support such as online collaboration, and enhancing self-control through mastery of digital skills. Third, the Competency-Based Approach emphasizes the development of a set of specific competencies required for digital entrepreneurship, such as digital literacy, the ability to identify digital opportunities, and digital risk management (Malhotra et al., 2023).

The advantages of DEL as a solution lie in several key points. First, DEL directly prepares students for the demands of the digital economy, equipping them with skills that are highly sought after by industry and enabling them to create their own job opportunities (Sitaridis & Kitsios, 2023). Second, through hands-on experience with digital tools and platforms, students can develop greater confidence in their ability to start and manage digital businesses (Suarez et al., 2022). Third, DEL encourages students to think outside conventional boundaries, leveraging technology

to develop innovative solutions and business models (de Waal & Maritz, 2022). Fourth, Flexibility and Accessibility: By leveraging digital learning platforms, DEL can provide more flexible and widespread access to entrepreneurship education, overcoming geographical and time barriers (Chen et al., 2021).

Several studies have explored the relationship between entrepreneurship education and entrepreneurial intention, with some highlighting the role of digital competence. For example, a study by Sutiadiningsih et al. (2025) found that digital competencies influence vocational students' entrepreneurial intentions through the mediation of entrepreneurial mindset and entrepreneurial self-efficacy. Similarly, Ganefri et al. (2023) showed that digital entrepreneurship education and digital entrepreneurship knowledge can enhance students' digital entrepreneurial intentions, with digital entrepreneurial vigilance acting as a mediating variable. Other studies also show that factors such as creative self-efficacy (Akbari et al., 2020), entrepreneurial interest (Wu & Tian, 2022), and internship experience significantly influence vocational students' entrepreneurial intentions (Mensah et al., 2023). Using gamification in online entrepreneurship education has also proven effective in influencing digital entrepreneurship intentions (Ruiz-Alba et al., 2023).

Although many studies have discussed entrepreneurship education and entrepreneurial intent, the focus on Digital Entrepreneurship Learning (DEL) as an emerging trend and future direction in vocational education through systematic review is still limited. Previous research focuses on single case studies, analysis of relationships between variables in specific samples, or more general reviews of entrepreneurship education. The novelty of this research lies in its effort to conduct a comprehensive Systematic Literature Review (SLR). This SLR will synthesize findings from various relevant studies to identify patterns, gaps, and emerging trends in DEL within vocational education. This will provide a more holistic and structured understanding of how DEL is developing and its potential future directions, something that previous studies rarely discuss within a systematic research framework.

Based on the background, problem identification, and urgency of the research described above, this study focuses on Digital Entrepreneurship Learning (DEL) as an Emerging Trend and Future Directions in Vocational Education. The primary aim of this Systematic Literature Review is to analyze existing literature on Digital Entrepreneurship Learning in vocational education, identify emerging trends, and plan future directions for research and practice. Specifically, this study aims to investigate how the implementation of DEL in vocational education has developed over the past five years (2019-2024), as reviewed from emerging trends, learning strategies, and reported learning outcomes.

METHOD

This study adopts a Systematic Literature Review (SLR) approach, which aims to analyze published literature on Digital Entrepreneurship Learning (DEL) in vocational education. The SLR approach enables the systematic and comprehensive identification, evaluation, and synthesis of findings from various relevant studies, providing a holistic overview of emerging trends, learning strategies, and reported learning outcomes in implementing DEL over the past five years (2019–2024). This method ensures the transparency and reproducibility of research findings.

This study searched on several highly reputable scientific databases covering publications in the fields of education, entrepreneurship, and technology. The databases used included Scopus, Web of Science, and Google Scholar. Selected articles span the publication dates between January 2019 and May 2024. The selection of this time span was based on the desire to capture current trends and future directions in DEL relevant to the Industrial Revolution 4.0. Selected articles should explicitly address Digital Entrepreneurship Learning, digital entrepreneurship education, or integrating digital skills in entrepreneurship education, particularly in vocational education (including TVET, vocational education, and polytechnics). Peer-reviewed journal articles, officially published conference proceedings, and theses/dissertations available in full-text.

