



EDUCATIONAL TECHNOLOGY AS AN ENABLER OF ENTREPRENEURIAL LEARNING: LITERATURE REVIEW ON PEDAGOGICAL INNOVATION AND THE FORMATION OF AN ENTREPRENEURIAL MINDSET

Teknologi Pendidikan Sebagai Pendorong Pembelajaran Kewirausahaan: Tinjauan Literatur Tentang Inovasi Pedagogis Dan Pembentukan Pola Pikir Kewirausahaan

✉ **Andi Tenri Ampa¹ Wulan Purnamasari²**

^{1,2} Universitas Negeri Makassar

Corresponding Author : a.tenriampa@unm.ac.id, Pendidikan Ekonomi, Universitas Negeri Makassar-Indonesia

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ABSTRACT

The rapid advancement of digital technology has transformed the educational landscape and opened new opportunities for developing entrepreneurial competencies. This study aims to map, synthesize, and evaluate empirical evidence regarding the role of Educational Technology (EdTech) as an enabler in entrepreneurial learning through a systematic literature review (SLR) guided by the PRISMA framework. Literature searches were conducted across five academic databases—Scopus, Web of Science, ERIC, Google Scholar, and IEEE Xplore—covering publications from 2014 to 2024, yielding 47 articles that met the inclusion criteria. The findings reveal four dominant EdTech clusters: business simulation and gamification platforms, online collaboration tools, adaptive artificial intelligence systems, and open learning ecosystems. When integrated with active pedagogical approaches such as project-based learning, flipped classrooms, and design thinking, these technologies consistently strengthen entrepreneurial self-efficacy, innovative orientation, and risk tolerance. However, effectiveness is moderated by digital infrastructure readiness, educator competency, and institutional support. This study concludes that EdTech functions not merely as a content delivery tool, but as a structural enabler that reconfigures how entrepreneurial knowledge and identity are constructed.

ABSTRAK

Kemajuan pesat teknologi digital telah mentransformasi lanskap pendidikan dan membuka peluang baru dalam pengembangan kompetensi kewirausahaan. Penelitian ini bertujuan untuk memetakan, mensintesis, dan mengevaluasi bukti empiris mengenai peran Educational Technology (EdTech) sebagai enabler dalam entrepreneurial learning melalui systematic literature review (SLR) yang dipandu kerangka PRISMA. Penelusuran literatur dilakukan pada lima basis data akademik—Scopus, Web of Science, ERIC, Google Scholar, dan IEEE Xplore—mencakup publikasi tahun 2014–2024 dan menghasilkan 47 artikel yang memenuhi kriteria inklusi. Temuan mengungkapkan empat klaster EdTech dominan: platform simulasi bisnis dan gamifikasi, alat kolaborasi daring, sistem kecerdasan buatan adaptif, dan ekosistem pembelajaran terbuka. Ketika diintegrasikan dengan pendekatan pedagogis aktif seperti project-based learning, flipped classroom, dan design thinking, teknologi-teknologi ini secara konsisten memperkuat efikasi diri kewirausahaan, orientasi inovatif, dan toleransi risiko. Namun, efektivitasnya dimoderasi oleh kesiapan infrastruktur digital, kompetensi pendidik, dan dukungan institusional. Kajian ini menyimpulkan bahwa EdTech tidak sekadar berfungsi sebagai alat penyampaian konten, melainkan sebagai enabler struktural yang merekonfigurasi cara pengetahuan dan identitas kewirausahaan dikonstruksi.

INTRODUCTION

The rapid development of digital technology has fundamentally transformed the educational landscape, creating new opportunities for developing the entrepreneurial capacity of the next generation. Amidst increasingly complex and uncertain global economic dynamics, entrepreneurial skills are no longer viewed simply as a career choice, but rather as an essential competency that every individual must possess (1). Educational Technology (EdTech) has emerged as a transformative catalyst, enabling the creation of a learning environment that is adaptive, collaborative, and oriented toward solving real-world problems—characteristics that align with the foundations of entrepreneurial learning (2). This phenomenon has prompted academics and education practitioners to delve deeper into how integrating technology into the learning process can effectively foster an entrepreneurial mindset in students.

