Strategic Mandate: A Systematic Review on the Role of Institution in Enhancing Educator and Student Advanced Digital Skills for AI-Driven Entrepreneurial Readiness in Indonesia Entrepreneurship Education

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Abstract
Purpose: This systematic literature review (SLR) critically examines the strategic role and responsibilities of educational institutions in Indonesia concerning the integration of advanced digital skills within entrepreneurship education. Specifically, this review aims to identify existing institutional strategies, programs, and policies for enhancing advanced digital skills among both educators and students in entrepreneurship education (EE), analyze critical success factors and systemic challenges faced by institutions, and pinpoint key gaps that hinder their effectiveness in fostering entrepreneurs capable of thriving in an AI-driven environment.
Design/methodology/approach: Adhering strictly to PRISMA guidelines, this SLR performed a comprehensive search in prominent academic databases, especially: Scopus.
Findings: The review reveals a nascent but critical recognition of the need for advanced digital skills in Indonesian entrepreneurship education.
Research limitations/implications: While foundational digital literacy is often present, dedicated integration of competencies such as sophisticated e- commerce strategies, data-driven digital marketing analytics, practical cloud computing applications, and essential cybersecurity awareness for ventures remains limited and inconsistently applied across curricula.
Practical implications: Crucially, the literature highlights systemic challenges at the institutional level, including insufficient dedicated budget allocation for educator upskilling in advanced digital and AI domains, fragmented curriculum development efforts, and a lack of formalized industry-academia partnerships to facilitate practical skill transfer.
Originality/value: This review provides an original contribution by systematically mapping the integration of nascent advanced digital skills in Indonesian entrepreneurship education— an area that remains under-explored by many existing experts. By highlighting institutional gaps and linking them with Indonesia's Vision 2045, particularly in advancing entrepreneurship and youth employment, this study uniquely places digital and AI-driven entrepreneurial readiness as a national educational and development priority.

Keywords: Nascent Advanced Digital Skills, Entrepreneurship Education, Institutional Role, Educational Policy, Student Skill Acquisition

Introduction

In the current global economic landscape, driven by the rapid advancements of artificial intelligence (AI) and digital technologies, entrepreneurial education is undergoing a profound transformation. Educational institutions worldwide are recognizing their evolving role from merely disseminating knowledge to becoming active facilitators of innovation and entrepreneurship. This shift, often referred to as the "third mission" paradigm, emphasizes a university's responsibility to generate economic and societal impact beyond traditional teaching and research (Lehmann et al., 2024). A central component of this new mandate is the integration of advanced digital skills—such as: data analytics, cloud computing, and AI application—into existing curricula. Evidence suggests that digital technology is a key driver of entrepreneurial activity, fundamentally reshaping how new ventures are created and sustained. This strategic alignment ensures that both educators and students are equipped with the competencies needed to thrive in a digitally-driven environment, thus fostering a new generation of entrepreneurs ready for the challenges of the AI era.

While the importance of this strategic shift is globally recognized, its implementation in developing countries, particularly in Southeast Asia, presents unique challenges and opportunities. In Indonesia, for instance, a significant body of research examines the general impact of entrepreneurship education, but there remains a critical gap in the literature concerning the specific role of educational institutions in systematically enhancing advanced digital skills for AI-driven entrepreneurial readiness (Susantiningrum et al., 2023). This systematic review aims to address this gap by comprehensively analyzing the strategies, policies, and challenges faced by institutions in Indonesia in preparing both educators and students. By adhering to PRISMA guidelines, this study will critically examine the effectiveness of current institutional efforts and identify key areas for future policy and curriculum development, ultimately providing actionable insights for strengthening the entrepreneurial ecosystem in Indonesia.