The literature selection process followed the PRISMA diagram with four main stages. First, the identification process yielded 273 articles found from various databases. Second, screening of titles and abstracts reduced the selection to 108 articles that met the initial criteria. Third, an eligibility evaluation of full texts identified 25 articles that met the inclusion criteria. Fourth, this study analyzed these 26 in depth to synthesize the findings. This process guarantees that this systematic review incorporates only relevant and high-quality literature.

RESULT AND DISCUSSION

Result

This section presents the synthesized results of a systematic literature review on Digital Entrepreneurship Learning (DEL) as an emerging trend and future direction in vocational education. This study synthesizes key findings from the 26 articles to provide a comprehensive overview of the implementation strategies, research focus, key findings, and emerging trends in DEL over the period from 2019 to 2024. Table 1 presents a detailed summary of each reviewed article.

TABLE 1. Digital Entrepreneurship Learning in Vocational Education (2019-2024)

No	Author & Year	Research Focus	Strategy/Method	Key Findings	Emerging Trends
1	Zuo et al. (2025)	Lifelong learning in vocational education strengthens entrepreneurship and innovation strategies	Game-theoretic model	Strengthening lifelong learning policies, enhancing innovation and adaptability	Lifelong learning, adaptive policies
2	Farrow (2019)	Utilization of MOOCs to improve employability and entrepreneurship	Rapid assessment review	Increased learning flexibility and CPD/CE credibility	MOOC, flexible learning
3	Putra et al. (2020)	Development of e-marketing-based MOOCs for entrepreneurship management	R&D; class trial	The effectiveness of MOOCs improves entrepreneurship administration	MOOC e-marketing, digital integration
4	Kholifah et al. (2022)	Structural model of entrepreneurial personality based on digital literacy	SEM (597 vocational students)	Significant influence of digital literacy, interest, and self-efficacy	Digital literacy, self-efficacy
5	Puni et al. (2018)	Self-efficacy as mediation between education and entrepreneurial intention	Linear regression (357 respondents)	Knowledge and opportunity recognition increase entrepreneurial intention	Self-efficacy, knowledge recognition
6	Ratten & Jones (2021)	Digital transformation in entrepreneurship education	Editorial	A new digital-based pedagogical approach is needed	Digital transformation of education
7	Xin & Ma (2023)	Gamification of digital entrepreneurship education	SEM; layered mediation	Gamification increases digital entrepreneurial intention	Gamification, digital entrepreneurial intention

No	Author & Year	Research Focus	Strategy/Method	Key Findings	Emerging Trends
8	Tantawy et al. (2021)	Creativity as a determinant of entrepreneurial intention	Pre-post survey	Creative self-efficacy increases entrepreneurial intention	Creativity, creative self-efficacy
9	Iwu et al. (2021)	Education, curriculum, and lecturer competence in entrepreneurial intention	Cross-sectional survey	Lecturer competence is important in generating intention	Lecturer competence, entrepreneurial intention
10	Wardana et al. (2020)	The role of self-efficacy and attitude as mediators	SEM; online survey	Attitude and self-efficacy are the main links between education and mindset	Entrepreneurial mindset, attitude
11	Yousaf et al. (2022)	The role of culture as a moderator of entrepreneurship education	PLS-SEM (735 respondents)	Educational efficacy increases with the influence of culture	Culture as a moderator of education
12	Ni & Ye (2018)	Entrepreneurial human capital in Chinese vocational schools	Survey (730 students)	Competence and knowledge mediate entrepreneurial intention	Entrepreneurial human capital
13	Perić et al. (2020)	The role of vocational education in shaping competencies	Survey (1272 students)	Extracurricular activities are more influential than the formal curriculum	Extracurricular vs formal curriculum
14	Hariyanto et al. (2023)	Application of entrepreneurship-based Project-Based Learning	Quasi-experiment	The project model produces better outcomes than lectures	Project-based learning (PBL)
15	Sutiadiningsih et al. (2025)	Digital competence as a predictor of entrepreneurial intention	SEM; 250 vocational students	Efficacy and mindset as mediators	Digital competence, mindset
16	Wibowo et al. (2023)	The role of digital entrepreneurial vigilance in digital entrepreneurial intention	PLS-SEM	Alertness as a mediator of digital entrepreneurial intention	Digital entrepreneurial alertness
17	Triyono et al. (2023)	Effect of EO & digital competence on intention	SEM; 757 students	EO as mediator and digital competence as moderator	Entrepreneurial orientation, digital competence

