



TRANSFORMING ENTREPRENEURSHIP EDUCATION THROUGH EDUCATIONAL TECHNOLOGY: A LITERATURE REVIEW OF STRATEGIES, EFFECTIVENESS, AND POLICY IMPLICATIONS

Transformasi Pendidikan Kewirausahaan Melalui Teknologi Pendidikan: Tinjauan Literatur Mengenai Strategi, Efektivitas, Dan Implikasi Kebijakan

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ARTICLE INFO

Article History:

Received : 22/05/26

Revised form : 30/05/26

Accepted : 03/06/26

Published online : 06/06/26

Keywords:

Entrepreneurship;

Educational

Technology;

Blended Learning;

Policy implications

Kata Kunci :

Kewirausahaan;

Teknologi Pendidikan;

Pembelajaran Campuran;

Implikasi Kebijakan

How To Cite:

Lipu AT, Ampa AT. Transforming entrepreneurship education through educational technology: A literature review of strategies, effectiveness, and policy implications. *Journal Research Education Mamminasata*.

2026;1(2):228-235.

doi:10.66303/4awdd816.

ABSTRACT

Background: The integration of educational technology (EdTech) in entrepreneurship education has grown significantly, yet systematic evidence on the effectiveness of various implementation strategies remains fragmented, particularly in developing country contexts. **Purpose:** This study aims to map EdTech implementation strategies in entrepreneurship education, evaluate their effectiveness based on empirical evidence, and formulate relevant policy implications. **Methods:** A systematic literature review (SLR) was conducted following PRISMA guidelines, searching four electronic database Scopus, Web of Science, ERIC, and Google Scholar covering publications from 2013 to 2024. Of 1,247 articles identified, 48 met the inclusion criteria and were synthesized thematically. **Results:** Five dominant strategies were identified: e-learning and MOOCs (72.9%), blended learning (64.6%), digital business simulations and gamification (58.3%), virtual/augmented reality (29.2%), and AI-based adaptive learning (22.9%). Blended learning and simulation-based strategies consistently demonstrated the strongest effectiveness, particularly for cognitive and affective outcomes. Long-term behavioral outcomes were measured in only 25% of studies. **Conclusion:** EdTech integration positively impacts entrepreneurship learning outcomes, though evidence on actual entrepreneurial behavior remains limited, underscoring the need for evidence-based national policy standards.

ABSTRAK

Latar Belakang: Integrasi teknologi pendidikan (EdTech) dalam pendidikan kewirausahaan telah berkembang secara signifikan, namun bukti sistematis tentang efektivitas berbagai strategi implementasi masih terfragmentasi, terutama dalam konteks negara berkembang. Tujuan: Studi ini bertujuan untuk memetakan strategi implementasi EdTech dalam pendidikan kewirausahaan, mengevaluasi efektivitasnya berdasarkan bukti empiris, dan merumuskan implikasi kebijakan yang relevan. Metode: Tinjauan literatur sistematis (SLR) dilakukan mengikuti pedoman PRISMA, dengan mencari di empat basis data elektronik — Scopus, Web of Science, ERIC, dan Google Scholar — yang mencakup publikasi dari tahun 2013 hingga 2024. Dari 1.247 artikel yang diidentifikasi, 48 memenuhi kriteria inklusi dan disintesis secara tematik. Hasil: Lima strategi dominan diidentifikasi: e-learning dan MOOC (72,9%), blended learning (64,6%), simulasi bisnis digital dan gamifikasi (58,3%), realitas virtual/augmented reality (29,2%), dan pembelajaran adaptif berbasis AI (22,9%). Strategi pembelajaran campuran dan berbasis simulasi secara konsisten menunjukkan efektivitas terkuat, terutama untuk hasil kognitif dan afektif. Hasil perilaku jangka panjang hanya diukur dalam 25% studi. Kesimpulan: Integrasi EdTech berdampak positif pada hasil pembelajaran kewirausahaan, meskipun bukti tentang perilaku kewirausahaan aktual masih terbatas, yang menggarisbawahi perlunya standar kebijakan nasional berbasis bukti.

INTRODUCTION

Entrepreneurship education has become a key pillar of modern education systems, as the need for innovative and adaptive human resources increases amidst global economic dynamics. Entrepreneurship is no longer viewed solely as a business activity, but rather as a cross-sector competency encompassing critical thinking skills, risk tolerance, creativity, and opportunity orientation.(1) The Global Entrepreneurship Monitor report notes that countries with strong entrepreneurial ecosystems tend to have more stable economic growth and lower unemployment rates, prompting many governments to integrate entrepreneurship education into formal curricula from elementary to higher education.(2)

Historically, entrepreneurship education has been delivered through conventional methods such as face-to-face lectures, case studies, and limited business simulations. While these approaches have their pedagogical value, they face significant

limitations, including limited geographic access, limited personalized learning, and the difficulty of creating authentic and contextual learning experiences. (3) These limitations have prompted educators and stakeholders to seek more flexible, scalable, and effective alternatives for delivering entrepreneurship content to students from diverse backgrounds.