Literature Review

The Institutional Role: Strategies for Entrepreneurship Education

In Indonesia, several national policies and programs have been introduced to strengthen the entrepreneurial ecosystem, with higher education institutions positioned as key actors. First, the financial support initiatives, include: the Kredit Usaha Rakyat (KUR) micro-loan scheme (Ministry of State-Owned Enterprises, 2022), non-KUR interest subsidies, and the Bantuan Produktif Usaha Mikro (BPUM) grant program (Coordinating Ministry for Economic Affairs, 2022). Furthermore, the educational programs, such as: Merdeka Belajar Kampus Merdeka (MBKM) (Ministry of Education, Culture, Research, and Technology, 2024) and the national digitalization of Micro, Small and Medium Enterprises or MSMEs (Ministry of Communication and Digital Affairs, 2024) aim to foster digital skills, literacy, ethics, and cybersecurity readiness. Complementary initiatives include the Sapa UMKM application, which integrates financing, incubation, business intelligence, gamification, community development, and AI-based services. At the strategic level, Presidential Regulation No. 2 of 2022 (Cabinet Secretariat of the Republic of Indonesia, 2022) and the National Youth Entrepreneurship Strategy (Coordinating Ministry for Human Development and Culture, 2022), developed in partnership with Friedrich Ebert Stiftung (FES) Indonesia, highlight the state's commitment to supporting youth entrepreneurship and enterprise development. It is again emphasized that academic business incubators and university accelerators are key institutional tools that provide students with essential resources, mentorship, and networking

opportunities to transform ideas into viable ventures (Budac & Ilie, 2024; Konak et al., 2025). In addition, a global paradigm shift is seeing universities embrace a "third mission" approach, moving beyond traditional education to focus on direct economic and social impact (Lehmann et al., 2024). This echoed in Indonesia, where women's entrepreneurship has been shown to significantly increase household income and contribute to community development in Batam (Purba et al., 2025). Such evidence highlights the need for a strategic mindset among university leaders to reform, explore, and innovate teaching methods (Bu & Zou, 2024; Dai, 2024) and to support entrepreneurship by actively engaging with industry, aligning institutional practices with national development goals as well as Indonesia's Vision 2045.

Educator Competency and Development
The successful integration of advanced digital skills depends essentially on the capabilities of educators themselves. Research shows that teachers' perceptions and self-efficacy regarding their entrepreneurial competencies directly influence the quality of entrepreneurship education delivered (Arruti et al., 2023; Ertem, 2024). Therefore, institutional strategies, supported by national policies, must prioritize the development of the educator profession. Programs that focus on competency-based training (Brophy et al., 2024), "Remote Sensing Plus" Training Mode (Zhang et al., 2023), and the effective application of computer simulation in teaching (Liu et al., 2022) are crucial. The main challenges are the lack of dedicated budget allocation and fragmented curriculum development for educator upskilling in advanced digital domains. Institutions that invest in continuous training and support for their teaching staff are better positioned to nurture a creativity-focused and digitally proficient mindset in their students (Leiva-Lugo et al., 2024; Trasberg, 2024).

Student Digital Skill Acquisition and Readiness
Higher education institutions aim to strengthen students' entrepreneurial competencies, employability, and entrepreneurial mindset to meet the demands of the digital economy. To achieve this, universities have widely implemented Innovation and Competition Programs (ICPs), including: startup incubators, design challenges, hackathons, accelerator programs, and innovation bootcamps (Konak et al., 2025). Such programs encourage students to design value propositions, identify societal and business needs, and develop socially responsible solutions, thereby fostering innovation with both market and social impact. Complementary initiatives, such as: ideathons, further promote creativity through co-creative and divergent methods like design thinking, brainstorming, and collaborative problem-solving (García-Castanedo et al., 2024). In Indonesia, Suparno et al. (2024; Maisaroh et al., 2024) empirically confirmed that entrepreneurship education positively influences and creativity and product innovation among university students highlighting the importance of integrating creativity-driven approaches into entrepreneurship curricula. Finally, partnerships with external incubators also provide access to market insights, financial resources, legal support, and investment opportunities, reinforcing entrepreneurial readiness (Panakaje et al., 2025).

Beyond universities, vocational institutions integrate Entrepreneurship Education (EE) into Technical Vocational Education and Training (TVET) programs as a premium strategy for developing entrepreneurial intention. This is pursued by aligning Attitudes Toward Business (ATB) creation with role models from industry, strengthening Subjective Norms (SN) through social interaction, and enhancing Perceived Behavioral Control (PBC) through curriculum reform and practice-based pedagogy (Bahaw et al., 2025). For example: VSS (Vocational Secondary Schools) in Central Java, designated as a Center of Excellence (CoE), expanded entrepreneurship teaching hours to 524 hours and repositioned entrepreneurship as a core

productive subject requiring more practical learning than theory (Susantinigrum et al., 2023). However, results indicate that most students' entrepreneurial skills remain at the middle level, with some indicators showing low performance, indicating gaps in implementation.