No	Author & Year	Research Focus	Strategy/Method	Key Findings	Emerging Trends
18	Wafi et al. (2023)	Post-COVID TVET Talent Management Module	Mixed method	9 important variables, including digital technology	Digital talent management
19	Fawaid et al. (2022)	Structural model of vocational students' entrepreneurial intention	SEM; 618 students	Technology, internship, and digital marketing play a significant role	Digital marketing, internship, efficacy
20	Zeng et al. (2024)	Framework for digital entrepreneurship curriculum development in TVET	Content analysis	Four curriculum components: objectives, content, organization, evaluation	Digital-based curriculum
21	Wibowo et al. (2024)	TAM model for digital entrepreneurial intention	PLS-SEM; 309 university students	Digital self-efficacy as the main mediator	TAM, perceived usefulness
22	Darmanto et al. (2023)	Competence and digital career maturity	PLS-SEM; 184 entrepreneurs	Mediate digital competence on business performance	Career maturity, digital competency
23	Lesinskis et al. (2023)	KABADA digital tools and Generation Z intentions	Quasi-experiment	Positive but not significant effect on all dimensions	AI-based tools (KABADA)
24	Stadler & Smith (2017)	Vocational learning conditions and entrepreneurial attitudes	Case study	Vocational conditions influence perceptions of entrepreneurial learning	Vocational experience, lecturer influence
25	Yu & Duchin (2022)	Social entrepreneurship curriculum and digital skills	Curriculum study	Combined top-down and bottom-up approaches for local contexts	Digital social curriculum

An analysis of the relevant articles revealed some key findings and dominant trends in the realm of Digital Entrepreneurship Learning (DEL) in vocational education. The emerging trends show a significant change towards stronger digital integration in entrepreneurship learning curricula and methodologies.

One of the key trends is Digital Technology Integration. Most studies highlighted the importance and effectiveness of using digital technologies in entrepreneurship education. This includes the development of Massive Open Online Courses (MOOCs) based on e-marketing (Putra et al., 2020; Farrow, 2019), the use of gamification to increase digital entrepreneurial intention (Xin & Ma, 2023), and the utilization of mobile learning and AI-based digital tools (Lesinskis et al., 2023). Innovations such as offline mobile learning with Raspberry Pi (Fadillah et al., 2023) are also emerging as solutions. Digital transformation in entrepreneurship education requires new pedagogical approaches that are digitally based (Ratten & Jones, 2021).

Another trend highlights the Focus on Competencies and Self-Efficacy. Many studies emphasize the crucial role of digital competencies, entrepreneurial self-efficacy, and entrepreneurial mindset. Digital competencies significantly influence entrepreneurial personality (Kholifah et al., 2022) and entrepreneurial intention (Sutiadiningsih et al., 2025; Triyono et al., 2023), often mediated by self-efficacy and mindset (Wardana et al., 2020). Entrepreneurial self-efficacy

repeatedly mediates the relationship between entrepreneurship education and entrepreneurial intention. (Puni et al., 2018; Wibowo et al., 2024).

There has also been significant Curriculum and Learning Module Development. These efforts include a curriculum development framework for digital transformation in TVET education (Zeng et al., 2024; Yu & Duchin, 2022) and the development of post-COVID-19 talent management modules covering digital technology skills (Wafi et al., 2023). In addition, the importance of lecturers' competencies in generating entrepreneurial intention was also emphasized (Iwu et al., 2021).

In terms of Innovative Learning Methodologies, the application of active learning methods such as entrepreneurship-based Project-Based Learning (PBL) is more effective in improving vocational students' learning outcomes than traditional lecture methods (Hariyanto et al., 2023). This shows a shift towards a more practical and project-oriented approach.