In general, entrepreneurship has long been recognized as a driving force for economic growth, innovation, and job creation

(3). Various global reports, including those from the World Economic Forum, emphasize that competencies such as creativity, critical thinking, tolerance for ambiguity, and the ability to take calculated risks are among the most in-demand skills of the 21st century (4). However, traditional education systems are often considered incapable of optimally accommodating the development of these competencies, as they rely on a linear and passive approach to knowledge transmission (5). This is where EdTech plays a strategic role: digital learning platforms, gamification-based business simulations, online collaboration tools, and adaptive artificial intelligence (AI) open up new dimensions in more immersive and contextual entrepreneurial learning (6).

Specifically, recent literature shows that integrating EdTech into entrepreneurship curricula can increase student engagement, strengthen innovative orientation, and accelerate the development of practical entrepreneurial competencies (7). A study by Nambisan et al. (8) revealed that digital platforms providing business simulation

environments significantly improved students' decision-making abilities and risk tolerance. Similarly, research based on technology-facilitated design thinking demonstrated faster ideation and prototyping capacity compared to conventional methods (9). The use of massive open online courses (MOOCs) and adaptive learning platforms has also been shown to expand access to entrepreneurship education, transcending the geographic and socioeconomic boundaries that have historically been barriers (10). Furthermore, the adoption of AI-based technology in formative assessments enables personalized feedback that encourages self-reflection, a key element in developing an entrepreneurial mindset (11).

Pedagogical innovations accompanying EdTech implementation have also received serious attention in academic discourse. Approaches such as technology-mediated project-based learning (PBL), flipped classrooms, and blended learning have been shown to create learning ecosystems that are more authentic and relevant to real-world business challenges (12). A meta-analysis conducted by Bae et al. (13) confirmed that the combination of active pedagogy and technology utilization produces a greater effect on the formation of entrepreneurial intentions than single interventions. These findings strengthen the argument that EdTech is not just a tool, but an enabler that completely reconfigures how students construct their entrepreneurial knowledge and identity.

There are significant research gaps in the existing literature. First, most studies still focus on higher education contexts in developed countries, thus limiting their generalizability to developing countries with varying digital infrastructure (14). Second, few studies explicitly examine the causal mechanisms between specific EdTech features—such as gamification, adaptive AI, or virtual collaboration—and measurable dimensions of entrepreneurial mindset such as self-efficacy, proactive orientation, and tolerance for uncertainty (15). Third, longitudinal studies measuring the impact of EdTech on long-term entrepreneurial behavior are still very rare, so the sustainability of technology-based

pedagogical interventions cannot be conclusively confirmed (16).

Building on these gaps, this article aims to conduct a systematic literature review to map, synthesize, and evaluate empirical evidence regarding EdTech's role as an enabler in entrepreneurial learning. Specifically, this review seeks to identify the most effective pedagogical innovations in shaping an entrepreneurial mindset, analyze contextual factors that moderate EdTech's effectiveness, and formulate a more inclusive and comprehensive future research agenda. Thus, this article is expected to provide theoretical and practical contributions to the development of entrepreneurship education policies and practices that are more responsive to the demands of the digital era.

METHODS

This study employed a systematic literature review (SLR) approach designed to identify, select, and synthesize empirical evidence in a transparent and reproducible manner. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was adopted as a procedural guide to ensure methodological rigor at every stage of the literature search and selection process (17).

The literature search was conducted systematically through five reputable academic databases: Scopus, Web of Science, ERIC, Google Scholar, and IEEE Xplore. Keyword combinations were designed using Boolean operators to maximize the relevance of search results, including: "educational technology" AND "entrepreneurial learning," "EdTech" AND "entrepreneurial mindset," "digital pedagogy" AND "entrepreneurship education," and "technology-enhanced learning" AND "entrepreneurial intention." The publication range was limited to the period 2014–2024 to ensure the recency of the analyzed findings.