Lastly, research on AI adoption in family businesses illustrates the broader relevance of digital entrepreneurship for competitiveness. Entrepreneurial orientation and innovation play a central role in driving AI adoption, improving decision-making, customer engagement, and operational efficiency (Elmadhi & Ait Nasser, 2024). However, readiness remains challenged by traditional values, limited resources, and knowledge gaps—factors that highlight the need for continued institutional efforts to build digital entrepreneurial capacity. This is in line with Zhang (et al., 20222), who explain how digital media environments naturally nurture students' vague consciousness of dynamic visual expression. Without proper guidance, this sensitivity remains unstructured; however, systematic training in design, modeling, and dynamic expression can transform it into professional, market-oriented skills that enhance both artistic capacity and entrepreneurial mindset.

Conceptual Framework

Based on the research objectives and the reviewed literature, this study proposes a conceptual framework (Figure 1) that illustrates the emerging institutional role in shaping digital and AI-based entrepreneurship education in Indonesia. The model posits that the Institutional Role—including universities, which provide information on financial support initiatives as well as educational programs—forms the foundational pillar. This role is strongly reinforced by national initiatives, as discussed in greater detail in the literature review section (The Institutional Role: Strategies for Entrepreneurship Education). These policies and regulations directly influence the enhancement of the second pillar: Educator Competency and Development.

Enhanced educator competency and development are crucial for translating national mandates into effective classroom practice. As shown by Arruti et al. (2023) and Ertem (2024), teachers' perceptions and self-efficacy regarding their entrepreneurial skills directly impact the quality of education they deliver. The literature highlights the need for specialized training programs, including competency-based approaches (Brophy et al., 2024), to equip educators with the knowledge to teach advanced digital skills. In turn, this enhanced educator proficiency leads to more effective and relevant instruction, which directly impacts the third pillar: Student Digital Skill Acquisition and Readiness. Student equipped with sophisticated digital competencies—such as data analytics, AI enable thinking, and practical cloud computing applications—are better prepared to navigate and innovate within the modern, digitally-driven economy (Bahaw et al., 2025; Panakaje et al., 2024; Elmadhi & Ait Nasser, 2024).