The emergence of educational technology (EdTech) has brought about a fundamental paradigm shift in the world of education, including in the domain of entrepreneurship. EdTech encompasses a broad spectrum, from online learning (e-learning) platforms, massive open online courses (MOOCs), computer-based business simulations, adaptive artificial intelligence (AI), to immersive technologies such as virtual reality (VR) and augmented reality (AR).(4) Integrating these technologies into entrepreneurship curricula has the potential to provide more interactive, data-driven, and relevant learning experiences in real-world industry contexts. Several early studies have shown that the use of digital

business simulations can significantly increase students' entrepreneurial intentions compared to traditional learning methods.(5)

Despite growing enthusiasm for EdTech in entrepreneurship education, systematic scientific studies on the effectiveness of various implementation strategies remain very limited and fragmented. Most existing research focuses on the context of developed countries with established digital infrastructure, so the findings cannot necessarily be generalized to the context of developing countries that face different challenges, such as the gap in internet access, limited digital literacy of teachers, and minimal institutional support.(6) On the other hand, existing studies also tend to evaluate one type of technology in isolation without considering how the combination of various EdTech tools can complement each other in achieving the goal of holistic entrepreneurship learning.(7)

The most crucial research gap lies in the lack of cross-study synthesis that comprehensively compares the effectiveness of various EdTech strategies, as well as the absence of in-depth analysis of the policy implications resulting from these empirical findings. Many educational institutions adopt new technologies in entrepreneurship education without a strong evidence base, so these investments do not always result in measurable improvements in learning outcomes.(8) Furthermore, the equity dimension of access to EdTech for entrepreneurship education has not received adequate attention in the existing literature, even though this aspect is crucial for designing inclusive and equitable education policies.(9)

Based on this research gap, this literature review article aims to: (1) map various EdTech implementation strategies in entrepreneurship education that have been documented in the scientific literature; (2) evaluate the effectiveness of each strategy based on available empirical evidence; and (3) formulate policy implications that can serve as a reference for decision-makers at the institutional and national levels in designing an effective, inclusive, and sustainable technology-based entrepreneurship education ecosystem. Thus, this review is expected to not only contribute to the development of entrepreneurship pedagogical theory but also serve as a practical guide for educators,

curriculum designers, and policymakers in responding to the digital transformation that is transforming the educational landscape.(10)

METHODS

This study used a systematic literature review (SLR) approach that adheres to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency, reproducibility, and rigor in the selection and synthesis of scientific evidence.(11) This approach was chosen because of its relevance in mapping, evaluating, and synthesizing findings from various primary studies spread across various scientific publication sources.(12)

A systematic literature search was conducted in four reputable electronic databases: Scopus, Web of Science, ERIC (Education Resources Information Center), and Google Scholar, with publication dates ranging from 2013 to 2024. The keyword combinations used included: "entrepreneurship education," "educational technology," "EdTech," "e-learning," "entrepreneurial intention," "digital learning," and "online entrepreneurship course," combined using the Boolean operators AND/OR to maximize search coverage. (13)

Inclusion criteria included: (1) articles that published in peer-reviewed journals in English or Indonesian; (2) discussing the implementation of technology in entrepreneurship education; (3) presenting quantitative, qualitative, or mixed-methods empirical data; and (4) having full text available. Exclusion criteria included articles in the form of editorials, opinion pieces, or proceedings without peer review, as well as studies not directly relevant to the focus of the study. (14)

The selection process was conducted in three stages. The first stage was independent screening of titles and abstracts by two researchers to minimize selection bias. The second stage was an assessment of eligibility based on the full text. The third stage was an assessment of methodological quality using the Mixed Methods Appraisal Tool (MMAT). (15) Disagreements between reviewers were resolved through consensus discussions. Of the 1,247 articles identified, 48 met all criteria and were included in the final synthesis. Data

extraction was conducted in a structured manner, covering information on context, methods, technological interventions, and learning outcomes, and then synthesized thematically and narratively.)

RESULTS

4.1 Characteristics of Included Studies

Of the 48 articles that met the inclusion criteria, the majority of studies originated from Europe (37.5%), followed by Asia (29.2%), North America (18.7%), and other regions (14.6%). The majority of studies used quantitative experimental and quasi-experimental designs (52.1%), followed by mixed-methods (29.2%), and qualitative (18.7%). In terms of educational level, 72.9% of studies focused on higher education, 18.8% on secondary education, and the remainder on non-formal training programs. These findings indicate that research on EdTech in entrepreneurship education remains largely focused on the higher education context, resulting in limited understanding of its effectiveness at the primary and secondary education levels.(16)

4.2 EdTech Implementation Strategies in Entrepreneurship Education

The thematic synthesis identified five key EdTech implementation strategies most widely documented in the literature.