The article selection process applied inclusion and exclusion criteria explicitly established before the search began. Articles were included if they met the following requirements: published in an English- or Indonesian-language peer-reviewed journal, had a substantive focus on the intersection of educational technology and entrepreneurship, and presented empirical data, whether quantitative, qualitative, or mixed. Conversely,

articles were excluded if they were editorials, opinion pieces without data, conference proceedings that had not undergone peer review, and studies that did not directly address the dimensions of entrepreneurial learning.

Article selection was conducted in two stages. The first stage involved screening titles and abstracts by two researchers independently to minimize selection bias. The second stage involved reading the full texts of articles that passed the initial stage. Differences in assessment between researchers were resolved through consensus discussions. The methodological quality of each article was assessed using the Mixed Methods Appraisal Tool (MMAT) to ensure only adequate-quality studies were included in the synthesis.

Data extraction was structured, covering: study identity, educational context, type of technology used, pedagogical approach, measured variables, and key findings. The synthesis was conducted narratively and thematically, given the heterogeneity of study designs and contexts that precluded quantitative meta-analysis. This procedure is expected to yield a comprehensive and objective mapping of the EdTech research landscape in the context of entrepreneurial learning.

RESULTS AND DISCUSSION

Based on a systematic selection process using the PRISMA framework, 47 articles met the inclusion criteria out of a total of 1,243 articles found in the initial search phase. These articles came from various geographic contexts and educational levels, with the majority of studies conducted in Europe (38%), Asia (29%), North America (21%), and the remainder from other regions.

Typology of Educational Technology in Entrepreneurship Learning

A thematic analysis of the reviewed literature revealed four main clusters of EdTech that are most frequently integrated into entrepreneurial learning contexts. The first cluster is business simulation and gamification platforms, which include applications such as virtual company management simulations and role-playing games based on real-life business scenarios. A study by Neck and Greene (5),

confirmed by more recent studies, shows that simulation environments can replicate the complexity of business decision-making without real financial risk, thus encouraging learners to experiment, fail, and learn iteratively—a process that aligns with the entrepreneurial learning cycle (20).

The second cluster is online collaboration and co-creation platforms, including tools such as virtual whiteboards, cloud-based project workspaces, and asynchronous discussion forums. These technologies have been shown to facilitate the formation of interdisciplinary teams that simulate the dynamics of real entrepreneurial teams (21). Technology-mediated collaborative interactions foster the development of social competencies such as negotiation, adaptive leadership, and conflict management—critical dimensions often overlooked in conventional entrepreneurship curricula.

The third cluster is artificial intelligence and adaptive learning, which includes intelligent tutoring systems, AI-based assessments, and personalized content recommendations. A study by Chassignol et al. (11) confirmed that AI-based adaptive feedback enables each learner to receive learning interventions tailored to their competency profile and learning style. In the context of entrepreneurship, this personalization is particularly relevant given the highly heterogeneous nature of entrepreneur profiles and the inability to standardize a single approach.

The fourth cluster is MOOCs and open learning ecosystems, which extend the reach of entrepreneurship education beyond institutional boundaries. Platforms such as Coursera, edX, and various local initiatives in developing countries have democratized access to high-quality entrepreneurship content (10). However, challenges related to low completion rates and limited direct mentoring interactions remain unresolved issues in the literature.

Technology-Mediated Innovations

Pedagogical Innovations

The findings of this study confirm that the effectiveness of EdTech in shaping an entrepreneurial mindset is not determined solely by the sophistication of its technology, but rather by the quality of the accompanying

pedagogical approach. Three pedagogical innovations consistently stand out in the analyzed literature.

Technology-facilitated project-based learning (PBL) is the most researched and proven effective approach. The combination of authentic project challenges with digital tools that enable market research, business modeling, and virtual presentations creates a learning experience that closely approximates the reality of entrepreneurship (12). Students participating in a technology-based PBL program demonstrated significant improvements in entrepreneurial self-efficacy, proactive orientation, and opportunity identification skills compared to a control group (22).