The framework (Figure 1.) also includes several moderating factors that can influence these core relationships. A strong industry-academia partnerships is a key moderator, as highlighted by Kuzior et al. (2024), facilitating the transfer of innovation and ensuring that skills taught are aligned with market needs. Similarly, the availability of dedicated funding is crucial moderating factors (Morselli, 2024), enabling institutions to invest in technology, training, and programs essential for fostering entrepreneurial readiness. This interconnected model demonstrates that a holistic approach, which addresses all three pillars and their moderating factors, is necessary for educational institutions to effectively foster AI-driven entrepreneurial readiness. The model serves as the theoretical backbone of this study, guiding the analysis of findings and informing the recommendations for future policy and research.
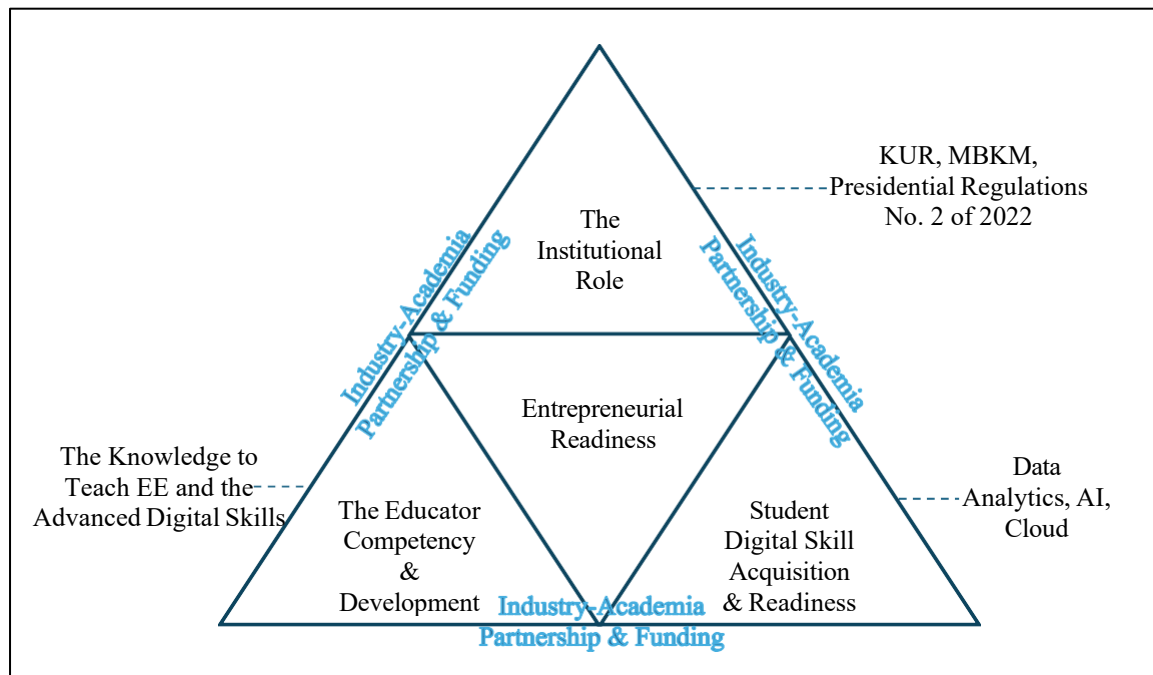
Figure 1: Conceptual Framework: A Model for Enhancing Entrepreneurial Readiness

Method

This systematic review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidelines to ensure a rigorous and transparent research process. The literature search was conducted systematically using the Scopus database, focusing on peer-reviewed articles published from 2021 to 2025. The initial search yielded 443 open-access articles related to entrepreneurship education (Figure 2). A preliminary screening of the abstracts revealed that while most of the studies focused on the general impact of entrepreneurship education on students' entrepreneurial intentions, whereas only a limited number specifically examined the roles of institutions, educators, students, as well as the integration of advanced digital skills and nascent AI readiness.
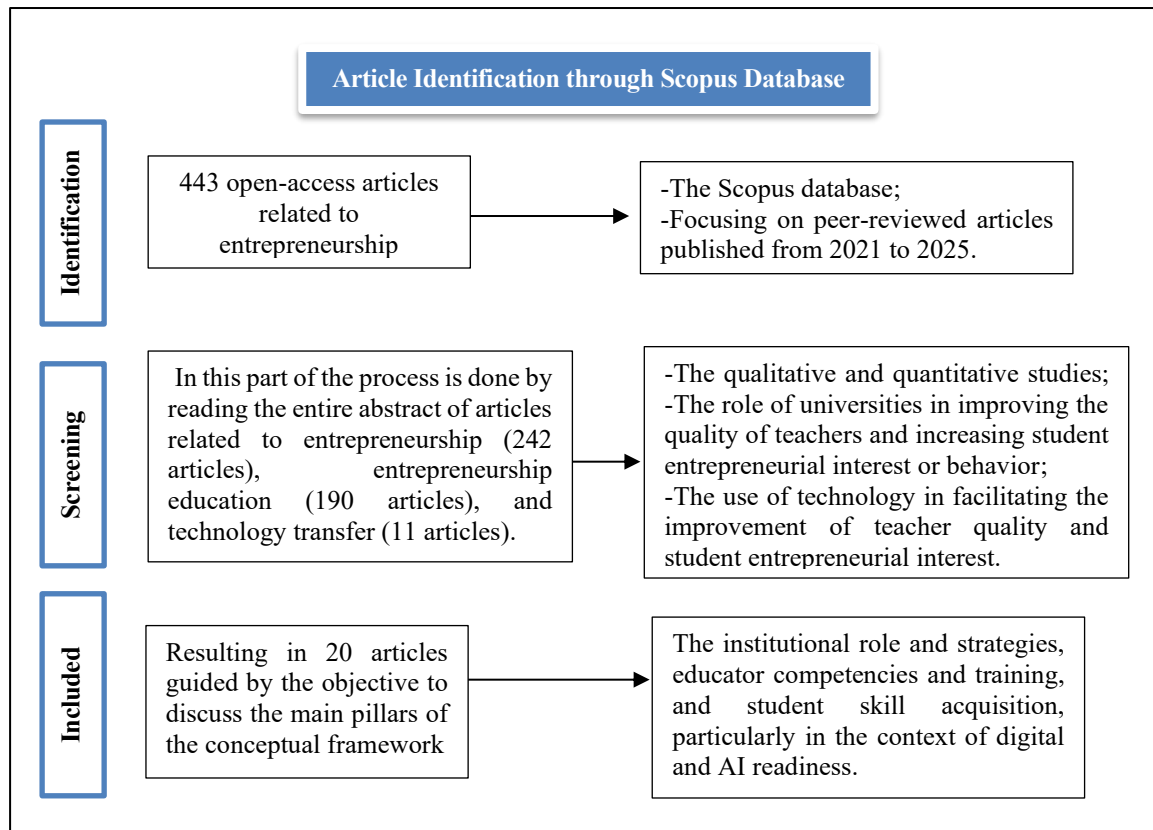
Figure 2: PRISMA Flow Diagram