First, the use of e-learning platforms and MOOCs was the most dominant strategy, found in 35 of 48 studies (72.9%). Platforms such as Coursera, edX, and independent institutional platforms were used to deliver entrepreneurship content asynchronously to learners at scale. Time flexibility and geographic accessibility are key advantages of this strategy, especially for learners in remote areas or with limited mobility.(17) However, low course completion rates, ranging from 5–15%, are a crucial challenge consistently reported across studies, indicating that accessibility alone is insufficient without adequate pedagogical support.(18)

Second, digital business simulations and gamification were found in 28 studies (58.3%). Simulations such as Venture Lab, SimVenture, and other serious gaming platforms allow learners to experience the business decision-making cycle in a safe environment without real financial risk. Several studies reported

significant increases in entrepreneurial self-efficacy after simulation-based interventions, with an average effect size of $d=0.68$, which is considered moderate to strong.(19) Gamification elements such as points, badges, and leaderboards have been shown to increase student motivation and engagement, although their impact on long-term learning outcomes requires further investigation.(20)

Third, immersive technologies based on VR and AR were found in 14 studies (29.2%). This technology allows students to simulate interactions with customers, virtually pitch products, and even manage business operations in a realistic three-dimensional environment. A study conducted by Radianti et al. showed that VR-based learning experiences significantly increase knowledge retention and entrepreneurial intentions compared to conventional methods.(7) However, limited infrastructure and high implementation costs are major barriers to the adoption of this technology, particularly in resource-constrained institutions in developing countries.(21)

Fourth, the use of artificial intelligence (AI) and adaptive learning was found in 11 studies (22.9%). AI systems are capable of personalizing learning paths based on each student's profile, pace, and learning style, making the learning experience more relevant and efficient. Some AI-based platforms also include chatbot mentoring features that provide instant feedback on students' business plans.(22) Despite its promising potential, the adoption of AI in entrepreneurship education is still in its early stages, and empirical validation of its effectiveness is very limited in the available literature.

Fifth, blended learning approaches that integrate digital technology with face-to-face interactions were found in 31 studies (64.6%). This model consistently demonstrates superior results compared to both purely online and purely face-to-face approaches, as it combines the flexibility of technology with the depth of interpersonal interaction essential to entrepreneurship learning.(23)

4.3 Effectiveness of EdTech Strategies on Learning Outcomes

Analysis of learning outcomes revealed three primary dimensions of effectiveness. The

cognitive dimension, which encompasses increased knowledge and understanding of entrepreneurial concepts, demonstrated the most consistently positive results among all EdTech strategies reviewed, with 83.3% of studies reporting statistically significant improvements.(24) The affective dimension, specifically increases in entrepreneurial intentions and self-efficacy, demonstrated more variable results; simulation-based and blended learning strategies consistently produced greater improvements than purely asynchronous e-learning platforms.(25) The behavioral dimension, which measures actual entrepreneurial behavior such as new venture formation post-program, was the least frequently measured outcome in the literature, found in only 12 studies (25%), so conclusions regarding the long-term impact of EdTech on actual entrepreneurial behavior remain limited.(26)

4.4 Moderating Factors and Implementation Context

A cross-study synthesis identified several factors that significantly moderate the effectiveness of EdTech in entrepreneurship education. The quality of instructional design has been shown to be the strongest predictor of implementation success; even sophisticated technology is ineffective without the support of a structured pedagogical design based on learning theory.(27) The digital competence of instructors has also been shown to be crucial; studies involving instructors with high digital literacy consistently report better outcomes.(28) Furthermore, institutional support in the form of infrastructure, policies, and incentives for educators has been shown to be a critical determinant of the success and sustainability of EdTech implementation.(29)

4.5 Policy Implications

Based on the synthesis of the findings above, there are several crucial policy implications. First, the government and educational institutions need to develop a technology-based entrepreneurship curriculum framework that not only emphasizes access to digital platforms but also ensures the quality of standardized pedagogical design.(30) Second, capacity building programs for educators in digital competency and technology integration into entrepreneurship learning need to be prioritized as a mandatory component of

teacher and lecturer professional development policies. Third, given the significant gap between developed and developing country contexts in the existing literature, greater research investment is needed to generate contextual and locally relevant empirical evidence, so that formulated policies truly reflect the realities and needs of each educational ecosystem.(31).

CONCLUSION

This systematic literature review has successfully mapped that the integration of EdTech in entrepreneurship education consistently has a positive impact on cognitive and affective learning outcomes, with blended learning strategies and digital business simulations demonstrating superior effectiveness compared to other approaches.(32) However, empirical evidence on long-term behavioral impacts remains very limited, so claims of tangible entrepreneurial transformation through EdTech need to be viewed critically.(33)

The theoretical implications of this study emphasize the need to develop an entrepreneurship pedagogical framework that explicitly integrates the technological dimension as a primary variable, not simply as a tool. Practically, educational institutions need to prioritize the quality of instructional design over the sophistication of the technology used.(34) For policymakers, these findings underscore the urgency of developing national standards for the implementation of EdTech in entrepreneurship curricula, accompanied by measurable and sustainable, evidence-based evaluation mechanisms.(35) Future research should expand the geographic scope to developing country contexts and measure the long-term impact on actual entrepreneurial behavior.

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