The second innovation, a flipped classroom based on interactive videos and podcasts, is the second innovation that has received substantial attention. This model shifts the delivery of conceptual content outside the classroom through digital media, allowing face-to-face time to be fully utilized for critical discussions, case studies, and problem-solving activities (23). In the context of entrepreneurship, this approach has been shown to increase the depth of conceptual understanding while honing the analytical skills entrepreneurs need to understand market dynamics.

The third approach is digital technology-mediated design thinking. The use of digital prototyping tools, virtual product testing platforms, and online user research tools allows students to carry out the empathy-definition-ideation-prototype-testing cycle more quickly and iteratively (9). A semester-long longitudinal study showed that students who participated in a technology-based design thinking program demonstrated significantly increased tolerance for ambiguity and divergent thinking skills (24).

Impact on Entrepreneurial Mindset Formation

A cross-study synthesis revealed that EdTech integration consistently contributed to strengthening three core dimensions of the entrepreneurial mindset. First, entrepreneurial self-efficacy increased significantly in students exposed to simulation-based learning environments and real-life projects (25). An individual's confidence in their ability to start

and manage a business is the strongest predictor of entrepreneurial intention, so this finding has significant pedagogical implications.

Second, innovative orientation and creativity were also strengthened through exposure to digital creative tools and open collaboration ecosystems. When learners are empowered by technology to experiment without conventional boundaries, the space for exploring ideas becomes much broader and more productive (26). Third, tolerance for risk and uncertainty shows a measurable increase, particularly in programs that integrate simulated business failure as a normalized, rather than stigmatized, learning component (27).

Contextual and Moderating Factors

Despite these promising findings, this study also identified a number of contextual factors that moderate the effectiveness of EdTech. Digital infrastructure readiness, educator digital competency, and institutional support proved to be critical determinants (28). In many developing countries, disparities in access to adequate devices and internet connections remain structural barriers that limit EdTech's transformative potential. Furthermore, the literature consistently emphasizes that technology adopted without adequate pedagogical reorientation has the potential to reinforce the very passive learning patterns it seeks to address (29). Therefore, developing educators' capacity to design authentic, technology-based learning experiences that are oriented toward entrepreneurial competencies is an indispensable prerequisite for any future EdTech transformation agenda.

CONCLUSION

This systematic literature review has successfully mapped and synthesized empirical evidence demonstrating that Educational Technology plays a significant role as an enabler in the entrepreneurial learning ecosystem. Three main conclusions can be drawn from the analyzed findings. First, the integration of EdTech into entrepreneurship learning has consistently been shown to increase student engagement, strengthen entrepreneurial self-efficacy, and accelerate the formation of entrepreneurial intentions.

Technologies such as business simulations, adaptive AI platforms, and gamification serve not merely as content delivery vehicles but rather as comprehensive reconfigurations for students' knowledge construction and entrepreneurial identity. Second, pedagogical innovations that combine active approaches such as project-based learning and design thinking with technological support yield greater impact than single interventions, confirming that technology and pedagogy should be treated as a synergistic whole, not as stand-alone elements. Third, the effectiveness of EdTech is contextual and not universal—digital infrastructure, technological literacy, and institutional support are crucial factors that cannot be ignored, particularly in developing country contexts. From a theoretical perspective, this study enriches the entrepreneurial learning framework by positioning technology as a structural variable mediating the relationship between pedagogy and entrepreneurial mindset formation, rather than merely an instrumental variable. This opens up opportunities for developing new, more comprehensive conceptual models that are relevant to the realities of 21st-century learning.

Practically, educational institutions are encouraged to design entrepreneurship curricula that integrate technology in a planned and evidence-based manner, rather than simply adopting it reactively. EdTech developers need to prioritize AI-based personalization features that are sensitive to users' contextual needs. Meanwhile, policymakers are recommended to allocate strategic investments in equitable digital infrastructure to ensure the benefits of EdTech are felt inclusively across socio-economic strata.

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