To align with the objectives and scope of this study, a total of 20 articles (Table 1.) are selected based on their direct relevance to the proposed conceptual framework. These were categorized into three pillars: (1) institutional strategies and roles (Lv et al., 2022; Isac et al., 2023; Sánchez & Ortega, 2023; Ocampo-López et al., 2023; Budac & Ilie, 2024; Lehmann et al., 2024; Yassine et al., 2024), (2) educator competencies and professional development (Arruti & Paños-Castro, 2023; Zhang & Tseng, 2023; Leiva-Lugo et al., 2024; Trasberg, 2024), and (3) student skill in innovation, digital skills and AI readiness (Comesaña-Comesaña et al., 2022; Liu, 2022; Zhang et al., 2023; Lee et al., 2023; García-Castanedo et al., 2024; Kanzola & Petrakis, 2024; Somià et al., 2024; Suparno et al., 2024; Wu et al., 2024). The selected articles include both Indonesian and global case studies to ensure a comprehensive and comparative analysis.

Table 1. Characteristics of Included Articles in the Systematic Review on Entrepreneurship Education (2021-2025)

No.	Reference	Context	Main Topic	Relevance to The Study
1	Lehmann et al. (2024)	Germany	Role of universities, institutional programs (EXIST).	Highly relevant, directly examines the role of universities and their programs.
2	Kanzola & Petrakis (2024)	Global	Labor market needs, skill portfolios.	Highlights the need for skill diversification, relevant to advanced digital skills.
3	Suparno et al. (2024)	Indonesia	Entrepreneurship education, product innovation, student creativity.	Highly relevant, one of the few studies with an Indonesian context, focusing on students

4	Budac & Ilie (2024)	Global	Academic business incubators, entrepreneurship education implementation.	Highlights incubators as an institutional tool to facilitate entrepreneurship.
5	Trasberg (2024)	Global	Teacher training, entrepreneurial competencies.	Highly relevant, explicitly discusses teacher training, a core part of your study.
6	Arruti & Paños-Castro (2023)	Spain	Teacher self-perception, entrepreneurial competence.	Relevant for examining the perspectives of educators on their own competencies.
7	Sánchez & Ortega (2023)	Europe	Entrepreneurial competences, educational implications	Provides insights into skill requirements and their educational implications.
8	Zhang & Tseng (2023)	China	Instructor ability, student learning outcomes.	Highly relevant, directly tests the link between instructor ability and student learning outcomes.
9	Leiva-Lugo et al. (2024)	Global	Education 4.0, entrepreneurial thinking.	Connects education (4.0) with entrepreneurship, relevant to the digital economy context.
10	Comesaña-Comesaña et al. (2022)	Global	Digital skills (technocreativity).	Highly relevant, focuses on specific digital skills in university students
11	Lv et al. (2022)	China	Sustainable Framework, innovation.	Examines the role of institutions in building a sustainable education system.
12	Lee et al. (2023)	Global	Entrepreneurial pathways, emerging creatives.	Relevant for understanding how digital skills are needed for creative ventures.
13	Liu (2022)	China	Student entrepreneurship system, intelligent decision making.	Relevant, highlights a technology-based institutional intervention.
14	Yassine et al. (2024)	Morocco	University challenges, patent valorization.	Illustrates the broader role of institutions in the entrepreneurial ecosystem.
15	Somià et al. (2024)	Global	Assessment & development in entrepreneurship education	Relevant for understanding how institutions evaluate and improve skills.
16	Isac et al. (2023)	Europe	Extracurricular activities, student competencies.	Highlights extracurriculars as an institutional strategy to enhance student competencies.
17	Ocampo-López et al. (2023)	Colombia	Post-digital learning.	Provides a case study of a digital education intervention in a developing country context.