Finally, various Psychological and Environmental Factors influence students' digital entrepreneurial intentions. These factors include digital entrepreneurial alertness (Wibowo et al., 2023), entrepreneurial orientation (Triyono et al., 2023), and social and psychological capital (Ni & Ye, 2018). However, one study suggests that extracurricular activities may have a greater influence on vocational students' entrepreneurial competencies than the formal curriculum itself (Perić et al., 2020), and vocational learning conditions influence students' perceptions of entrepreneurial learning (Stadler & Smith, 2017). Culture was also found to moderate the effect of entrepreneurship education on self-efficacy (Yousaf et al., 2022).

Overall, the findings suggest that implementing DEL in vocational education is maturing, with a growing focus on technology integration, strengthening digital competencies and self-efficacy, and the adoption of more innovative learning methodologies relevant to the needs of the digital job market.

Discussion

The key findings identified through the systematic literature review on Digital Entrepreneurship Learning (DEL) in vocational education show a significant shift towards deeper digital integration in entrepreneurship curricula and practices. This discussion will examine how these trends align with relevant theoretical frameworks, compare them with the existing literature, and identify theoretical and practical implications of the findings.

The first prominent trend is the integration of digital technology in DEL. The utilization of Massive Open Online Courses (MOOCs) based on e-marketing (Putra et al., 2020; Farrow, 2019), gamification (Xin & Ma, 2023), mobile learning (Fadillah et al., 2023), and AI-based digital devices (Lesinskis et al., 2023) shows the commitment of vocational education in preparing its graduates to face the digital economy era. This integration is in line with Bandura's Social Learning Theory (1977), where students gain skills and beliefs through direct observation and interaction with simulated or real digital environments. For example, MOOCs and digital simulation platforms enable virtual learning experiences and behavioral modeling of successful digital entrepreneurs. In addition, the application of simulations and interactive multimedia has proven effective in improving learning readiness and practical learning outcomes, which strengthens the immersive learning experience dimension in vocational education (Ridhani et al., 2025; Wibawanto et al., 2022). The findings also support the Competency-Based Approach by focusing on the development of specific digital skills that are critical for entrepreneurship in the modern era, such as digital literacy emphasized in curriculum development (Zeng et al., 2024).

Second, the focus on competence and self-efficacy is a key pillar in DEL. Research consistently shows that digital competencies significantly influence entrepreneurial intention (Sutiadiningsih et al., 2025; Triyono et al., 2023) and entrepreneurial personality (Kholifah et al., 2022), often mediated by self-efficacy and mindset (Wardana et al., 2020). Entrepreneurial self-efficacy repeatedly predicts as a powerful predictor of entrepreneurial intention (Puni et al., 2018; Wibowo et al., 2024; Tantawy et al., 2021). This finding is highly consistent with Social Learning Theory, which emphasizes the importance of self-efficacy as a predictor of individual performance and persistence. When students feel capable of mastering digital skills and facing entrepreneurial challenges, their intention to engage in such activities increases. In addition, these findings are also in line with the Theory of Planned Behavior, where perceived behavioral control, strongly associated with self-efficacy, is a key determinant of behavioral intentions.

Third, recent research highlights significant efforts in curriculum development and learning modules specific to DEL. These include the design of a curriculum framework for digital transformation in TVET (Zeng et al., 2024; Yu & Duchin, 2022) and the development of relevant talent management modules post-COVID-19 pandemic, emphasizing digital skills (Wafi et al., 2023). Such curriculum development reflects vocational education's adaptation to changing market needs, focusing on providing a clear set of competencies in line with the Competency-Based Approach. The findings highlight the importance of lecturer competencies and their central role in implementing the curriculum effectively (Iwu et al., 2021).

Fourth, the adoption of innovative learning methodologies is a driver of DEL effectiveness. Entrepreneurship-based Project-Based Learning (PBL), for example, has been superior in improving vocational students' learning outcomes compared to traditional methods (Hariyanto et al., 2023). Such results underscore the shift from a passive approach towards more active and practice-oriented learning. By allowing students to apply digital skills in real-world contexts, this method encourages both problem-solving and innovation. This is a manifestation of Social Learning Theory, which promotes learning through hands-on experience and practical application.