18	García-Castanedo et al. (2024)	Global	Ideathon, university entrepreneurship education.	Relevant, ideathons as a strategic tool used by institutions.
19	Wu et al. (2024)	China	Impact of digital technology.	Examines the general impact of digital technology on entrepreneurship, providing context.
20	Zhang et al. (2023)	Global	Training modes, student competitions.	Highlights student competitions as one of the institutional strategies for talent development.

Findings

The Institutional Role and Strategies

Several studies highlight the role of institutional in enhancing innovation and entrepreneurship. As an illustration, Budac & Ilie (2024) emphasize university-incubator collaboration across three levels—startups, the university, and the economy. Isac et al. (2023) describe entrepreneurship as an extracurricular activity where participants gain insight from entrepreneurs about business idea. Likewise, the German EXIST program demonstrates the role of universities in spin-off production with ESG (Environment, Social, and Governance) characteristics (Lehmann et al., 2024). As for China, the implementation of the 14th Five-Year Plan illustrates how top-tier technical universities are tasked with reducing mismatches between talent supply and industry demand, thereby contributing to national innovation and regional development (Lv et al., 2022). Similarly, Ocampo-lópez et al. (2023) underline MOOCs as a transformative technological innovation in entrepreneurship education. These global cases illustrate how universities serve as policy instruments for entrepreneurship development, similar to Indonesia's own national initiatives, for instance: MBKM and the Presidential Regulation No. 2 of 2022, which position higher education institutions as strategic actors within the entrepreneurial ecosystem.

Educator Competencies and Professional Development

The literature also emphasizes the complexity of applying entrepreneurial competencies in entrepreneurship education due to limited training, limited resources, and delicate evaluation systems. In line with the emphasized complexity, Arruti & Paños-Castro (2023) introduce the EntreCompEdu Project, funded by the Erasmus + The European Union, which provides a competency-based framework to improve teacher professional development in teaching entrepreneurship education to student. Another study adopted Education 4.0 based training model that integrate connectivity, digitalization, and SDG (Sustainable Development Goals)-focused curricula, showing potential for generating sustainable entrepreneurial solution (Leiva-Lugo et al., 2024). Similarly, Transberg (2024) highlights the transformative role of entrepreneurship education in enhancing critical thinking and adaptability in pre-service teacher, where entrepreneurial training is mandatory in Estonia. The same goes for Maisaroh et al. (2024) found that entrepreneurship education positively affects the environmental commitment and motivation of SMEs (Small-medium Enterprises) owners in Yogyakarta, thereby encouraging environmentally friendly entrepreneurial behavior. These findings suggest that teacher-focused initiatives and broader training programs play an important role in shaping entrepreneurial mindsets and sustainability-oriented practices.

Student Skills in Innovation, Digital Skill, and AI Readiness

Research focusing on students reveals how entrepreneurial competencies are reshaped in the digital era. Comesaña-Comesaña et al. (2022) demonstrate how social media fosters

technocreativity, project management, and design thinking, enabling collaborative and globally networked entrepreneurship education. García-Castanedo et al. (2024) analyze ideathons as co-creative spaces where students generate innovative solutions across disciplines. Which is in line with Liu (2022) introduces the "internet +" model, integrating entrepreneurship, innovation, and venture capital to revitalize traditional industries. Zhang et al. (2023) propose the "Remote Sensing Plus" training mode, which combines learning, education, and innovation through student competitions to foster entrepreneurial readiness. Not forgetting that Somià et al. (2024) emphasize coachability and self-awareness competencies as predictors of entrepreneurship education outcomes.

Discussion and Conclusion

Our analysis reveals critical gaps in Indonesia, while the top-down government policies (such as: MBKM and Presidential Regulation No. 2 of 2022) provide the strategic reasons, where the policies do not have a clear and comprehensive roadmap for the how to increase innovation, entrepreneurship, advanced digital skills, as well as nascent AI readiness. So that, the practical implication policies such as: KUR, non-KUR, and also BPUM may not fully realized in fostering a digitally savvy generation of entrepreneurs.

Patterns and Best Practices in Skill Development

Our comparative analysis of entrepreneurship education in both global and Indonesian contexts reveal several patterns and best practices in skill development. Globally, there is a clear trend toward experiential learning through platforms like academic incubators and "ideathons" (Budac & Ilie, 2024; García-Castanedo et al., 2024). These methods go beyond theoretical knowledge to build practical skills in a real-world setting. In Indonesia, studies like that by Suparno et al. (2024) affirm the positive relationship between entrepreneurship education and student creativity, but they focus more on general entrepreneurial intentions rather than the specific acquisition of advanced digital skills. Similarly, while international literature highlights the importance of instructor ability and teacher training as a direct link to student learning outcomes (Zhang & Tseng, 2023; Trasberg, 2024), this is a relatively under-explored area in Indonesian research. When compared to global practices (for instance: the EXIST program or the entrepreneurship mandate in China's 14th five-year Plan), Indonesia initiatives like MBKM, Sapa UMKM, and Presidential Regulation No. 2 of 2022 demonstrate strong policy intentions but remains fragmented in its implementation. Unlike the mature institutional ecosystems observed internationally, Indonesia institution still face challenges in integrating advanced digital skill and fostering AI-readiness among educators and students.

Systematic Gaps and Key Challenges

The systematic gaps and challenges identified from the findings are key differences between policy and practice. Some global policies and practices, such as: technocreativity towards social media, Internet+, EntreCompEdu project, ideathon, EXIST program, creative thinking and teamwork in pre-service teacher education in Estonia (Comesañ, 2022; Liu, 2022, Arruti & Pañ, 2024; Garcí, 2024; Trasberg, 2024)—provide structured approaches to strengthening entrepreneurial competencies, Indonesia's implementation approach remains fragmented. Furthermore, there is also a lack of empirical data on specific results in measuring the effectiveness of the national strategies for early and advanced digital skills development, which represents a critical barrier to policy and curriculum development in building entrepreneurial ecosystems for the digital age. Addressing these gaps can contribute to diversifying the skills portfolio of both educators and students, enabling them to meet immediate labor market demands and future challenges, as it has fostered the spirit of resilient, adaptive and forward-looking leaders who can navigate the complex business environment (Kanzola & Petrakis, 2024). This is supported by the evolution of an entrepreneurial mindset in the creative industries, which legitimizes both formal and informal risk-taking as a pathway to future

success (Lee et al., 2023).

Policy Implications and Future Recommendations

There are several policy implications and recommendations to strengthen Indonesia's entrepreneurial ecosystem. First, policies are re-evaluated by comparing several global policies that are quite successful in increasing innovation, mindset, and entrepreneurial skills in educators and students due to the results-oriented framework by integrating digital skills in the entrepreneurship curriculum. Second, institutions can prioritize special budget allocations to create teaching skills improvement programs such as: EntreCompEdu project and creative thinking and teamwork in pre-service teacher education (García-Castanedo et al., 2024; Trasberg, 2024). Third, further research is recommended to conduct empirical case studies that analyze the direct impact of certain digital skills intervention, such as: social media or Internet + (Comesaña-Comesaña et al., 2022; Liu, 2022). Thus, it is hoped that Indonesia can evaluate and improve its strategy into a real and effective program to prepare teachers and students to face the challenges and opportunities of the AI-based economy.

Acknowledgement

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