Finally, psychological and environmental factors also have a significant influence on digital entrepreneurial intentions. Digital entrepreneurial alertness (Wibowo et al., 2023), entrepreneurial orientation (Triyono et al., 2023), and social and psychological capital (Ni & Ye, 2018) correlate strongly with such intentions. Interestingly, some studies suggest that extracurricular activities may have a greater influence on vocational students' entrepreneurial competencies than the formal curriculum (Perić et al., 2020), and vocational learning conditions influence students' perceptions (Stadler & Smith, 2017). Culture can also moderate the effect of entrepreneurship education on self-efficacy (Yousaf et al., 2022). These findings enrich the understanding of the Theory of Planned Behavior by showing that not only individual attitudes but also subjective norms and perceived behavioral control, including alertness and orientation, play an important role in shaping digital entrepreneurial intentions.

The findings of this SLR confirm and reinforce an existing trend in the broader entrepreneurship education literature, namely a shift towards an emphasis on digital aspects and practical experience (Ratten & Jones, 2021). This research specifically improves on previous understanding by synthesizing fragmented findings on DEL in vocational contexts, which previous studies have failed to summarize systematically. By comprehensively identifying trends, strategies, and learning outcomes, this SLR fills a gap in the literature by providing a holistic view of the evolution of DEL, providing a stronger basis for future research than single studies limited to a specific sample or context.

The implications of this research are multiple, both theoretical and practical. Theoretically, this SLR enriches the understanding of how learning and behavioral theories, such as Social Learning Theory and Theory of Planned Behavior, manifest in digital entrepreneurship education, particularly in vocational settings. The research provides a more solid conceptual framework for future research, highlighting key variables, e.g., digital competencies, self-efficacy, and innovative methodologies that require further exploration. Practically, the results provide valuable guidance for policymakers, educators, and curriculum developers in vocational education. Recommendations include prioritizing the development of adaptive and digitally enabled curricula, investing in lecturer training to improve their digital competencies, and adopting active and project-based learning strategies that use digital technologies. In addition, the findings emphasize the importance of creating learning environments that support the development of self-efficacy and entrepreneurial alertness among vocational students.

SLR provides a comprehensive overview, but there are some limitations. Although the databases used are reputable, their scope may not encompass all relevant publications worldwide. In addition, the focus on articles that are available in full text and in English/Indonesian may exclude important literature from other languages. Further research should conduct empirical studies that test the causal relationships between the variables identified in DEL, for example, through experimental or quasi-experimental research comparing the effectiveness of various DEL learning strategies. In-depth exploration of the impact of cultural factors and government policies on implementing DEL in various geographical contexts could also be a promising direction for research.

CONCLUSION

This systematic literature review concludes that implementing Digital Entrepreneurship Learning (DEL) in vocational education has shown significant development over the past five years (2019-2024). Emerging trends show

a strong significant change toward deeper integration of digital technology, an emphasis on developing digital competencies and entrepreneurial self-efficacy, and the adoption of innovative and relevant learning methodologies aligned with the digital ecosystem. These findings collectively illustrate the evolution of DEL as a holistic approach that not only equips students with digital skills but also fosters an adaptive entrepreneurial mindset and intent in response to the demands of the digital economy. This research contributes to the literature by providing a comprehensive synthesis of previously fragmented studies, offering a clear picture of the dynamics of DEL and filling knowledge gaps regarding its future direction within the context of vocational education.

The practical implications of this study emphasize the importance for stakeholders in vocational education, including policymakers and educators, to prioritize the design of adaptive and technology-based curricula. Investment in improving the digital competencies of lecturers and the adoption of active and project-based learning strategies that use digital devices are crucial. These findings underscore the need to create a conducive learning environment for fostering self-efficacy and entrepreneurial awareness among vocational students, ensuring graduates are prepared to become job creators in the digital age.

ACKNOWLEDGMENTS

The authors would like to thank those who were involved in completing this research, especially the Doctoral Program in Educational Sciences, Faculty of Teacher Training and Education, Sebelas Maret University, for their valuable support.

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